Effectiveness of the Catch (coordinated Approach to Child’s Health) Rainbow Program in Elementary Schools for Change in Fruit and Vegetable Intake

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ABSTRACT

EFFECTIVENESS OF THE CATCH (COORDINATED APPROACH TO CHILD’S HEALTH) RAINBOW PROGRAM IN ELEMENTARY SCHOOLS FOR CHANGE IN FRUIT AND VEGETABLE INTAKE

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School of Health Studies
Northern Illinois University, 2023
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Background: There is currently a lack of nutrition education programs that effectively increase fruit and vegetable (FV) intake among children. Not meeting the recommendations for fruits and vegetables increases the risk for poor academic achievement, obesity, and chronic diseases such as cardiovascular disease, type II diabetes, asthma, and more. Nutrition, cooking, and gardening lessons individually and together have shown to increase fruit and vegetable (FV) consumption in school-aged children.

Methods: Two-Hundred Twenty-five 4th and 5th graders participated in six cooking and six gardening lessons between September 2021 and May 2022 at Genoa Elementary school. Each nutrition education session was 25-minutes long, paired with either hands-on cooking activities or gardening skills. At baseline and post-intervention, participants’ height and weight were assessed with a stadiometer/scale, and skin carotenoid measurement was taken by a Veggie Meter. Students also completed the Block Food Frequency Questionnaire to self-report FV consumption at both time points. Focus groups were conducted with students at the end of the program for qualitative feedback.

Results: Paired samples t-test results indicated no significant decrease in BMI. There was an unanticipated statistically significant decrease in skin carotenoid scores (p < 0.01) and there was no significant change to self-reported FV intake. Additionally, the qualitative feedback was positive, as children mentioned benefits of healthy eating, and expressed enjoyment for growing, cooking, and tasting fruits and vegetables.

Conclusion: Results from this study can be used to guide future cooking and gardening programs for elementary school children. Time of the year when implementing these programs and collecting data may impact study outcomes due to seasonal variations in fruit and vegetable intake.
EFFECTIVENESS OF THE CATCH (COORDINATED APPROACH TO CHILD’S HEALTH) RAINBOW PROGRAM IN ELEMENTARY SCHOOLS FOR CHANGE IN FRUIT AND VEGETABLE INTAKE

BY

ASHLEY VALINSKAS

A THESIS SUBMITTED TO THE GRADUATE SCHOOL IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE MASTER OF SCIENCE

SCHOOL OF HEALTH STUDIES

Thesis Director: Dr. Henna Muzaffar
ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to Dr. Muzaffar and all her hard work contributing to this pilot study. This study would not have happened if it was not for her input and help along the way. Most importantly, the creation of the CATCH Rainbow program lessons is thanks to her and another graduate student, Megan Farris.

Additional acknowledgements to those that helped deliver this program to the students at Genoa Elementary school: Nora Collins, Ashley Werner, and Melanie Reagan. Their help and enthusiasm for the program was appreciated and enjoyed by both staff and students.
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CHAPTER ONE

INTRODUCTION

A balanced diet is essential to health and wellness as it provides necessary nutrients, vitamins, and minerals the body needs for optimal function. Several benefits to healthy nutrition throughout the lifespan include reducing high blood pressure, lowering cholesterol, improving recovery times from injury or illness, improving immunity, and increasing overall energy levels.\(^1\) Healthy eating patterns include following a well-balanced diet that provides all the necessary nutrients. A well-balanced diet incorporates whole grains, lean proteins, low-fat dairy, fruits, vegetables, and healthy fats.\(^{1,2,3}\) Fruits and vegetables provide a vast array of vitamins and minerals that the body needs to work efficiently.\(^3\) To list a few of the many, minerals such as sodium and potassium found in tomatoes and potatoes maintain fluid balance within the body; and vitamins such as vitamin A and K found in dark leafy greens help with physiological processes such as vision and bone health.\(^3,4\) This is why eating a variety of fruits and vegetables from different families optimizes potential benefits from their nutritional properties. Currently, less than 50% of children in the US eat enough fruit to meet recommendations, and less than 12% eat enough vegetables.\(^5\) In general, at least half of your plate should contain fruits and vegetables at each meal.\(^2\) According to the Dietary Guidelines for Americans 2020-2025, the specific number of servings needed per day of fruit and vegetables is dependent on a person’s total calorie intake. For those eating a 1,000-2,000-calorie diet, fruit servings range from 1-2 \(\frac{1}{2}\) cups per day and for vegetables, serving recommendations range from 1-2 cups per day.\(^2\)
Those who have a diet lacking in fruits and vegetables have higher risks for chronic diseases such as obesity, hypertension, coronary heart disease, stroke, and cancer. Adults who are obese risk comorbidities such as high blood pressure, high cholesterol, type 2 diabetes, asthma, sleep apnea, joint problems, cardiovascular disease, and more; for children who are obese, their risk for these health concerns in the future is also heightened. According to the CDC, 1 in 5 children and adolescents in the United States are affected by childhood obesity. This demands attention and intervention to reduce the number of American children who are obese and risk potential complications in their adult life.

A person's eating habits carry on from childhood to adulthood which prompts nutrition interventions to happen earlier in life rather than later to prevent the risk of obesity and further diet-related chronic diseases. Research has linked unhealthful eating habits to declined cognition; furthermore, these studies have linked poor nutritional quality to less success academically. Researchers have indicated that children's brain development is hindered by poor nutritional quality within their diets. This is usually a rapid process in early life and healthy nutrition is essential; those children who have a low-quality diet may have lower academic achievement. Poor academic achievement has additionally been linked to obesity, lower income, and even unemployment later in life. In an Australian Cohort study published by Haapala et al. in 2016, researchers collected 24-hour diet recalls from 2,287 children at ages one, two, and three from the parents. Results showed that a higher quality diet score at as early as age one led to higher scores in math, reading, and spelling when tested at age seven. They concluded that quality of early diet may be a predictor for later academic achievement. This continues past ages one, two, or three, and is true throughout a child’s school-age years emphasizing the
importance of a balanced diet throughout the lifespan. For precisely this reason, early nutrition intervention is key to a child’s development and success later in life. The earlier a person is exposed to fruits and vegetables and develops healthy eating habits, the more likely they are to carry on those habits in the future.²¹¹

Research has shown that nutrition education alone is not enough to result in lasting changes in young children’s dietary habits.⁸ A randomized controlled study was published by Serenbrennikov et al. in 2020 on the effectiveness of nutrition education on plate waste. In this study there were sixty-two students in the intervention group and thirty-six in the control. After six weeks of bi-weekly nutrition education lessons, researchers found no difference in fruits and vegetables being ordered or wasted. These researchers expected an increase in the number of fruits and vegetables being ordered while simultaneously decreasing waste. Researchers ultimately concluded that education is not enough and a more coordinated approach to nutrition intervention is needed.⁸

There is a lack of effective nutrition interventions in society today from childhood to older adulthood as there is no current standard method of teaching nutrition information to different age groups. Researchers and health professionals have been experimenting with various interventions and studying their impact on fruit and vegetable (FV) intake in elementary aged school children. Methods of interventions range from nutrition lessons through videos, lectures, and worksheets to cooking demonstrations, taste tests, hands-on cooking lessons, gardening lessons, or any combination of the above listed. The search for an effective, engaging program is ongoing and seems to depend on the age group, demographic area, and resources for nutrition education/interventions within the school.
The current study aims to analyze the participant level data on the effectiveness of the Coordinated Approach to Children’s Health (CATCH) Rainbow program in improving fruit and vegetable intake in elementary school children. The CATCH Rainbow program is a classroom-based cooking and gardening program that was developed in April 2021. The twelve CATCH Rainbow lessons were written by Dr. Henna Muzaffar with the help of a graduate student. The CATCH name was used to illicit interest in the program due to CATCH familiarity among schools. However, the development of the lessons is solely the work of the two mentioned authors and will be renamed in the future. Two hundred and twenty-five elementary school children participated in six cooking and six gardening lessons between September 2021 and May 2022. Each session was 25 minutes long and included nutrition education and either fruit and vegetable tasting activities or gardening skills. The program was delivered by four university students and a university professor. The primary aim of the CATCH Rainbow Program was to assess the effectiveness of the program for increasing fruit and vegetable consumption in school aged children.

Background and Significance

High fruit and vegetable intake is imperative in a healthy and balanced diet. The Standard American Diet (SAD) is riddled with highly processed foods, artificial colors and sweeteners, and saturated fats. The school environment is one of the most influential places for students to learn about nutrition and be exposed to new foods. Students get anywhere from one-third to half of their nutrition for the day from their school cafeteria. This provides a unique opportunity for schools to have an influence on what students eat. The National School Lunch Program (NSLP) has tried to make use of this opportunity in recent years by offering fruit and vegetable options.
during lunch and requiring students to take a minimum of one serving of a fruit or vegetable. A study published in 2020 by Amin et al. found that this did not increase FV intake in students. Although this had forced students to take one serving, many of those servings wound up being wasted.\textsuperscript{13} Such results demonstrate that it was not availability alone that impacts consumption, but students’ individual tastes and preferences as well. A Norwegian study published in 2020 by Vik et al. tested a similar change in policy to see if it would impact students daily FV intake. For one year, they offered a free healthy lunch to 55 students. The only significant difference they found was that students had increased their number of vegetables on sandwiches specifically.\textsuperscript{14} Although this intervention had an impact on FV consumption and researchers stated that policy change is needed in other schools as well, it showed that policy change is not enough to create lasting impacts in a child’s daily eating habits. The CATCH Rainbow program educates students on how to make healthier choices as well as provide them with resources to cook healthy foods or grow their own garden, instead of enacting policies within school lunch.

Nutrition education lessons have proven to be impactful on student’s self-efficacy, knowledge, and preference towards fruits and vegetables.\textsuperscript{15-18} Wall et al. conducted a study to observe changes in student’s self-efficacy, FV preference, and knowledge after attending four vegetable-focused nutrition education lessons. Their intervention group \((N = 1047)\) demonstrated an increase in all categories when compared to the control group \((N = 890)\).\textsuperscript{15} A study conducted by Jakubowski et al. (2018) in New Jersey delivered nutrition education lessons to seventy-one 2\textsuperscript{nd} grade students during their regularly scheduled gym class. The intervention group scored significantly higher on their “healthy choices” score.\textsuperscript{16} This shows that nutrition education lessons have the potential to positively impact students FV intake. Most states in the US require
nutrition education to be a part of the school curriculum and teachers are more than willing to integrate nutrition lessons into their classrooms. However, most programs are underdeveloped and lack consistency. Beyond lessons in the classroom, other studies have shown that hands-on approaches are more effective. The Las Vegas “Students Pick a Better Snack” study published by Christiansen et al. (2019) provided students with nine monthly nutrition education lessons and cooking demonstrations with taste tests lead by a trained chef/registered dietitian (RD). Researchers discovered that the intervention group ($N = 380$) had increases in attitude towards fruits and vegetables when compared to the control group ($N = 99$). Cooking lessons are a popular way to expose children to new foods and healthier choices early on in life. This further supports the implementation of hands-on approaches with school aged children for promoting FV intake/consumption. The CATCH Rainbow program provides students with FV lessons, gardening lessons and snacks after each nutrition lesson.

Providing students with gardening lessons has been another area of nutrition interventions in which students have shown interest and modeled behavior change. A study published in 2020 by Kim and Park included a 12-week intervention where 202 elementary school students participated in nutrition education, gardening lessons, and cooking lessons that used the gardens’ harvested produce. Pre-and post-program questionnaires were collected from the children. They found that dietary self-efficacy, outcome expectancies, gardening knowledge, nutrition knowledge, vegetable preference, and vegetable consumption were significantly increased, and food neophobia was significantly decreased. Research suggests that nutrition education can positively influence nutrition knowledge, whereas hands-on lessons can provide students with life skills to adopt healthy habits. A study conducted by Robinson et al. (2005) on
the impact of a gardening intervention on life skills showed an increase in teamwork, self-understanding, leadership, communication skills, decision making skills, and volunteerism.\textsuperscript{20} This provides convincing evidence that combined nutrition and gardening intervention programs are effective in increasing nutrition knowledge, vegetable preferences, as well as confidence when choosing healthy choices.

For a multi-component approach, the CATCH Rainbow program combines nutrition education, FV tasting sessions, and gardening lessons aimed at increasing fruit and vegetable consumption in elementary school aged children.

**Research Purpose**

The purpose of this study is to evaluate the effectiveness of implementing weekly cooking and gardening lessons to 4\textsuperscript{th} and 5\textsuperscript{th} graders at Genoa Elementary school on fruit and vegetable consumption as measured by the Veggie Meter (skin carotenoid scanner) scores and Food Frequency Questionnaire (FFQ) administered before and after participation in the program.

**Specific Aim**

The specific aim was to increase fruit and vegetable consumption in school aged children by eliciting interest and familiarity to various fruits and vegetables through basic cooking, taste testing, and gardening activities.

**Objectives**

At the end of the CATCH Rainbow Program, the study will assess the:
1. Impact of the CATCH Rainbow program on FV intake for elementary school aged children as evidenced by the FFQ

2. Impact of the CATCH Rainbow program on FV intake for elementary school aged children as evidenced by the Veggie Meter scores

3. Correlation between the Veggie Meter scores and FV intake assessed by the Food Frequency Questionnaire (FFQ)

4. Acceptability of the CATCH Rainbow Program for 4th and 5th graders by conducting focus groups

**Hypothesis**

1. The CATCH Rainbow program will increase FV intake as evidenced by comparison of self-reported FV intake pre and post intervention

2. The CATCH Rainbow program will increase FV intake as evidenced by an increase in Veggie Meter scores from pre-program to post-program

3. There will be a positive correlation between the Veggie Meter scores and FV intake assessed by the Food Frequency Questionnaire (FFQ)

4. 4th and 5th grade participants will express high acceptability of the CATCH Rainbow program per the focus groups result
CATCH Program

The CATCH program has been adopted by more than 15,000 schools and communities in the United States over the last 30 years.\textsuperscript{21} The program can be adapted to children PreK through 12\textsuperscript{th} grade\textsuperscript{21} and includes health concepts that are delivered through the following methods: classroom instruction, physical education lessons, school nutrition services, and family events.\textsuperscript{22} There are more than 120 peer-reviewed scientific publications supporting the effectiveness of the CATCH program from reducing childhood obesity to E-cigarette prevention.\textsuperscript{21,22}

A study published in 2023 by Samuel-Hodge et al. evaluated the programs outcomes and perceptions by interviewing, surveying, and leading focus groups with students, parents, and school staff.\textsuperscript{23} Their results showed an overall mean change in BMI z-scores of -0.04 (SD = 0.59; \( p = 0.35 \)). Their qualitative findings were that the program is widely accepted by students, parents, and staff alike.\textsuperscript{23} Another study published in 2021 by Kelder at al. studied the effect of the implementation of the CATCH My Breath program in twelve Texas middle schools. From baseline to 16-month follow up, results showed a reduction in the e-cigarette use in intervention schools (\( N = 6 \)) when compared to the control schools (\( N = 6 \)).\textsuperscript{24} Research also showed increase in e-cigarette knowledge and perceived positive outcomes in intervention schools when compared to control schools.\textsuperscript{24}
CATCH Rainbow Program is based on the CATCH nutrition education curriculum with additional lessons focusing on cooking and gardening activities. For this study, the effectiveness of the CATCH Rainbow program is measured by the change in fruit and vegetable intake among elementary school children.

Cooking Programs

Cooking lessons in schools have shown an increase in cooking knowledge, food preference, and cooking self-efficacy in young children. A quasi-experimental pre-post study published by Saha et al. (2020) was conducted on 3rd-5th (N = 115) graders evaluating the effect on FV consumption and other dietary behavioral factors after the provided intervention. The intervention program included nutrition lessons, cooking classes, and tasting sessions. Students were additionally given nutrition and recipe handouts to be sent home after each lesson. Results showed that there was an improvement in nutrition knowledge, fruit and vegetable preference, and eating and cooking self-efficacy. In order to elicit lasting change in FV consumption, students must have confidence and positive attitudes towards fruits and vegetables.

A 2016 study published by Jarpe-Ratner et al. included seventeen elementary schools and one middle school from Chicago, IL. Students at the recruited schools participated in an after-school cooking and nutrition program to improve student nutrition knowledge, cooking self-efficacy, FV preference and consumption, and communication to family about healthy eating. A chef instructor led a ten-week (two hours/week) program in the cafeterias after school. At the six-month follow-up interval, post-intervention data was collected. Results showed an increase in all the objectives mentioned above.
In Colorado, a nutrition intervention program, Cooking with Kids, was implemented as a randomized controlled trial in a school setting. Lessons included introductory lessons, cooking classes, and vegetable tasting sessionsspanned over 10 weeks during their spring semester. Researchers found that students’ vegetable preferences, cooking attitudes, and cooking self-efficacy significantly improved in the intervention group ($N = 137$) when compared to the control ($N = 120$).\textsuperscript{27,28}

The CATCH Rainbow program includes cooking and tasting sessions that aim to increase students’ FV consumption leading to healthier choices.

**Gardening Programs**

As previously mentioned in the Robinson et al. (2005) study, gardening programs have been shown to increase students’ overall life skills.\textsuperscript{20} Six life skills were assessed in this study: teamwork, self-understanding, leadership, decision making skills, communication skills, and volunteerism and the intervention showed a significant increase in all of these skills. Five schools were included in this study with a total of 190 students participating over the span of one year. Students who were a part of the control group had an initial higher life skills score (for unknown reasons) when compared to the intervention group. After the program, the intervention group improved significantly, surpassing the control groups scores.\textsuperscript{20}

Gardening programs have also been analyzed for their effectiveness to increase FV consumption in young children. A randomized controlled study published by Christian et al. (2014) compared two different gardening programs on their effectiveness in increasing FV intake. Students who participated ($N = 641$) were an average of 8.1 years of age.\textsuperscript{29} Assessment of
FV consumption via 24-hour diet recall was used before and after implementation of the programs. There was a four-item questionnaire developed by the researchers to collect details about the gardening activity within the school, that was also given to students after the program implementation. Results showed an overall increase in FV consumption between both programs. They also noted that schools with a “higher level” garden within the school would have more success. These levels ranged from 0 = no garden to 5 = community involvement. However, despite success with an increase in overall FV consumption, researchers concluded that their study provided limited evidence to support garden programs alone for improving children’s FV intake. The multi-component approach provided by the CATCH Rainbow program pairs nutrition, cooking lessons, and gardening lessons together with the aim to provide lasting impact in increasing FV consumption.

Programs that focus on gardening and include a tasting component have shown to be more successful than gardening interventions alone. These combined gardening and tasting programs have demonstrated improvement in students’ thoughts and feelings towards vegetables and healthy choices as seen for cooking programs. Nine schools from Wisconsin participated in a study observing the effectiveness of a Farm-to-School program. In this study published by Bontrager Yoder et al. (2014), students (N = 1117) took gardening lessons, tended to their school garden, and taste tested the produce. Results showed an increase in overall attitudes towards vegetables, vegetable knowledge, exposure, and willingness to try new things.

A similar study done in 2022 published by Taniguchi et al. studied the impact of a farm-to-school program on vegetable intake (N = 139). The intervention group (N = 106) had a significant increase specifically for the intake of squash and beans when compared to the control.
Researchers concluded that while they had success in a school setting, a parent component embedded in the intervention would add more lasting effects to students’ dietary habits. The CATCH Rainbow program added a parental component by sending home weekly newsletters with nutrition information and recipes.

The aforementioned gardening studies showed that nutrition education including gardening lessons has shown increase in students’ overall life skills, attitudes, and preferences towards FV. Tasting paired with gardening programs has shown more engagement and dietary changes for students when compared with single component studies. The CATCH Rainbow Program included both gardening and tasting sessions.

**Combined Cooking and Gardening programs**

An example of a successful program that equally integrates cooking and gardening lessons into their nutrition program intervention is an after-school program called Sprouts. In Texas, a study published by Landry et al. (2021) studied eight control and eight intervention schools who participated (N = 3,135) in the Sprouts intervention. The Texas Sprouts program included eighteen weekly lessons delivered to the students and nine monthly lessons delivered to the parents. These lessons included cooking lessons, gardening lessons, tasting sessions, and nutrition education classes. It was noted that this was the first study to examine the effect of a gardening program on diet quality using the Healthy Eating Index 2015 (HEI-2015). Pre and post 24-hour diet recalls were collected and then given an HEI-2015 score to measure Diet Quality. After implementation of the program, the intervention group compared to the control group had an increase in HEI-2015 scores and total vegetable scores. Although this study compared diet quality before and after the implementation of the multi-component program, this thesis has
looked to measure specific differences in fruit and vegetable intake before and after participation in the program. Another Sprouts study conducted in LA and published by Martinez et al. (2015) comprised of 290 low-income 5th grade students. Researchers found an increase in cooking behaviors which are linked to increases in dietary fiber intake and vegetable intake. While they did not measure for any change in FV consumption, students’ attitudes and feelings towards cooking, gardening, and vegetable preferences have been positively influenced by these nutrition intervention programs. The Sprouts studies were both conducted after school. The current study was an in-school intervention program, and evaluated differences in FV intake before and after program participation, and asked participating students about their perception of the program.7,32

**Acceptability of Nutrition Intervention Programs**

Students’ qualitative feedback helps to gain perspective about the success of a nutrition intervention program. A study published by Lukas and Cunningham-Sabo (2011) collected qualitative feedback from students and teachers after the implementation of the nutrition intervention program Cooking with Kids.33 Focus groups were conducted with students ($N = 178$) and teachers ($N = 17$). The data collected indicated that student perspectives were positively associated with the addition of cooking lessons and encouraged learning in other academic subjects. Reportedly, they enjoyed trying new foods, talking about other cultures, and participating in the hands-on lessons. Teachers from the focus groups corroborated this statement by stating that cooking lessons aide in mathematics, geographical, and science lessons.33 Additionally, the Food as Medicine study by Marshall and Albin shows the acceptability of nutrition and cooking lessons among children of all ages. In this study, thirteen children participated in four interactive nutrition and cooking lessons with their parents. The children
ranged from early preschool to early high-school age. Families were recruited from the local food pantry where classes were being held. Through observation, children enthusiastically participated in these programs and showed a willingness to try new foods, participate in food preparation, and learn about nutrition. This study provided evidence to show that children are not only willing but eager to participate in food preparation and learn about nutrition. These studies all took the children’s perspective into account. Collecting qualitative feedback from students helps to evaluate a program’s effectiveness more comprehensively. The current study also conducted focus groups with the program participants after the CATCH Rainbow program concluded. Themes from those focus groups will help to shape future recommendations for changes to the program.

Tools Used

The Block 2004 Food Frequency Questionnaire (FFQ) developed by Nutrition Quest has been included in a few validation studies. A study by Marshall et al. (2008) with 233 children tested the correlations between the FFQ and 3-day diaries when collecting information about milk, calcium, and vitamin D intake. Results using spearman correlation coefficients showed medium correlation between the FFQ and 3-day diary results for milk \( r = 0.571 \), calcium \( r = 0.515 \) and vitamin D \( r = 0.512 \). Researchers concluded that the FFQ provides reasonable estimates of milk, calcium, and vitamin D intake when compared to three-day diaries. In a second study by Cullen et al. (2008) including 83 adolescents and children ages 10-17, there was conflicting evidence showing that the FFQ is valid for some nutrients, but not for most food groups. They stated that the study might be more useful for adolescents. However, a systematic review published in 2015 by Olukotun and Seal examining the different
dietary assessment tools for children 11 years and younger reported that FFQ’s may be the best method for assessing dietary intake for this age range.\textsuperscript{37} The current study aims to examine the effect of the program on overall FV intake before and after the intervention. This will be done by using the questionnaires’ total fruit and total vegetable serving estimates and comparing them at baseline and post-intervention.

The Veggie Meter is a widely accepted and validated tool to assess fruit and vegetable intake.\textsuperscript{39,40,41} The Veggie Meter is manufactured by Longevity Link Corporation, a company that creates technology for detecting micronutrients in living human tissue.\textsuperscript{38} On their website they provide information about the Veggie Meter and how it has been used in dietary interventions. They partnered with the US Department of Agriculture to assess skin carotenoid levels during different phases of carotenoid consumption. They tested 29 participants who followed a low-carotenoid diet for 6 weeks, then were provided a high-carotenoid diet for 8 weeks, and then their usual diet for the following 8 weeks. The study showed that carotenoid levels were higher during the high-consumption period and scores were lower during the low-consumption period.\textsuperscript{39} A 2019 study by Jahns et al. found that a skin carotenoid scanner (like the Veggie Meter) is a powerful tool to assess FV intake.\textsuperscript{40} This study by Jahns et al. assessed the use of skin carotenoid status (SCS) as a proposed marker of fruit and vegetable intake. Researchers compared the results of a resonance Raman spectroscopy (RRS) and a pressure-mediated reflection spectroscopy (RS) to a 24-hour diet recall and plasma carotenoid levels among women ages 40-60 ($N = 52$). Results showed the SCS as measured by the RS and RRS to be moderately to strongly correlated with plasma carotenoid concentrations.\textsuperscript{40} While this study did not use the Veggie Meter directly, the researchers concluded that SCS can be a powerful measure to assess
for FV intake. A pilot study conducted in 2021 with elementary school students found a statistically significant correlation between self-reported fruit and vegetable intake and Veggie Meter scores. Likewise, May et al. (2020) found the Veggie Meter to be a useful tool for school-based nutrition interventions when tested in a preschool, middle, and high-school settings. Furthermore, a study was conducted by Jones et al. (2021) to test the validity of using the Veggie Meter in a Low-Income School setting. VM scores were collected three times between Fall 2018 and Spring 2019, Researchers found an overall increase in VM scores ($p = 0.005$), which they stated was influenced by nutrition education within the schools. They concluded that the Veggie Meter is an effective tool to objectively assess FV intake in low-income school settings. A study conducted by Obana et al. (2022) used the Veggie Meter to measure FV intake in elementary and junior high school students ($N = 261$) after a brief nutrition education session on the importance of FV. In this study, there were three measurements taken, one at baseline, and then 3 months and 6-month postintervention. At baseline, after students Veggie Meter scores were taken, they were given a ranking based on their current score (e.g.: A=Excellent to E=severe shortage of vegetables). The baseline reading was followed by a brief 10-minute session on the importance of FV intake. At 6-month follow-up, researchers saw an increase in average VM scores by 47.4 points ($p < 0.001$). This study concluded that the VM can be used as an effective educational tool to raise awareness of FV intake. The aforementioned studies show the overall acceptance and wide range of use for the Veggie Meter to assess changes in fruit and vegetable intake. Based on these studies, the Veggie Meter can be a useful tool for assessing skin carotenoid status for all age groups and is an appropriate and reliable way to detect changes in FV intake.
A study by Beccarrelli et al. (2017) used the combination of skin carotenoid levels measured by Raman spectroscopy (RRS) and the 2004 Block Food Frequency Questionnaire by NutritionQuest to examine changes in fruit and vegetable intake before and after program implementation. This study reported the results of 30 students who participated in the Shaping Healthy Choices Program. Results from this study showed an unanticipated decrease in skin carotenoids by 2,247.9 units ($p = .04$) as well as a decrease in carotenoid intake by 1.5mg ($p = .05$). This study used the total vegetable intake and total fruit intake from the FFQ to assess change in FV intake as well. Researchers saw no significant change in reported totals for fruit and vegetable intake. The CATCH Rainbow program evaluated FV intake using the same FFQ to assess FV intake and used the Veggie Meter to assess skin carotenoid levels. These researchers additionally tested the correlation between the FFQ and the RRS readings. Scherr et al found a significant correlation between reported carotenoid intake from the FFQ and the carotenoid levels by the RRS readings ($r = .43; p = .02$). The CATCH Rainbow program study also looked at the correlation between the FFQ and the Veggie Meter scores, however it will be looking at the correlation between reported total FV intake and skin carotenoid levels assessed by the Veggie Meter.
CHAPTER THREE
METHODS AND DESIGN

Research Design

This intervention study used objective and subjective data to evaluate a pilot study using pre-post data on school aged children examining the effects of the CATCH Rainbow program on fruit and vegetable intake before and after the implementation of the program. To collect baseline data on fruit and vegetable intake, the program participants filled out a FFQ during the first meeting. To further collect objective fruit and vegetable intake data, participants skin carotenoid levels were assessed with a Veggie Meter score. A demographics form was filled out for each participant by the research team. This form included information such as age, gender, height (cm), weight (lbs.), and their Veggie Meter score. The original CATCH Rainbow program includes six hands-on cooking lessons where students take part in building the snacks. However, due to COVID-19, this was edited out for this study. The participants in this current study did not have any hands-on cooking activities but were given a pre-made snack that connected to the lesson they were taught. Six nutrition and six gardening lessons were then delivered to the students, six cooking lessons in the fall semester and six gardening lessons in the spring semester. At the end of the program, data was collected again using the same FFQ, Veggie Meter reading, and demographics form. Additionally, focus groups were conducted to examine the acceptability of the CATCH Rainbow program among 4th and 5th graders at the end of the program.
Study Sample

Two hundred twenty-five 4th and 5th graders from Genoa Elementary School participated in this research study. There were five 5th grade classrooms and four 4th grade classrooms with an average of 25 students per class that participated in the program. In the initial data collection phase, 199 students provided baseline data. At post-data collection phase, 177 students provided data. Attendance was taken during each of the lessons and 90% of the students in each class attended each of the program sessions.

Recruitment

Researchers sought approval for this study from the Northern Illinois University Institutional Review Board (IRB) in June 2021. In April 2021, elementary schools in the area surrounding Dekalb, IL were emailed about potential interest in participating in the CATCH Rainbow program. Genoa Elementary School responded saying that they would be willing to participate. Participant recruitment started after obtaining IRB approval for this study. More information about the program and who it involves was given to the principal; once he agreed, a passive informed consent form (Appendix A) was sent out to the parents via an email. Passive consent occurs when a parent or guardians’ consent is assumed for the study, unless communicated otherwise. More specifically, any parent who signed the form and brought it back to the school/researchers indicated that they did not want their child to participate in the program. Inclusion criteria included whether the student was in 4th or 5th grade and had a signed consent form.
**Procedure**

This study had 225 4th and 5th grade participants from nine different class sections. During the first visit in each classroom, four researchers introduced themselves, explained the data collection procedures to the students, and gave them an overview of the cooking and gardening lessons. The FFQ was distributed in every classroom and students were given roughly 25 minutes to complete it. Two of the four university student researchers monitored the administration of the FFQs as they walked around the classroom to help answer students’ questions. The other two university student researchers collected demographic data and Veggie Meter scores (Appendix B) simultaneously while the students were completing the FFQ. Height and weight were measured by having the participants step onto a scale that measured their weight (lbs.) and height (cm) simultaneously. Then they were sent to the Veggie Meter station where they had their index finger scanned one time to assess their skin carotenoid score and recorded the value onto the form. The demographics form and FFQ were both given a personal identification code (PIN; ex: 5D10) to keep track of students for pre and post comparisons while maintaining anonymity. These forms were stored in a locked filing cabinet in the University faculty member’s locked office.

In the following six visits, six cooking lessons (Appendices C to I) were delivered to the students. Each cooking lesson talked about a part of the plant and was accompanied by a snack. Students were also given a newsletter at the end of each lesson to take home to their guardian. The newsletter contained a summary of the lesson for the day and a recipe for the snack they had just enjoyed. The cooking lessons for the students were as follows:
1. The Seed: students were taught about the parts of the seed and what they do; accompanied by a trail mix with chickpeas
2. The Root: students learned where roots are found and their function within the plant; accompanied by a beet apple salad
3. The Stalks & Stem: students learned the function of the stem; accompanied by ants on a log snack
4. The Leaves: students examined the different texture, taste, look, and smell of leaves; accompanied by three different leaves and salad dressing snack
5. The Flowers: students examined the growth of flowers and how they bloom; accompanied by a smoothie that contained broccoli
6. The Fruit: students learned how a plant makes fruit; accompanied by build-your-own fruit pizzas

Week one of the cooking lessons was all about the seed of a plant (Appendix C). At this visit, the university researchers presented an overview of the CATCH Rainbow program, discussed the benefits of beans and seeds including that they are excellent sources of fiber and protein, and then filled out a worksheet with the students. With every cooking lesson, the researchers showed how to use that part of the plant in a snack given to the students. Weeks ones’ snack was a trail mix that had baked chickpeas to represent the seed.

Week two covered the roots of a plant (Appendix D). In this lesson, students reviewed the parts of a plant. The student researchers drew a plant on the board in each classroom, then, each part of the plant was labeled with participatory help from the students. Students then watched an episode of The Dr. Binocs Show. This is a YouTube channel that provides students with
engaging informational lessons on various scientific topics. Students then brainstormed different root vegetables and discussed the function of roots including keeping the plant anchored, absorbing nutrients from the soil, and storing energy for later. To demonstrate this part of a plant in a snack, students were given a salad slaw that had shredded beets and apples.

During week three students learned about the stalks and stems of a plant (Appendix E). Students reviewed the previous week's topics and volunteered information on whether they had tried any new fruits and/or vegetables. Students then reviewed the plant vascular system by viewing a PowerPoint presentation shown on the projector. Each student was then given a magnifying glass and a piece of celery that had been cut in half. In order to show the vascular system in a more evident way, the stalks had been placed overnight in cups with blue colored water. This demonstrated to students how a plants vascular system works by highlighting the plants veins with the blue water. For this week's snack, students were given “ants on a log.”

Week four was about the leaves of a plant (Appendix F). Students reviewed the previous week's topics and were again asked if they had tried any new fruits or vegetables since the last time. Then students discussed the botanical functions of leaves, watched another episode of The Dr. Binocs Show, and participated in a leaf taste test. Students were given a worksheet and four different leaves in a baggy. They were asked to draw the leaf and then describe its’ smell and taste. Then, students were shown “mystery” slides describing one of the leaves in their baggies. They then had to match their description with the description provided and see if they got it right. The snack for this week was the provided leaves and salad dressing that was given to the students.
Week five the students learned about the flowers of a plant (Appendix G). Students watched an episode of the *Dr. Binocs Show* on flowers and pollination between plants. They then completed a fill-in-the-blank video summary. Students then watched a PowerPoint presentation by a graduate student on cruciferous vegetables. Students then used a magnifying glass to observe broccoli crowns. The snack was a smoothie that had broccoli in it. Students completed a “taste test” form on the smoothie which rated the smoothie’s taste, smell, appearance, and overall likeness.

Week six of the cooking lessons was about the fruit of the plant (Appendix H). Students participated in a class discussion on the wide variety of fruits including berries, tropical fruits, melons, stone fruits, and more. Then students were shown a 30-second time lapse video of a pear growing from a flower into a fruit. The snack that week was build-your-own fruit pizzas with pita breads, vanilla yogurt, and various fruits.

Following the six cooking lessons, six gardening lessons (Appendix I to N) were then delivered in the Spring semester. These six lessons were designed to teach students about gardening and how to plan their own garden, leading up to the implementation of a school garden on their school property. The gardening lessons were as follows:

1. Design Your Garden: students were given a worksheet to design their own garden and pick what plants they might want to grow
2. Companion Planting: students learned what companion planting means and which plants are friends and enemies
3. Sowing Seeds Indoors: students were given seeds, egg cartons, and dirt; students planted their seeds in these cartons and were informed when to water them
4. Transplant and Garden Action Plan Part 1: students transferred their plants from the egg cartons to larger plastic-colored cups

5. Garden Action Plan and When to Harvest: students discovered the various times plants needs to grow, when they should be planted, and when they are ready to be harvested

6. Transplant Day: Students brought their plants in the plastic-colored cups outdoors where they were planted in the outdoor garden

Week one of the gardening lessons students learned about designing the garden (Appendix I). Students were given gardening magazines to look through and decide with their table mates which plants they would want to grow in their garden. They were handed a worksheet that had a box on it where they could create a layout for their plants. This allowed for the students to discuss with friends, get creative, and encourage their excitement for growing their own vegetables in the school garden.

Week two of the gardening lessons students learned about companion planting (Appendix J). Students watched a video that taught them about companion planting. This outlined the importance of where you plant each fruit or vegetable, and which ones work well together and help each other grow and which plants are bad for each other and steal nutrients. This taught the students that there is an actual methodology to planning a garden. They were able to locate in the magazines where it talked about companion plants to better plan their garden layout.

Week three of the gardening lessons students learned about sowing seeds indoors (Appendix K). Students learned how to plant seeds indoors. To do this they were in groups of 3-4 and received cardboard egg cartons, some fresh dirt, and seeds. They were shown how deep to put
the seeds and how much to water them. They were able to pick which seeds they wanted and then labeled their cartons accordingly.

Week four of the gardening lessons students learned about transplanting seeds and garden action plan part 1 (Appendix L). Students transferred their beginning plants and sprouts into bigger cups. The reason to transfer them to bigger containers was discussed as the plants needed room for their roots to grow. The students were instructed on how often to water these plants and how much.

Week five of the gardening lessons students learned about the second part of the action plan and when to harvest. Students looked over the same catalog as the first two weeks and found the plants that were going to be in their school garden. They wrote down the time of year they are supposed to be planted and harvested. This taught the students about using their resources and the complexity behind having a garden.

The last week of the gardening lessons was spent outside for transplant day. The students saw where the garden was behind the school and took their indoor plants out in their cups. According to the garden plan made in previous weeks, different sections of the garden had designated vegetables planted there. The students brought their plants to the right spots in the garden, and some students helped the university researchers plant them into the ground.

After the full delivery of the programs, the last visit included post-intervention data collection. Students were given the same amount of time to fill out the FFQ (25 minutes), and demographic data were collected simultaneously. The post surveys were collected and labeled with identification numbers like the pre-data forms. The FFQs were then sent to Nutrition Quest to be analyzed. The results from the surveys show the amount of specific nutrients each student
gets from their average diet. This included specific nutrients such as Vitamin A, iron, magnesium, but also included broader categories such as “starchy vegetables,” and “oils.” One last visit was made by a University Professor and one University student researcher who conducted 9 focus groups with the children to obtain qualitative feedback. The focus groups were comprised of two boys and two girls from each of the nine classrooms. Each focus group had a total of four students; therefore, nine focus group sessions were held. Students were asked 14 questions including opening, introductory, key, and closing questions (Appendix O). Each focus group was 15-20 minutes long and all the responses were audiotaped and transcribed verbatim.

**Description of Instruments**

There were four instruments that were used for data collection in this study: the demographics form, the carotenoid skin scanner (Veggie Meter), the Block 2004 Food Frequency Questionnaire (FFQ), and the 14 focus group questions.

**Demographics form**

The demographics form included queries about age, gender, height (cm), weight (lbs.), and the ethnicity of the participant. Participants were assigned an identification number printed on the demographics form and then matched with the identification number on their FFQ. A stadiometer was used to obtain data for the height and weight. A university student had the participants step onto the scale and then the researcher read and recorded their height and weight onto the demographics form. Before stepping onto the scale, the students were asked to remove their shoes. The students were not asked to remove anything else (hats, sweatshirts, coats, etc.). The students weight was displayed on the scale in pounds and the students height was measured
using the stadiometer; the height measurement was in centimeters. To calculate BMI, the researchers converted the weight into kilograms and then used the CDC website to calculate BMI and determine BMI Percentiles from the information recorded on the demographics form (height, weight, age, gender). This was done after data-collection on a university researchers’ computer and recorded onto a spreadsheet.

Table 1. BMI Percentile Categories

<table>
<thead>
<tr>
<th>Weight status category</th>
<th>Percentile range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>Less than the 5\textsuperscript{th} percentile</td>
</tr>
<tr>
<td>Healthy weight</td>
<td>5\textsuperscript{th} percentile up to the 85\textsuperscript{th} percentile</td>
</tr>
<tr>
<td>At risk of overweight</td>
<td>85\textsuperscript{th} to less than the 95\textsuperscript{th} percentile</td>
</tr>
<tr>
<td>Overweight</td>
<td>Equal to or greater than the 95\textsuperscript{th} percentile</td>
</tr>
</tbody>
</table>

**Carotenoid Skin Scanner (Veggie Meter)**

The Veggie Meter uses reflective spectroscopy as a non-invasive way to measure skin carotenoid levels. The scanner works by emitting a white LED light through the fingertip. Carotenoids in the skin have a characteristic absorption band in the blue wavelength of the visible light spectrum. The absorption seen by the scanner directly correlates to the concentration of carotenoids present in the skin. It has been tested and recommended that before collecting data, the Veggie Meter be calibrated with the white and black blocks provided.\(^4\)\(^6\) Before having the participant place their finger into the scanner, it is highly recommended to explain the Veggie Meter process, especially for children, to reduce any apprehension about the scanner.\(^4\)\(^6\) The
researcher wiped the participants finger clean using a disinfectant wipe and then placed their finger into the scanner. The Veggie Meter asks for the participant's gender, height, and weight to calculate an accurate score. Scores can range from 0-800 with a higher score indicating higher intake of fruits and vegetables. For the most accurate results, three scans are recommended.46 Two studies found that using the non-dominant ring finger is best to avoid misreading of the results due to overuse of the dominant hand and index fingers where participants may have calluses or other marks on their fingers preventing the light to pass through without issue.43,46 For the CATCH Rainbow program, researchers asked the students to wipe and place their index finger into the scanner.

**Block 2004 Food Frequency Questionnaire**

The FFQ asks participants about the types of foods they eat based on food group category, the frequency of consumption (how many times per week), and the portion size they normally consume. This FFQ included seventy-seven food items. Each item is asked individually as there are no categories; it starts with the breakfast foods such as pancakes, cereals, bacon, eggs. Then moves to the traditional lunch or dinner items such as burgers, tacos, pork chops, spaghetti, and mac and cheese. Next it asks about butter, peanut butter, jelly, salad dressing, and mayo. Then transitions to vegetables such as beans, peas, broccoli, carrots, sweet potatoes, baked potatoes, French fries. Lastly it asks about ketchup and snack items such as crackers, chips, and candy. With each food item it asks about the frequency and portion in relation to that food item. For example, one item reads, “Pancakes, waffles, pop tarts” and the respondent selects *how many days last week?* The options are None, 1 day, 2 days, 3-4 days, 5-6 days, or *every day.* Next, reading the item from right to left it then asks *How many?* The options are ½, 1, 2, or 3. For other
questions for the How many category? The respondent refers to the portions page where they have different sized bowls filled with different amounts of an example item and the respondent picks A, B, C, or D. Individual portion size is asked, and pictures are provided to enhance the accuracy of the quantification.

The participants took about 25 minutes to complete the questionnaire. It was developed for those ages 8-17. The food items included in the survey were adapted from the NHANES 1999-2002 dietary recall data. The nutrient database was developed from the USDA Nutrient Database for Dietary Students, version 1.0.

Focus Groups

After the implementation of the CATCH Rainbow program, nine focus groups were conducted with a sample group of students from each class that participated in the program. In the focus groups, two boys and two girls were asked to meet with the University professor and one University student from the study in a separate room. During each focus group, students were asked a series of questions that were pre-determined by the professor and the university student (Appendix O). Students were able to answer the question one at a time, encouraged to share their thoughts and respond to their peers. The University student took notes during the focus groups and recorded the audio on their cell phone. The focus groups took approximately 15-20 minutes each. Students were then returned to their classrooms.

Data Collection

Several types of data were collected for this research study. Data collection included quantitative, demographic, anthropometric, and post-qualitative data. Quantitative data were obtained from the FFQ with 77 food and beverage questions including frequency and portion
size. Demographic data included gender, age, height (cm), weight (lbs.), and ethnicity. Anthropometric data included the Veggie Meter score and BMI percentile (obtained from collected height and weight). Post-Qualitative data included responses collected from the nine focus groups.

Outcome Measures/ Statistical Analysis

The data collected were used to assess the impact of the CATCH Rainbow Program on three program outcomes. Fruit and vegetable intake was the main outcome of this research study. The Veggie Meter scores, and the results from the FFQ contributed to the evaluation of fruit and vegetable intake pre and post program implementation. In addition, qualitative acceptability of the program was assessed by the focus groups.

IBM SPSS Statistical package 26 was used to analyze the data obtained from this study. The following variables were recorded into a spreadsheet file and then imported into SPSS: participants’ ID, height, weight, age, grade, gender, race, ethnicity, BMI, BMI percentile, skin carotenoid score 1 and 2. FFQ results were analyzed by Nutrition Quest. The data provided from Nutrition Quest was then imported into SPSS to further analyze and compare results to the Veggie Meter scores.

Descriptive statistics and descriptive frequencies were used to evaluate the demographic data from this study. Paired samples t-test was used to compare the means and test the statistical significance of change in VM scores and FFQ results from baseline to post-intervention. Regression Analysis was used to predict VM scores and FFQ results from age, gender, race, and ethnicity.
Grounded theory analysis was used to interpret the qualitative data obtained from the focus groups conducted with the student participants. This was done by recording the focus groups, transcribing the student responses, and extrapolating themes from the students’ reports.

Data Analysis

Table 2. Summary of Objectives and Variables

<table>
<thead>
<tr>
<th>Research Objectives</th>
<th>Types of Variables</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Impact of the CATCH Rainbow program on FV intake as evidence by the FFQ</td>
<td>Outcomes: FFQ data</td>
<td>Descriptive Statistics</td>
</tr>
<tr>
<td>2. Impact of the CATCH Rainbow program on FV intake as evidence by the Veggie Meter scores</td>
<td>Outcomes: Veggie Meter Scores</td>
<td>Paired Samples t-test</td>
</tr>
<tr>
<td>3. Correlation between the Veggie Meter scores and FFQ on FV intake</td>
<td>Outcomes: Veggie Meter Scores and FFQ data</td>
<td>Pearson’s Correlation</td>
</tr>
<tr>
<td>4. Acceptability of the CATCH Rainbow Program for 4th and 5th graders per focus groups</td>
<td>Outcomes: Qualitative Responses</td>
<td>Grounded Theory Analysis</td>
</tr>
</tbody>
</table>

Data Safety and Monitoring

Demographic forms and FFQ were given a corresponding identification code. Students in the 4th grade had a 4 at the beginning of their ID code, followed by a letter identifying which classroom they were in, followed by their own numerical digit (ex: 4B12). Students in the 5th grade had a similar ID procedure, but their assigned number was 5. This was to keep the names and personal details confidential when collecting and analyzing the data. FFQ’s and demographic forms are kept in file folders in a university faculty member’s locked office during the study. After the presentation of findings, both the demographic forms and FFQs will be
shredded and disposed of. The sessions were recorded using one of the University students’ iPhone where only audio was recorded. These were then transcribed by the same University student into a Google Doc. After the transcription was complete, the audio file was deleted.
CHAPTER FOUR
RESULTS

A total of 225 students were recruited for this study, 178 (79.1%) students were present at the first session and filled out the demographic data form and completed the food frequency questionnaire. The study population included 4th ($N = 83, 46.6\%$) and 5th ($N = 95, 53.4\%$) graders. The age of the students was nine ($N = 52, 29.2\%$), ten ($N = 87, 48.9\%$), eleven ($N = 15, 8.4\%$), and others did not report their age ($N = 24, 13.5\%$). Gender was reported as male ($N = 92, 51.7\%$), female ($N = 80, 44.9\%$), and others did not report their gender ($N = 6, 3.4\%$). Race and ethnicity were separated into two categories. The races of the students were white ($N = 33, 74.7\%$), African American ($N = 6, 3.4\%$), or other ($N = 22, 12.4\%$) with 9.6% of students not reporting their race. Ethnicity of the participants was reported as Hispanic ($N = 31, 17.4\%$), Non-Hispanic ($N = 132, 74.2\%$), and 8.4% did not report their ethnicity. These frequencies can be seen in Table 3.
Table 3. Baseline Demographics of CATCH Rainbow Participants ($N = 178$)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Frequency n(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grade</strong></td>
<td></td>
</tr>
<tr>
<td>$4^{th}$ graders</td>
<td>83 (46.6%)</td>
</tr>
<tr>
<td>$5^{th}$ graders</td>
<td>95 (53.4%)</td>
</tr>
<tr>
<td>Total</td>
<td>178 (100%)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>52 (29.2%)</td>
</tr>
<tr>
<td>10</td>
<td>87 (48.9%)</td>
</tr>
<tr>
<td>11</td>
<td>15 (8.4%)</td>
</tr>
<tr>
<td>Did not report</td>
<td>24 (13.5%)</td>
</tr>
<tr>
<td>Total</td>
<td>178 (100%)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>92 (51.7%)</td>
</tr>
<tr>
<td>Female</td>
<td>80 (44.9%)</td>
</tr>
<tr>
<td>Did not report</td>
<td>6 (3.4%)</td>
</tr>
<tr>
<td>Total</td>
<td>178 (100%)</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>133 (74.7%)</td>
</tr>
<tr>
<td>African American</td>
<td>6 (3.4%)</td>
</tr>
<tr>
<td>Other</td>
<td>22 (12.4%)</td>
</tr>
<tr>
<td>Did not report</td>
<td>17 (9.6%)</td>
</tr>
<tr>
<td>Total</td>
<td>178 (100%)</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>31 (17.4%)</td>
</tr>
<tr>
<td>Non-Hispanic</td>
<td>132 (74.2%)</td>
</tr>
<tr>
<td>Did not report</td>
<td>15 (8.4%)</td>
</tr>
<tr>
<td>Total</td>
<td>178 (100%)</td>
</tr>
</tbody>
</table>
BMI was recorded at baseline data collection with the mean BMI across all participants. The majority of students during baseline collection were in the healthy weight category with 46.5% of students having a BMI Percentile between the 5\textsuperscript{th} and 84\textsuperscript{th} percentile. However, students who were at risk for overweight or overweight was 52.3% of the student sample (see Table 4).

**Table 4. BMI Percentiles of CATCH Rainbow Participants (N=172)**

<table>
<thead>
<tr>
<th>BMI Percentile</th>
<th>Number of Students</th>
<th>Percent of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight: &lt; 5\textsuperscript{th}</td>
<td>2</td>
<td>1.2%</td>
</tr>
<tr>
<td>Healthy weight: 5\textsuperscript{th} - 84\textsuperscript{th}</td>
<td>80</td>
<td>46.5%</td>
</tr>
<tr>
<td>At risk of overweight 85\textsuperscript{th} – 95\textsuperscript{th}</td>
<td>44</td>
<td>25.6%</td>
</tr>
<tr>
<td>Overweight =/&gt;95\textsuperscript{th}</td>
<td>46</td>
<td>26.7%</td>
</tr>
</tbody>
</table>

Of the 225 students recruited for the study, 159 (70.6%) students’ baseline skin carotenoid scores were recorded, and 164 (72.8%) students’ post-intervention skin carotenoid scores were recorded. The mean skin carotenoid scores at baseline and post-intervention were 216.67 and 162.82 respectively. Students' mean VM scores decreased by 54 points when comparing baseline and post-intervention scores (Table 5). This decrease was statistically significant ($p < 0.01$). Only the results from students who completed both the baseline and post-intervention FFQ were considered for estimating FV change ($N = 168$, 74.6%). The mean intake of FV servings at baseline and post-intervention were 3.15 and 3.55 respectively, but there was no statistically significant change in self-reported FV intake (FFQ scores) ($p = 0.075$).
Table 5. Baseline and Post-Intervention Results

<table>
<thead>
<tr>
<th>Outcome Measures</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean (±SD)</th>
<th>p-value for difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI 1</td>
<td>172</td>
<td>13</td>
<td>39.9</td>
<td>20.356 (4.8356)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>BMI 2</td>
<td>172</td>
<td>9.9</td>
<td>41.6</td>
<td>21.170 (5.1127)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>BMI Percentile1</td>
<td>172</td>
<td>1</td>
<td>99</td>
<td>73.70 (26.781)</td>
<td>.002</td>
</tr>
<tr>
<td>BMI Percentile2</td>
<td>171</td>
<td>1</td>
<td>99</td>
<td>76.24 (25.652)</td>
<td>.002</td>
</tr>
<tr>
<td>Skin carotenoid score1</td>
<td>159</td>
<td>22</td>
<td>404</td>
<td>216.67 (83.571)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Skin carotenoid score2</td>
<td>164</td>
<td>1</td>
<td>472</td>
<td>162.82 (79.796)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>FVServ1</td>
<td>168</td>
<td>.00</td>
<td>19.93</td>
<td>3.1533 (2.96825)</td>
<td>0.075</td>
</tr>
<tr>
<td>FVServ2</td>
<td>168</td>
<td>.00</td>
<td>30.27</td>
<td>3.5542 (3.41505)</td>
<td>0.075</td>
</tr>
</tbody>
</table>

A multiple regression analysis was carried out to predict VM scores from grade, age, gender, race, and ethnicity. The results (Table 6) showed that the full set of variables did not significantly predict VM scores \( F(5, 130) = 2.653, p = .026, R^2 = .093 \). However, examination of individual predictors showed that only one variable—gender—significantly predicted VM scores \( b = -40.40, p = 0.005 \). A second multiple regression analysis was carried out to predict self-reported FV intake from grade, age, gender, race, and ethnicity. The results showed that these variables did not significantly predict FFQ FV consumption scores, \( F(5, 133) = 1.084, p = .372 \) (Tables 5).
Table 6. VM ANOVAa

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>86141.872</td>
<td>5</td>
<td>17228.374</td>
<td>2.653</td>
<td>.026b</td>
</tr>
<tr>
<td>Residual</td>
<td>844325.768</td>
<td>130</td>
<td>6494.814</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>930467.640</td>
<td>135</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Dependent Variable: Skin carotenoid score1
b. Predictors: (Constant), Ethnicity, Age, Gender, Race, Grade
Table 7.
FFQ ANOVAa

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>49.933</td>
<td>5</td>
<td>9.987</td>
<td>1.084</td>
<td>.372b</td>
</tr>
<tr>
<td>Residual</td>
<td>1225.658</td>
<td>133</td>
<td>9.215</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1275.591</td>
<td>138</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Dependent Variable: FVServ1
b. Predictors: (Constant), Ethnicity, Gender, Age, Race, Grade

The correlation between the baseline and post-intervention results were tested using the Pearsons correlation, and this was carried out for both the Veggie Meter scores and the self-reported FV intake. Pre and post VM scores showed a significant moderate correlation (r = .530, p < 0.001). Pre and post self-reported FV intake show a non-significant correlation (r = .596, p = 0.075; Table 8). Correlation between the VM scores and FFQ at baseline was tested revealing no statistically significant correlation, (r = .085, p = 0.313, Table 6). The post-intervention scores from the VM and self-reported FV intake also showed no statistically significant correlation (r = .086, p = 0.298, Table 8).
### Table 8. Correlation between VM and FFQ

<table>
<thead>
<tr>
<th></th>
<th>Skinscore1</th>
<th>FVServ1</th>
<th>Skinscore2</th>
<th>FVServ2</th>
</tr>
</thead>
<tbody>
<tr>
<td>VM1</td>
<td>Pearson Correlation</td>
<td>1</td>
<td>.085</td>
<td>Pearson Correlation</td>
</tr>
<tr>
<td></td>
<td>$p$</td>
<td>.313</td>
<td>$p$</td>
<td>.298</td>
</tr>
<tr>
<td></td>
<td>$N$</td>
<td>159</td>
<td>142</td>
<td>164</td>
</tr>
<tr>
<td>FVServ1</td>
<td>Pearson Correlation</td>
<td>.085</td>
<td>1</td>
<td>Pearson Correlation</td>
</tr>
<tr>
<td></td>
<td>$p$</td>
<td>.313</td>
<td>$p$</td>
<td>.298</td>
</tr>
<tr>
<td></td>
<td>$N$</td>
<td>142</td>
<td>168</td>
<td>147</td>
</tr>
</tbody>
</table>

The results from the focus groups using grounded theory analysis revealed that students were enthusiastically in support of cooking and gardening programs. There were four major themes that emerged from the focus groups: benefits of healthy eating, cooking and tasting fun, joy of growing fruits and vegetables, and ultimate cooking and gardening program. Select quotes were pulled from various focus groups to reinforce these themes which can be seen in Table 9. Students shared their thoughts on healthy eating and what it means to them. They discussed with
researchers and each other about trying new foods they would not have at home or trying these fruits and vegetables in new ways. They also talked about how it felt to grow some fruits and vegetables at their school. Lastly, they focused on what their ultimate cooking and gardening program would look like, giving suggestions to the researchers (Table 9).

Table 9.
Themes Revealed from Focus Groups

<table>
<thead>
<tr>
<th>Themes</th>
<th>Quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits of Health Eating</td>
<td>“Healthy eating is important and it can be really good. It’s a lot of food that’s actually super healthy for you, and is probably some of their favorite foods,” (4th grader)</td>
</tr>
<tr>
<td></td>
<td>“Good idea to help people get more energized,” (5th grader)</td>
</tr>
<tr>
<td>Cooking and Tasting Fun</td>
<td>“I liked that there was a lot of things we got to try, and it was really creative,” (4th grader)</td>
</tr>
<tr>
<td></td>
<td>“It was good to see different foods and get to taste them even though not all of them satisfied my taste buds,” (4th grader)</td>
</tr>
<tr>
<td>Joy of Growing Fruits and Vegetables</td>
<td>“[it was] fun to learn how plants grow and how they survive and breathe and do all the stuff that humans do like eat, drink, breathe, and stuff like that,” (5th grader)</td>
</tr>
<tr>
<td></td>
<td>“It was really cool to be able to take care of plants by ourselves, [and] us being responsible to do it,” (4th grader)</td>
</tr>
<tr>
<td>Ultimate Cooking and Gardening Program</td>
<td>“I would say go around the world grabbing and taking all different fruits and vegetables and maybe picking up new recipes and giving people an idea of what they can make at home,” (5th grader)</td>
</tr>
<tr>
<td></td>
<td>“It helped us to eat healthier, to be more active, and to plant more plants, and that it was a program that actually truly helped us,” (4th grader)</td>
</tr>
</tbody>
</table>
The purpose of this study was to assess the effectiveness of the CATCH Rainbow program in increasing fruit and vegetable intake in 4th and 5th graders at Genoa Elementary School. Children in the US do not eat enough fruits and vegetables, prompting the need for effective interventions to increase their intake.\(^5,25\) The primary objective of this study was to assess the impact of the CATCH rainbow program on FV intake for elementary school aged children as evidenced by the VM scores and self-reported FV intake. Additional objectives included testing the correlation between the VM scores and self-reported FV intake as assessed by the FFQ and assessing the acceptability of the CATCH Rainbow program for 4th and 5th graders by conducting focus groups. The impact of the CATCH Rainbow program showed no increase in FV intake as measured by the VM and no increase in self-reported FV intake. The results showed that there was no correlation between the VM scores and FV intake. Lastly, the CATCH Rainbow program was enthusiastically accepted by 4th and 5th graders which was indicated by the children’s responses during their participation in the focus groups.

To our knowledge, this is the first study to assess the effectiveness of the CATCH Rainbow program in increasing FV intake. The objective of the CATCH Rainbow program was to increase FV intake from baseline to post-intervention. However, contrary to researcher expectations, there was a statistically significant decrease in VM scores (an average decrease of -141.153). This is unlike other studies that have used the Veggie Meter to test FV changes after
program implementation. In both the Jones et al and Obana et al studies, VM scores increased after nutrition education sessions. In the Obana et al study they used the readings of the VM at baseline to educate students on how much FV they were currently eating and encouraged them to increase their intake by the next reading. They took measurements at baseline, and then 3-months and 6-month postintervention. They saw an overall increase of 47.4 points from baseline to 6-month. They concluded that the Veggie Meter was an effective educational tool to inform participants on their FV intake. In future studies, sharing the VM scores with the participants and using them to educate students should be considered.

Additionally, the decrease in VM scores from baseline to postintervention in this current study is unlike other research that observed FV intake changes after combined cooking and gardening programs. The Sprouts studies examined overall dietary changes after implementing nutrition education, cooking, and gardening lessons by use of the Healthy Eating Index 2015. An area of improvement for future studies would be to utilize after school sessions such as the Sprouts study to provide less time constraints and hands-on experience. Conversely, our results are similar to the study conducted by Beccarelli et al which used the FFQ and skin carotenoid scores to examine changes in FV intake before and after program implementation. Similar to our findings, their study revealed a significant decrease in skin carotenoid levels (P = .04). Researchers proposed that this was due to the amount of fruit and vegetable availability during their spring versus the fall. The Researchers in the Beccarelli et al study took the students readings in the fall when fruits and vegetables with higher carotenoid levels are available. In the springtime, the FV in season have lower carotenoids. This could have been the case in the present study as well. There are several additional possibilities for why the scores decreased.
instead of increased. The first being the timing of program implementation. When baseline scores were taken, it was in September of 2021, and postintervention scores were taken in early April. The spring-to-fall timeframe is when fruits and vegetables are most available in this region, making it more likely that students would be consuming more fresh produce prior to baseline data collection. Post-intervention scores were taken in early spring, right after the winter months when the variety of produce in the Midwest is limited and includes the holiday season when people may be eating more treat foods rather than fruits and vegetables. For future studies, a more reliable way to test true intervention changes would be to re-test the Veggie Meter scores one year after the baseline collection data. Perhaps the reading of the Veggie Meter scores themselves could have been an error; two studies have suggested using participants non-dominant ring finger for scans to avoid calluses or marks that typically form on dominant hand digits.\textsuperscript{43,45} Additionally, due to time constraint, we were only able to take single veggie meter reading for each participant at pre and post intervention, when the standard of practice is to take three readings and use the mean of those readings.\textsuperscript{43}

At the sample level, the FFQ self-reported FV intake increased by an average of 0.4 servings, but this change was not statistically significant ($p = 0.075$). The results from this study are unlike the Bontrager Yoder et. al study which used a FFQ to assess the effectiveness of a farm to school program. Their study showed an increase in attitudes towards FV but there was no effect on overall dietary patterns when assessed by their FFQ results.\textsuperscript{30} Other studies looking at the impact of FV intake after nutrition intervention have showed similar results in increasing FV intake.\textsuperscript{31,32}
The results showed no statistically significant correlation between the use of the FFQ and VM. This is unlike the results from the Beccarelli et al. study which used the FFQ and skin carotenoid scanner and found a significant correlation between the tools ($r = .43; p = .02$). This could be due to the low number of students in that study, $N = 30$ compared to our sample of $N = 225$. This could also be because the students in the Beccarelli et al. study were able to take their FFQ home and have the help of their parents to fill out the form. This could make a difference in the accuracy of the FFQ results due to less time constraints at home and each student having a one-on-one helper, which we were not able to do in the classrooms. This shows that future research should be conducted testing the correlation between the FFQ and skin carotenoid scores, however researchers should be aware of possible time constraints and participants needing additional help to complete the survey.

The focus groups conducted by the researchers showed the support of the students for the CATCH Rainbow program through the themes identified. Students learned about healthy eating, stating that they understood the importance of healthy eating. They expressed their enjoyment for trying new foods, stating that they would not have tried them outside of the classroom. The students displayed a positive sense of responsibility to the plants they grew in school. Lastly, the students provided suggestions for future school nutrition education programs including tasting different foods from around the world. This study was like other research that studied the acceptability of nutrition programs among students.\textsuperscript{33,34} In fact, Lukas et al. used focus groups to reveal student perspectives that could strengthen content of intervention programs.\textsuperscript{33} This study has a similar impact as results can be used to inform changes for future program based on students’ responses to these focus groups.
The results of this study can be used to improve future nutrition education programs. More studies need to be conducted testing the effectiveness of nutrition education programs in increasing fruit and vegetable intake.\textsuperscript{6,25,29-31}

Limitations

There were several limitations to this study that could have influenced the results. The biggest limitation was that there was no control group for this study. This was a pilot intervention and to accurately measure the intervention’s effects, a control group would have been appropriate. Another limitation of this study was that only one school was used for research. All students were from the same town/area limiting the applicability to the general population. Additionally, there was limited classroom time for data collection and nutrition education lessons. Limited time for data collection could have increased human error when recording the data. Thirdly, the Veggie Meter manual suggests taking an average of 3 scores for each participant. However, due to limited time, only one skin carotenoid score was measured for each participant. Fourthly, several students expressed confusion and needed help filling out the FFQ form which was unanticipated by the researchers. This may have caused some students to rush through the survey, impacting the quality of the data collected. Another limitation to this study was that the lessons were taught by different university students. The university students had no prior education regarding teaching these lessons. Sixthly, due to COVID-19, the original intention of including participants in hands-on cooking activities was omitted. The recipes were prepared ahead of time by the university students. This limited the participants’ hands-on learning approach. Additionally, there was limited parent involvement for this intervention. Students were given the weekly newsletter to deliver to their parents. There was no other contact
with parents/guardians or the participants’ families. Lastly, there were no follow-up evaluations with the students after the post-intervention data collection. To further test for changes in the student’s fruit and vegetable intake, a one-year follow-up from the baseline data collection would have given an additional opportunity to observe changes. Future research should include multiple schools’ participation from different areas with less time constraints. Additionally, having students participate in the cooking lessons with the hands-on approach may have a more positive result on FV intake.

**Strengths**

The strengths of this program include its multi-component approach to nutrition intervention. This program included nutrition education lessons, cooking lessons, gardening lessons, and a take-home newsletter for guardians. This study used multiple types of data collection including subjective and objective data from the FFQ, VM, and focus groups. The qualitative collection is unique to this study. Lukas et al. stated that the utilization of student focus groups can help strengthen the content delivered during nutrition intervention programs as well as enhance the future implementation of such programs.\(^\text{22}\)

**Implications to the Dietetic Practice**

This study provides quantitative and qualitative data to test the effectiveness of the CATCH Rainbow program in increasing fruit and vegetable intake in elementary school aged children. This study provides insight for future researchers to implement the program. Future programs should include multi-component style, including nutrition education, gardening, and cooking lessons. All data can be used to improve future intervention programs in increasing FV intake among elementary school aged students.
Conclusion

This study tested the effectiveness of the CATCH Rainbow program in increasing fruit and vegetable consumption in 4th and 5th graders at a local elementary school. The objective findings of the Veggie Meter scores showed a significant decrease in FV intake, while the FFQ results showed non-significant increase in FV servings from baseline to post-intervention. The focus groups conducted testing the acceptability of the program had positive results revealing students support of a combined cooking and gardening nutrition intervention program. Further studies are indicated of multi-component nutrition intervention programs to test their effect on FV intake among elementary aged children.
REFERENCES


INFORMED CONSENT FORM FOR CHILD AND PARENT

PLEASE READ, SIGN ON THE LAST PAGE, AND RETURN THE FORM to Dr. Muzaffar

Title of Project: Evaluation of the Coordinated Approach to Child Health (CATCH) Rainbow Program for Fourth and Fifth Graders in Northern Illinois

Principal Investigator: Henna Muzaffar, Ph.D., RD, FAND
253 Wirtz Hall, 370 Wirtz Drive, DeKalb IL 60115
hmuzaffar@niu.edu

1. Purpose of the Study: The purpose of this study is to evaluate the effectiveness of the CATCH Rainbow program in the Sycamore, IL County in fourth and fifth grades.

2. Procedures to be followed: Three NIU students will be trained to deliver the CATCH Rainbow program to fourth and fifth graders in one elementary school in Genoa, IL. Children in fourth and fifth grades will participate in twelve 30-minute nutrition education sessions during the school day. First six lessons will focus on nutrition education and cooking skills and the other six lessons will focus on nutrition education and gardening sessions. The cooking lessons will be implemented between September and November 2021; and the gardening lessons will be implemented between February and April 2022. The NIU students and the principal investigator will make two additional visits to the school to administer program evaluation questionnaires (demographics and food frequency questionnaire) and measure the children’s height, weight and skin carotenoid status. These visits will be made before the program starts in September 2021 and after the program ends in April 2022. The information collected from the surveys will be used to assess the effectiveness of CATCH Rainbow program in improving the fruit and vegetable intake of children.

3. Discomforts and Risks: The risks in this study are minimal. There are no anticipated discomforts or dangers to your child in this study.

4. Incentives/Benefits: Children will receive an incentive worth $15 for participating in the program. The incentive may include measuring cups, gardening tools, cutting board etc.

5. Duration/Time: Children will participate in twelve 30-minute sessions, including 6 cooking sessions and 6 gardening sessions. In addition, the research team will meet with children two more times to administer the demographics form and food frequency questionnaire, and get their height, weight and skin carotenoid status measured.
6. **Statement of Confidentiality:** Your participation in this research is confidential. Data (any information that you provide to the investigators) will be stored and secured in Wirtz Hall on the Northern Illinois University campus in a locked file cabinet. Any information stored on a computer will be on a password-protected computer at Northern Illinois University.

   Northern Illinois University’s Office of Division of Research and Innovation and the Institutional Review Board may review records related to this research study. In the event of a publication or presentation resulting from the research, no personally identifiable information will be shared. Only the investigators of this study or students of the investigators will be allowed access to any data. If you want to share your information with other people, such as your friends or parents, this is up to you.

7. **Right to Ask Questions:** Please contact Dr. Muzaffar at 815-753-5178 with questions, complaints or concerns about this research. You can also call this number if you feel this study has harmed you. If you have any questions, concerns, or problems about your rights as a research participant or would like to offer input, please contact the Northern Illinois University’s Institutional Review Board Office (815-753-1438). The Office for Research Protections cannot answer questions about research procedures. Only the research team can answer questions about research procedures.

8. **Payment for participation:** There is no payment for this study.

9. **Voluntary Participation:** Your child’s participation is voluntary. If you feel your child has in any way been pressured into participation, please inform the faculty advisor. We also ask that you read this letter to your child (if age-appropriate) and inform your child that this participation is voluntary.

   You must be in 4th or 5th grade to consent to take part in this research study. If you agree to take part in this research study and the information outlined above, please sign your name and indicate the date below. Your parent also must sign and date below. You and your parent will be given a copy of this consent form for your records.

   **Please check one option and fill in the information requested below, then return the form by September 22, 2021.** If you do not send a response back, researchers will assume you agree to participate in this study.

   □ I give permission for my child to participate in the study.

   □ I do not give permission for my child to participate in the study.

   ____________________________________________________________________________  
   Parent’s name (Print)  
   ___________________________________________  
   Date

   ____________________________________________________________________________  
   Parent’s Signature  
   ___________________________________________  
   Date

   ____________________________________________________________________________  
   Participant’s (Child’s) Signature  
   ___________________________________________  
   Date

   ____________________________________________________________________________  
   Person Obtaining Consent  
   ___________________________________________  
   Date
APPENDIX B

DEMOGRAPHIC DATA COLLECTION FORM
### Post Demographics

<table>
<thead>
<tr>
<th>Children</th>
<th>Participant ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is your age?</td>
<td>9 10 11 12</td>
</tr>
<tr>
<td>Height</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td></td>
</tr>
<tr>
<td>BMI Percentile</td>
<td></td>
</tr>
<tr>
<td>Skin carotenoid measure score:</td>
<td></td>
</tr>
<tr>
<td>What is your gender?</td>
<td>Boy Girl</td>
</tr>
</tbody>
</table>
APPENDIX C

COOKING LESSON ONE: SEEDS AND LEGUMES
Lesson Overview

This is the first lesson in a series of six cooking lessons within the CATCH Rainbow curriculum. In this lesson, students are provided with an introduction to the CATCH Rainbow pilot program. Students are introduced to the benefits of including beans and seeds within their diet through a discussion-based lecture. Students learn the anatomy of seeds and beans with the “Parts of a Seed” worksheet. They are given the opportunity to observe and taste a baked chickpea. The main cooking activity allows students to create personalized trail mix snacks which includes seeds and baked chickpeas. Finally, students are provided with a “Fruit and Vegetable Chart” worksheet which they use to track new foods they try at school and home. The worksheet is designed to be used throughout the two-semester program. It serves as an aide to guide students toward deciding which plants they would like to include in their school garden. The Family Newsletter for this lesson plan includes basic facts about seeds and beans, tips for managing family meals, a hummus recipe, and a recipe for the baked chickpeas the students tasted in class.

Learner Objectives

• List three vegetables that are considered legumes
  • Garbanzo beans/chickpeas
  • Green beans
  • Peas
  • Lima beans
  • Lentils
  • Black, Cannellini, Kidney, Great Northern
• Describe the parts of a bean
• Describe parts of a seed

Activities

• Try a garbanzo bean
• Baked Chickpea Taste Test
• Make Nut-Free DIY Trail Mix Snack

Materials

- Properties of a Seed and Legumes Worksheet
- Fruit and Vegetable Chart
- Legumes and Seeds Handout
Tools for Baked Chickpea Taste Test and Nut-Free DIY Tail Mix Snack

- Large Rubbermaid container to use for transporting supplies
- Enough snack size Ziplock bags for each student to get one
- 9 medium bowls
- 9 disposable teaspoons
- Kitchen Gloves
- Roll of paper towels
- Baked chickpeas (Made ahead of time. See Recipes from the Classroom in Family Newsletter for recipe)
  - 1 batch savory
  - 1 batch sweet
- Sunflower seeds,
- Raw pepitas (shelled pumpkin seeds)
- Rice Chex (GF)
- Corn Chex (GF)
- Enjoy Life mini chocolate chips
- Raisins
- Craisins
## Lesson Plan

<table>
<thead>
<tr>
<th>Learner Objective</th>
<th>Activity/Tools</th>
<th>Script</th>
<th>Time in Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set-up</td>
<td>Turn on ELMO. Organize handouts and activity materials.</td>
<td>Give students 5 minutes to go wash their hands while you set up.</td>
<td>5</td>
</tr>
<tr>
<td>Welcome</td>
<td>Hi! I’m _____ and I’m from NIU. I’m part of a program called CATCH Rainbow. We are very excited because this school year, not only are we going to continue to learn about Go, Slow, and Whoa foods, but we are going to learn how to cook them, do some taste tests, and then get to grow our own food in a garden here at school. Also, each time we meet, your family will receive a newsletter that tells them what you learned and gives them some recipes or activities to do as a family at home. Today we’re going to start by talking about a protein-packed food that also makes a great snack.</td>
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<tr>
<td>List three vegetables that are considered legumes</td>
<td>Background</td>
<td>Can anyone think of a “Go” food that is both a protein AND a vegetable? Perhaps this is something that is in your pantry at home? Sometimes they come cooked in a can or dried in bag. <em>Let kids guess.</em> That’s right! We’re talking about beans! Beans are like a superhero because like Tony Stark and Ironman, Bruce Wayne and Batman, or Clark Kent and Superman, they are two-things in one! They are considered both a vegetable and a protein. There are not many foods that are able to happily sit in both places on the MyPlate.</td>
<td>5-8</td>
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</table>
Does anyone know exactly what a bean is or what it comes from? *Let the kids answer.*

Did you know that beans are seeds? If you took a whole bean, planted it in soil, watered it, and gave it plenty of sunlight, you would grow a bean plant.

Beans are a popular food in all different cultures around the world. Why do you think that is? *Let kids answer.*

It is because they are inexpensive, easy to grow, tasty, healthy, and are a fiber-filled protein.

Can you name some other protein sources besides beans? *Let kids respond.*

That’s right!

And those are all types of meat. Vegetarians and vegans (people who don’t eat meat) need to be careful about eating enough protein. As you just said, a lot of protein sources come from meat and vegetarians and vegans do not eat any meat. The best way for vegetarians and vegans to get protein is to eat beans and rice. Not only do beans and rice taste great together, they also work together to help build strong muscles.

Here’s one more fun fact for you: Beans are in a food group called “legumes.” A legume is an edible seed that grows in a pod. Can you think of other legumes beside beans? *Let kids answer.*
Learner Objective

Describe the parts of a bean.

Describe parts of a seed.

Activity/Tools

Pass out the Properties of Seeds and Legumes handout, then place a blank one up on the Elmo.

Script

Some examples of other kinds of legumes include peas, lentils, chickpeas, and peanuts. Did you know that peanuts are legumes? An interesting fact about peanuts is that while the peanut plant grows above ground, the peanuts grow on the plant, they stretch down to the soil and mature underground. The other familiar legumes we talked about, peas, beans, lentils, all mature above ground.

I am passing out a worksheet that has a couple of activities for us that will help us learn about legumes and seeds.

Make sure you have something to write with. As we go through the different parts of the seed, fill in the blanks on the worksheet. I will be filling out the worksheet on the ELMO so you can follow along.

On this sheet you will see two different legumes and one seed.

First, let’s start with the parts of the seed. This drawing shows that seeds have many different parts. The outside of the seed is called the seed coat or the testa. It is tough and protects the inside of the seed.

Then we have the cotyledon. This is where the nutrients for the plant are stored. The plant will need these for energy to grow until it has established roots and can absorb water and nutrients from the soil. This is also the part of the seed that gives us nutrients in our diet.

Next, we see the embryo. This is the starting of the plant. There are three parts to the embryo. The leafy looking part is called the epicotyl. It will become the branches and leaves of the plant. This is attached to
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<th>Learner Objective</th>
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<th>Time in Min</th>
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<tr>
<td>hypcotyl. This will become the stem of the plant. Finally, there is the radicle. This will become the roots of the plant.</td>
<td>Pass out <em>Fruit and Vegetable Chart</em>. Set one copy on the ELMO</td>
<td>Before we talk more about different kinds of legumes or beans, I’m going to pass around a handout for you. This is a very special handout that you want to take care of because we are going to add to it every time I come for a visit. As soon as you get one, put your name on the top of the paper. As we go through the different foods we will talk about, you will write the name in the correct column. You are invited to draw a picture of the food as well. Let me show you what I mean. <em>Place a copy of the handout on the Elmo.</em> <em>Identify the column that says “Seed.”</em> <em>Demonstrate drawing a small kidney bean in one of the boxes below seed.</em> One type of legume we talked about is a pea. Try drawing a little green pea in the box. In the same box write the name of the food. We will write “green pea.” Next, think if you would like to grow this food. If so, put a small check mark in the box.</td>
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<tr>
<td>Try a garbanzo bean</td>
<td>Preparing Beans</td>
<td>There are different ways to prepare beans and seeds. Beans are fairly easy to prepare but they must be cooked all the way before they are safe to eat. Does anyone know that song, “Beans, beans, the musical fruit?” Can you finish it? So, yes! A side effect of eating beans is that they give a lot of people gas. That is because they are high in fiber and really good for our</td>
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<td>Learner Objective</td>
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<td>stomachs. Does anyone have a family member who makes beans from scratch? If so, do you recall how they do this?</td>
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<td>There are a couple of ways to help keep beans from making us too gassy. Soaking dried beans in water overnight before you prepare them is one way. The other is to thoroughly rinse them in cool water before we heat them up if we’re getting them out of a can.</td>
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<td>Today we have some baked garbanzo beans (or chickpeas) for everyone to try. We made half of them sweet and half of them savory (or more salty tasting). We will pass them out for you to study and taste.</td>
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<td><em>After the students receive their beans, ask them:</em></td>
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<td>Looking at your garbanzo bean, can you see the different parts of the seed that you learned about? What does the garbanzo bean look like? What does the garbanzo bean smell like? What does the garbanzo bean taste like? Is it soft or crunchy? Sweet, salty or spicy?</td>
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<td>Make Nut-Free DIY Trail Mix Snack.</td>
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<td>Trail Mix</td>
<td>For seeds, you can eat them in the shell, without the shell, raw, or roasted. Often salt or seasonings is added to enhance flavor, but you may find that you like them plain or roasted. What are some seeds you like to eat and how do you eat them? For instance, I like to eat chia seeds. I add them to oatmeal for a little crunch. What about you? You can add seeds to salads, cereal, smoothies, or eat seeds plain like in a trail mix!</td>
<td>10</td>
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</table>
As a matter of fact, you are going to make a trail mix that you can snack on for the rest of the day. This may not be like any other trail mix you have had before because our star ingredients are: Chickpeas and sunflower seeds. Some people like saltier foods, some people like sweeter foods, and others like a combination of salty and sweet. Everyone will get a baggie. You can decide what kind of trail mix you would like to make. We have both sweet and savory flavored baked chickpeas for you to add to your bags.

Everyone take a baggie, make two lines, and take a spoonful of each of the ingredients you would like to add to your trail mix. Challenge yourself to try the different baked chickpeas and mix up flavor combinations.

Wrap-up

We have a challenge for you to do between now and when we come back in a few weeks. We want you to taste as many beans and seeds as you can. Help your family find and prepare recipes with beans and seeds in them. Each time you try a new bean or seed, use your *Fruit and Vegetable Chart* to keep track. Write it in the column under the word seed. Place a checkmark or star in the box if you would like to grow it in a garden. Thank you for having us we’ll see you again in three weeks.

Cleanup

Cleanup the classroom and mess. Use volunteers as appropriate.
Name:

Parts of Seeds

Fill in the blank:

A. The outside of a seed or legume is called the
   ____________________.

B. The nutrients of the seed or legume are stored around embryo
   and is called the ____________________.

C. The baby plant is called the ____________________ and is made
   up of ____________________ parts.

D. The part that will become the leaves and branches is called the
   ____________________.

E. The part that will become the roots is called the
   ____________________.

F. The part that will become the stalk of the plant is call the
   ____________________.

Try to label the parts of the seeds.

<table>
<thead>
<tr>
<th>Broad Bean</th>
<th>Pea</th>
<th>Sunflower Seed</th>
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</table>

*The shell and testa have been removed from this sunflower seed.

What are three similarities you notice between the broad bean, the pea, and the sunflower seed?

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<table>
<thead>
<tr>
<th>Seeds &amp; Legume</th>
<th>Roots</th>
<th>Stem</th>
<th>Leaf &amp; Herb</th>
<th>Flower</th>
<th>Fruit</th>
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Write the name and draw a picture of the food you learned about. Indicate if you would like to grow it in our garden.
Did you know that beans are a type of legume? A legume is a seed that grows in a pod. Both legumes and seeds are excellent sources of protein.

**Featured Recipe**

**Yummy Hummus**

Homemade hummus is a delicious food that makes the perfect after school snack. It works well as a dip for vegetables like carrots, cucumbers, or whole wheat crackers. Using a food processor or high-powered blender, you can whip up this healthy snack in minutes.

**Ingredients**
- 15 oz can of garbanzo beans
- 1/4 cup fresh lemon juice (from 1 lemon)
- 1/4 cup tahini (can substitute olive oil for sesame allergy)
- 1 clove minced garlic
- 2 tbsp olive oil
- 1/2 tsp ground cumin
- salt to taste
- 2-3 tbsp cold water
- Dash of paprika (optional)

**Directions**
1. Empty garbanzo beans into a colander. Rinse thoroughly with cool water. Set aside.
2. Add lemon juice and tahini to processor and blend for 1 minute. Scrape down the sides of the bowl between each step.
3. Add cumin, 1/2 tsp salt, olive oil and blend for 30 seconds.
4. Add 1/2 the garbanzo beans and process for 1 minute. Repeat with the remaining beans.
5. Add 2-3 tbsp of cool water until smooth and ENJOY!

**Tips for Family Meals**

It is important to eat meals as a family. Try to set aside at least one night each week to eat a meal together. Challenge everyone to put their phones away, turn off the television, and focus on each other. Sharing meals increases socialization and family bonding. For added quality time, plan and prepare your family meals together. Sharing the responsibility of preparing the meal will not only give kids an opportunity to learn important cooking skills, but it will also give them ownership of the dishes they help prepare. Kids who help prepare meals are less likely to be picky eaters.
APPENDIX D

COOKING LESSON TWO: ROOT VEGETABLE
Lesson Overview

The second lesson of the program examines root vegetables, the function of roots for plants, and the nutritional benefits. The lesson opens with a review of topics from the week before including a recall of different recipes with seeds and beans the students may have tried. Next there is an overview of the parts of the plant. The instructor has the option to present this material either by drawing of the parts of the plants, showing the linked 4-minute *The Dr. Binos Show* YouTube video, or a combination of the two. Next, the students brainstorm a list of root vegetables, clarified by the instructor. Finally, the students assemble and taste a Shredded Beets with Apple and Carrot Salad. The supplemental Family Newsletter includes basic facts about root vegetables, tips for parents on managing family meals, a roasted root vegetable recipe, and a recipe for the Shredded Beets with Apple and Carrot Salad from class.

### Learner Objectives

- Describe parts of a plant
  - Flowers
  - Leaves
  - Stock
  - Roots
- List three vegetables that are considered root vegetables
  - Beets: Red Beets, Yellow Beets, Candy Cane Beets
  - Potatoes: Russet, Yukon Gold Potatoes, Red Potatoes, White Potatoes
  - Carrots: Orange, Yellow, Purple
  - Parsnips
  - Radishes
  - Turnips
  - Sweet Potatoes
  - Onions: Red, Yellow, White, Green/Scallions
  - Garlic
  - Shallots
- Describe the nutritional benefits of root vegetables

### Activities

- Shredded Beet Salad (with Apples and Carrots)
- Taste 2 Root Vegetables

### Materials

- Blank Fruit and Vegetable Chart for instructor
- 2 blank pieces of paper
- Pencil/pen
Tools

- Large cutting board
- Sharp kitchen knife
- Vegetable peeler
- Box cheese grater
- 3 large bowls
- 1 medium bowl
- Whisk
- Wet measuring cup
- Set of dry measuring cups
- Set of measuring spoons
- Saran wrap
- Large wooden spoon or rubber spatula
- Serving tongs
- Enough small plates for each student to get one
- Enough forks for each student to get one
- Large roll of paper towels
- Shaker of sea salt
- Shaker of ground black pepper
- Shredded Beet Salad scaled 3 times (18-24 servings)
  - 3 medium beets
  - 1 whole purple beet
  - 2 beets – prepare ahead of time by peeling, shredding on the large side of a cheese grater, rinsing, drying, and then placing in a large bowl and covering with saran wrap and keeping in a refrigerator until needed. Try to get a variety of beet varieties ie. Purple, yellow, orange, candy cane, … etc.
  - 3 large carrots
  - Peel and shred carrots on the large side of a cheese grater ahead of time. Place in a refrigerator in a large bowl covered with saran wrap until ready to use. If able to attain purple, yellow, or white carrots then mix those in with the orange ones.
  - 3 large apples
  - Shred the apples on the large side of a cheese grater ahead of time and place in a refrigerator in a large bowl covered with saran wrap until ready to use.
  - 3 cups of parsley, roughly chopped ahead of time
  - ½ cup sunflower seeds (optional)
  - ½ cup of raisins or craisins (optional)
  - 3 tbsp of apple cider vinegar
  - 1 ½ cups extra virgin olive oil
  - 3 tbsp of honey or real maple syrup
  - 3 lemons, juiced and zested
Lesson Plan

<table>
<thead>
<tr>
<th>Learner Objective</th>
<th>Activity/Tools</th>
<th>Script</th>
<th>Time in Min</th>
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<tbody>
<tr>
<td>Opening</td>
<td>Organize materials, Turn on ELMO</td>
<td>Give students 5 minutes to go wash their hands while you set up.</td>
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<td>Welcome and recap. A blank <em>Fruit and Vegetable Chart</em>.</td>
<td>Hi! I’m _____ and I’m from NIU. Last time we were here we talked about protein-packed foods “Go” foods that are great for both main dishes and snacks. Do you remember what we talked about? <em>Allow the kids time to respond</em>.</td>
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<td>That’s right. We talked about beans and seeds. What did you think of the snack we made? <em>Allow the kids time to respond</em>.</td>
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<td>Last time before we left, we gave you a challenge to taste as many beans and seeds as you could. What did you try that was new since the last time we met? <em>Allow the kids time to respond</em>.</td>
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<td>We also asked you to help your family find and prepare recipes with beans and seeds in them. Were you able to help prepare any recipes with beans or seeds in them? What meals did you help prepare since we last saw you? <em>Allow the kids time to respond</em>.</td>
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<td>Finally, we asked you to keep track of the new beans and seeds you tried on your Fruit and Vegetable chart. I have a blank Fruit and vegetable chart here I’d like you all to help me fill it out so that we can start gathering ideas for vegetables we would like to grow. Who would be willing to share some of the different beans or seeds that you tried in the past few weeks? <em>Allow the kids time to respond</em>.</td>
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<td>It sounds like all of you did a great job.</td>
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<td>Learner Objective</td>
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<td>Describe parts of a plant</td>
<td>Parts of a plant: See sample below. Place a blank piece of paper on the Elmo. Black marker. Art skills! You don’t need to be Bob Ross. Kids understand. They are just happy to see this picture come to life. You can always ask for a volunteer from the class to help you out with drawing it. If budget allows, making the drawing out of felt pieces that could be laid on a board would save a bit of</td>
<td>I want us to imagine a plant that lives outside. Where does a plant grow? Good thinking. Plants grow in the ground. Draw a horizontal line halfway across the paper. When we look at a plant, what do we see? We see the stalk (draw a vertical line coming out of the ground to represent the stalk), we see branches (draw 2-3 branches), we see leaves on those branches (draw 2-3 leaves per branch), and sometimes we see some flowers (draw 3-4 small flowers near the leaves). Every part of a plant has a function. Let’s start with the flower. Does anybody recall what the flowers of a plant do? Allow the kids to respond, then clarify. The flower is the reproductive organ of the plant. Bees and other bugs are attracted to the sweet smell the flowers give off (can draw a little bee next to one or two of the flowers). They brush up against one flower, get dusted with pollen, and then buzz over to another flower and spread the pollen from the first flower to the second flower and so on. Did you know that in flowering plants like tomato and cucumber plants, once the flowers are pollinated, they grow into the fruit we eat? And what is in the middle of those fruit? Maybe seeds? This is part of the reason bees are so important to us. They help us grow food by spreading pollen from one plant to the next, which allows the plant to produce fruit and more</td>
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<tr>
<td>Describe the nutritional benefits of root vegetables</td>
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Today we’re going to talk about a kind of food that we eat that comes from the dirt. Can you think of any foods that come from the dirt? Allow the kids time to respond. Those are some great ideas!
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<th>Learner Objective</th>
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<td>time during the class.</td>
<td>seeds. We can plant those seeds and have more tomato or cucumber plants.</td>
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<td>Next, let’s look at the leaves. Any ideas what the leaves do for the plant? <em>Allow the kids to respond, then clarify.</em></td>
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<td>The leaves help the plant convert sunlight into energy <em>(draw a sun in the corner of the picture with rays extending down toward the leaves of the plant).</em> They do this through a complicated process called photosynthesis. What do you know about photosynthesis? <em>Allow the kids to respond, then clarify.</em></td>
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<td>Photosynthesis results in the creation of energy for the plant to help it grow and also the conversion of carbon dioxide <em>(draw a couple of bubbles that say “CO₂” in the middle of them above some of the leaves)</em>, which is what we breath out, to oxygen <em>(draw a couple of smaller bubbles below the same leaves with O₂ in the middle of them)</em>, which is what we breath in. We need plants to produce oxygen just as much as they need us to produce carbon dioxide.</td>
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<td>What about the branches and stalk? What do you think they do for the plant? <em>Allow the kids to respond, then clarify.</em></td>
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<td>Well, the closer the plant is to the sun, the more sunlight it can get. The stalk also has tunnels that run through it that carry the energy and water molecules back and forth between the leaves and the roots.</td>
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<td>Speaking of roots, let’s look at this picture. We’ve covered the parts of the plant that grow above the ground. What about below the ground? Our</td>
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<td>Learner Objective</td>
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<td>plant is missing its roots! <em>(Draw some squiggly roots coming down from the stalk of the plant.)</em></td>
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<td>Roots play a very important role in the plant’s life. Does anyone know what the roots do? <em>Allow the kids to respond, then clarify.</em></td>
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<td>The roots keep the plant anchored in the ground. They also absorb nutrients from the soil like nitrogen, phosphorus, acids, and water so the plant can use them to grow healthy and strong. Some plants store a lot of nutrients in their roots so they can survive colder temperatures and days with less sunshine. The energy they store in their roots is in the form of sugar, starches, vitamins and minerals. The roots of these types of plants typically grow larger than roots of other plants <em>(draw a carrot under the ground next to the plant you just drew making sure you include the stalks and leaves).</em> When we eat these roots, we get these nutrients into our bodies.</td>
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<td>Show the following 4 minute video Parts of a plant</td>
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<td><a href="https://www.youtube.com/watch?v=p3St51F4kE8">Dr. Binocs Show</a></td>
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<td>List three vegetables that are considered root vegetables</td>
<td>List root vegetables. Piece of blank paper and a maker. Have a volunteer with nice handwriting write down the list of vegetables the kids come up with</td>
<td>Let’s brainstorm some vegetables that we eat that are considered root vegetables: <em>try to get most of these</em> Beets Potatoes [Differentiate between Go Food Versions <em>(eg. Baked potato)</em> vs. Whoa Food Versions <em>(eg. French fries)</em>] Carrots Parsnips Radishes Turnips Sweet potatoes Onions Garlic Shallots</td>
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<td>Learner Objective</td>
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<td>Let’s take a moment and think about the different colors of the vegetables on this list. There is enough variety to make up a rainbow.</td>
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<td>Beet Slaw with Apples and Carrots Recipe</td>
<td>Have kids gather around the food prep space. This could be a cart we bring in, an available table in the classroom, or lunchroom table. Before starting the lesson, set out the large bowls filled with sliced carrots, sliced beets, and sliced apples, the 3 Cups of mint, (roughly chopped ahead of time), sunflower seeds (optional), raisins or craisins (optional), apple cider vinegar, extra virgin olive oil, honey or real maple syrup, ground cumin, the shakers of salt and pepper, the whisk and spatula, empty medium bowl, and the measuring devices.</td>
<td>Hand one student the empty medium bowl and the whisk. Assign one student each to measure out the 3 tbsp apple cider vinegar, 1 ½ cup extra virgin olive oil, 3 tbsp of honey or real maple syrup, 2.25 tsp of ground cumin. Guide them to use the appropriate measuring device. (You may also have these premeasured and separated into small containers to save time.) Have each student empty his or her assigned ingredient into the medium mixing bowl. Add a fair amount of salt and pepper. Have the student with the whisk, whisk the vinaigrette together with all his or her might until it is an emulsion. Meanwhile, have one student each uncover and add the shredded apples and carrots to the bowl of beets and toss to combine. Stress that carrots and beets are both root vegetables. Assign one student each to measure out the ½ cup sunflower seeds (optional) and ½ cup of raisins or craisins (optional). Instruct him or her to add each of their</td>
<td>15</td>
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<tr>
<td>Learner Objective</td>
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<td>ingredients to the large bowl with the other vegetables.</td>
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<td></td>
<td><em>When the emulsion is ready, have the student with the whisk add it to the bowl with all the other ingredients. Using the large spatula, toss to coat. Have a student top the slaw with the chopped mint leaves.</em></td>
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<td></td>
<td><em>Allow the students to get in line and using the tongs, evenly portion out a tasting for each student.</em></td>
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<tr>
<td>Wrap Up</td>
<td></td>
<td>You all did a great job! I hope you liked what we made.</td>
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<td>Today, we talked about root vegetables and why they have so much nutrition in them. We have a new challenge for you this time. Between now and the next time we meet, try to identify three new-to-you root vegetables. Help your family plan and prepare a meal or a dish that uses root vegetables. There are a lot to choose from. Sorry, French fries and onion rings don’t count. Don’t forget to add the new root vegetables you taste to your Fruit and Vegetable Chart so we can make some decisions about what we will grow in your garden this year.</td>
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<tr>
<td>Clean up</td>
<td></td>
<td>Place all of the items into a large Rubbermaid container with a lid and bring them back to NIU to be washed or if possible clean them in the kitchen at the school.</td>
<td>5+</td>
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Sample Final Drawing of Plant and Carrot
Featured Recipe

Roasted Roots

Root vegetables can make a quick and easy side dish that compliments many meals. Cook a large batch once during the week and use leftovers in omelets, soups, or as quick sides for dinner.

Ingredients
- 3 pounds of coarsely chopped root vegetables like beets, carrots, sweet potatoes, or potatoes
- 1 red onion, diced
- 1/4 cup of olive oil
- 1 1/2 tsp of salt
- 1/4 tsp ground black pepper
- 1/2 tsp garlic powder

Directions
1. Preheat oven to 425°F
2. Wash, peel, and chop the vegetables into 1” chunks.
3. Place the vegetables on a baking sheet lined with foil. Drizzle the 1/4 cup of olive oil over the vegetables and toss to coat evenly. Spread the vegetables cut side down in an even layer. Sprinkle with salt, pepper, and garlic powder.
4. Bake for 45 minutes, flipping the vegetables at least one time to evenly cook.
5. ENJOY!

Tips for Family Meals

After a long day of school, work, soccer practice, and rehearsals, who has time to decide what to make and then prepare dinner? One solution is to spend 20 minutes during the week and sit down with a favorite cookbook full of simple recipes and plan out meals for the week. Keep dinners simple by batch cooking large amounts of food at one time and using the leftovers in creative ways. A roasted chicken can serve as a main entree on Sunday, fill for chicken quesadillas on Monday, and then chicken and vegetable soup on Tuesday. A few minutes of planning can save time and money.
# Shredded Beet Salad
with Apples, Carrots and Sunflower Seeds

## Ingredients
- 1 beet shredded
- 1 carrot peeled and shredded
- 1 apple cored and shredded
- 1 cup chopped parsley
- 1/3 cup sunflower seeds
- Chives as a garnish

## For the dressing
- 1/2 cup olive oil
- 1 tbsp apple cider vinegar
- 1 lemon juiced and zested
- 1 tbsp brown sugar or honey
- Salt
- Pepper

## Instructions
1. Wash and peel the beets and carrots, then core the apple.
2. Using a box grater, shred the beets, apple, and carrots into a bowl.
3. Mix together with a pinch of salt.
4. Prepare the dressing by whisking together the oil, lemon juice, vinegar, and sugar. Season to taste with salt and pepper.
5. Pour the dressing over the shredded vegetables and mix together, refrigerate for 1 hour.
6. When ready to serve mix in sesame seeds, parsley, and lemon zest. Chopped chives are optional but add a great fresh flavor to this crisp salad!

## Notes
Note that this salad gets better if it sits overnight in the fridge and has a chance to "marinate".

Recipe adapted from: [www.earthfoodandfire.com/shredded-beet-salad/](http://www.earthfoodandfire.com/shredded-beet-salad/)
APPENDIX E

COOKING LESSON THREE: STEMS, STALKS, AND MORE
Lesson Overview

The third lesson explores the function of plants stems and stalks as well as its culinary uses and nutritional benefits. The lesson opens with a review of previously discussed topics and allows the students an opportunity to share any foods they have tasted or prepared with their families. The Fruit and Vegetable Chart is revisited and expanded with the students’ input. This is followed by an overview of the plant vascular system. Students are provided with a mini magnifying glass and ½” slices of celery to examine, draw and describe their observations on the provided, “Draw What I See” handout. Power Point Slides are used to bolster the discussion. Following this activity, students create their own take on the classic “Ants on a Log” snack using celery, a variety of fillings and toppings of fruits, vegetables, and seeds. The lesson closes with a challenge for the students to try one additional stalk food before the next lesson. The supplemental Family Newsletter provides tips on creating family meals, a recipe for Asparagus Sticks, and a copy of the “Celery Bugs” recipe.

Learner Objectives

• Describe three functions of plant stalks/stems
  • Conducts water and minerals throughout the plant from the leaves to the roots
  • Supports the branches and leaves
  • Stores energy for the plant
    • Because it is stored energy, we can get energy from it
  • Stem may be above ground or below ground
• List two plant stalks/stems that appear in the diet
  • Celery
  • Rhubarb
  • Asparagus
  • Fennel
  • Green Onion
  • Bamboo
  • Kohlrabi
  • Fig
• List the nutritional benefits of eating plant stalks
  • Fiber
  • Energy and minerals
• Key Terms
  • Xylem and Phloem (Vascular system)
    • Xylem transports water
    • Phloem transports synthesized nutrients from leaves to the rest of the plant
Activities

- Draw What I See
- Celery Bugs

Materials for Draw What I See

- Fruit and Vegetable Chart
- Draw What I See Handout
- Pen or pencil
- Stalks and Stems PowerPoint Slides

Tools for Draw What I See

- Mini-magnifying glasses, one for each student
- 6 stalks of celery that have sat in red or blue food coloring-infused water for at least 24 hours.
  - Keep two of the stalks, preferably the ones with leaves, intact.

Tools for Celery Bugs

- Small disposable plates for every student.
- Roll of paper towels
- At least two plastic serving spoons for each “dip”
- Enough 3-4" pieces of celery stalks for each student to get 2.
- 1 jar Sun butter
- 2 8oz packages of cream cheese
- Container of prepared hummus
- 1 pint of cherry tomatoes, diced in half
- 1 large cucumber sliced 1/8” thick into circles
- 1 large apple sliced into 1/8” thick circles and then cut in half
- 1 bunch of radishes sliced in circles or half circles
- 1 package of shredded carrots.
- 16 oz container of raisins
- 1 family size bag of mini pretzels
- 1 family size bag of mini pretzel sticks
- Mini chocolate chips, Enjoy Life brand is allergen-friendly
- Sunflower seeds
- Other leftover ingredients from the trail mix day.
## Lesson Plan

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<th>Learner Objective</th>
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<tr>
<td><strong>Set up</strong></td>
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<td>Set up materials and ELMO. Send kids to take 5 minutes to wash their hands.</td>
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<tr>
<td><strong>Welcome and Recap</strong></td>
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<td>Hi everyone! I’m ______ and I’m from NIU. So far we’ve talked about a variety of foods. The first time I was here, we discussed seeds and beans. Last time, we discussed different root vegetables. What are some of the root vegetables we talked about? <em>Allow the kids time to respond.</em> That’s right. How did you do with the challenge we gave you this last time? As a refresher, we asked you to try three new-to-you root vegetables. What did you try? What did you think of it? <em>Allow the kids time to respond.</em> Did you help your family prepare any meals since we met? <em>Allow the kids time to respond.</em> What about any beans or seeds? Did anyone try any new dishes with beans or seeds in them? <em>Allow the kids time to respond.</em> You all did really great with that challenge. Let’s pull out our Fruit and Vegetable Charts and I will pull out the master chart for the class and place it on the Elmo. Does anyone have any root vegetables they would like to grow in the garden this year? <em>Allow the kids time to respond.</em> Thank you for sharing. Let’s move on.</td>
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<tr>
<td><strong>Describe three functions of plant</strong></td>
<td><strong>Background</strong> Plant vascular system slide.</td>
<td>Last time we covered all the different parts of the plant but focused on the roots. This time, we’re going to move up the plant to the stalk.</td>
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In CATCH, you learn how our blood is carried throughout the body through our veins and arteries. This is called our vascular system. Our blood transports nutrients and oxygen from organ to organ throughout our bodies. Likewise, plants have a vascular system that transports nutrients and water through the stalk from the roots to the leaves and back.

Plants’ vascular systems have two parts. One is called the phloem and the other is called the xylem.

Do you recall what part of the plant photosynthesis occurs in? Allow the kids time to respond.

That’s right. Photosynthesis occurs in the leaves. That is where plants use energy from the sun to convert carbon dioxide to carbohydrates and starches. The carbohydrates are then transported from the leaf to the roots and the rest of the plant through the phloem so the plant can grow.

Do you recall what part of the plant absorbs the most amount of water? Allow the kids time to respond.

That’s right. Plants absorb water through their roots. The water is transported through the stalk to the leaves and the rest of the plant by way of the xylem.

Let’s take a closer look at these systems.

Celery Experiment
6 stalks of celery that have sat in red water

Have you ever seen what happens when you place celery into a cup of water that has been colored with food coloring? Allow the kids time to respond.
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| or blue food coloring-infused water for at least 24 hours. Keep two of the stalks, preferably the ones with leaves, intact. Dice up the remaining 4 stalks into ½ inch dices on an angle, so the xylem is apparent. Draw What I See paper If not enough time to prep the celery, use the Xylem of Celery Slide. | That’s right. The celery absorbs the food coloring from the bottom of the stalk all the way to the leaves. Yesterday, I took 6 fresh stalks of celery and placed them into a cup of water that was colored with food dye. Today, we came back and diced up a few of the stalks so you could better see the xylem and try to find the phloem in the stalks. **Partner the students up. To each pair, pass out the diced-up stalks of celery, mini-magnifying glass, and Draw What I See paper.** Now, what we are passing out are not for eating, they are for you to examine and draw. On the pieces of paper, put your name and the draw the cross section of your piece of celery. See if you can find the xylem. It will be the part that is dyed the darkest red/blue. While you are examining your piece of celery, think of at least two descriptive words you would use to describe the celery. Examples of descriptive words include colors like “yellow” if you were to describe a yellow flower, or if you were to describe the texture of the outside of an avocado, you might say “bumpy.” You have 4 minutes. | --- 4 minutes later --- 

Our time is up. Are there a couple of volunteers who would like to share their drawing on the Elmo? In one minute, let’s see how many different words we can use to describe the celery? | 3 minutes |

<p>| List the nutritional benefits of eating plant stalks | Nutritional Benefits of Celery | The words you used to describe celery leads to our next topic. You said the celery is stringy and hard. That is because it is made up of starches and fiber. We placed our celery in a cup of water overnight, yet when we took it out this morning, it |</p>
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<td>was still in one piece. If we took a piece of bread or the fleshy part of a pear and put it in a cup of water over night, what might happen? Allow the kids time to respond.</td>
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<td>In fact, it would turn to mush! Good job! Foods like celery, asparagus, rhubarb, and fennel stay together because they are made up of a kind of extremely strong starch called fiber. We are unable to digest it. This is good for our bodies because it helps keep our digestive track moving which helps keep our bodies and especially our hearts healthy.</td>
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| Celery Bugs | Today, we are going to make celery bugs! Each person will be able to make two. We have brought a bunch of different ingredients. There are a couple of steps: 1. The filling: using a spoon, you can fill your celery with sun butter, cream cheese, or hummus. 2. Decorate: have fun decorating your bug. Make it a butterfly with pretzel wings, or a snail with a radish slice shell and carrot stick antennas. We also have raisins for the traditional “ants on a log,” if you are more of a traditionalist. We also have cherry tomatoes, grapes, and cucumber and apple slices. Have fun! You have about 10 minutes. |
| Celery and other food ingredients. |

| Wrap-up and Challenge | I hope you had a lot of fun with that and maybe discovered a silly snack you make with your family after school. We do not eat a lot of different stalks but today you tried one: celery. Over the next few weeks, see if there are other stalks you could try. One that is very popular with panda bears and is featured in a lot of Asian dishes is bamboo. You can buy it canned near the other Asian foods in the grocery store. Another option is asparagus. It |
| Show examples of stalks and stems. | 3 |

<p>| Time in Min |
| 15 |</p>
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<td>is great grilled or in pasta dishes. Also, figs are considered a stem so they would count. Your challenge is to try at least one other stalk or stem between now and the next time we meet. Remember to keep up with your chart. We’ll review what you tried next time.</td>
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<td>Clean up</td>
<td></td>
<td>Place all of the items into a large Rubbermaid container with a lid and bring them back to NIU to be washed or if possible clean them in the kitchen at the school.</td>
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VASCULAR SYSTEM

Source: By Nefronus - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=77033799

XYLEM OF CELERY
1. In the box above, draw the cross-section of the celery. Label the xylem.
2. How would you describe the celery? (Color, texture, what it feels like, etc...)
Talking about food can be one of the easiest ways to connect as a family. While asking simple questions about food preferences, such as, “do you like the pasta tonight?” can help engage your family in conversation, try expanding the dialogue by discussing textures, aromas, and flavors of the meal. Questions like, “what did you think about the chewy texture of the pasta tonight?” or “how would you describe the smell of the soup?” can not only further the exchange, but also expand everyone’s appreciation for different foods. Try to take note of preferences so that future meals may feature specific flavors, textures, and aromas.

**Featured Recipe**

**Asparagus Sticks**

Stalk vegetables retain their shape even after being cooked. These asparagus sticks make a kid-friendly substitute for fries.

**Ingredients**

- 1 cup dried breadcrumbs
- 1 tbsp Italian seasoning
- 1/2 tsp salt and garlic powder
- 2 large eggs
- 1/4 cup flour
- 1 bunch of asparagus, cleaned, and patted dry
- tomato sauce, for dipping

**Directions**

1. Preheat oven to 425°F and lightly oil sheet tray
2. Mix the breadcrumbs, Italian seasoning, salt, and garlic powder together in a baking dish.
3. Whisk eggs together and pour into a shallow baking dish.
4. Place flour in a shallow baking dish.
5. Set the dishes side by side.
6. Dip the asparagus into the flour, then the egg mixture, and finally, the breadcrumb mixture. Ensure that each piece of asparagus is evenly coated.
7. Place the asparagus on the oiled baking sheet. Keep them evenly spaced so they do not touch. Spray with oil and cook for 30-35 minutes or until golden.
8. Serve with tomato sauce.
**Recipes from the Classroom**

**Celery Bugs**

![Image of celery bugs]

**Ingredients**

**Snails**
- celery stalks
- peanut butter or cream cheese, at room temperature
- sliced apple
- sliced orange
- sliced kiwi
- sliced cucumber
- sliced tomato
- cashews

**Caterpillars**
- celery stalks
- Peanut butter or cream cheese, at room temperature
- grapes
- blueberries
- grape tomatoes
- candy eyes
- celery or radish matchsticks

**Instructions**

**Make the Snails:** Fill celery stalks with peanut butter or cream cheese and top with an apple, orange, kiwi, cucumber or tomato slice shell and a cashew head. Use peanut butter or cream cheese to glue on candy eyes.

**Make the Caterpillars:** Fill celery stalks with peanut butter or cream cheese and top with grapes, blueberries or grape tomatoes for the body and head. Use peanut butter or cream cheese to glue on candy eyes and celery or radish matchstick for antennae.

APPENDIX F

COOKING LESSON FOUR: POWERHOUS LEAVES
Lesson Overview

The fourth lesson in the curriculum focuses on leaves and lettuces. The lesson begins with a review of previously covered topics. There is a review and in-depth discussion of the botanical function of leaves. *The Dr. Binos Show* episode on YouTube may be shown in lieu of the discussion or used to present the information in an alternative manner. This program is designed to run during the school year starting in late August or early September. At the time this lesson runs, the leaves should be in the process of changing colors. The instructors may bring in red, orange or yellow leaves to help connect the discussion of leaf pigments to the curriculum. Following the introduction to the botanical function of leaves, the lesson provides an interactive game where students are given time to observe, draw, and describe four different edible leaves. Then, they are challenged to match their descriptions to those provided on Power Point slides. Winners could be awarded a bottle of salad dressing to take home as a prize.

Students create a lemon vinaigrette salad dressing as their cooking activity. The supplemental Family Newsletter provides facts about nutritional benefits of leaves, tips for family meals, a recipe for “Kid-Friendly Lettuce Wraps”, and the recipe for “Lemon Vinaigrette.”

**Learner Objectives**

- Describe 1 function of plant leaves
  - Photosynthesis/make plant energy
- List 5 different varieties of lettuces and leaves
  - Spinach
  - Romaine
  - Bib Lettuce
  - Butter Lettuce
  - Arugula
  - Chard
  - Frize
  - Mustard Greens
  - Microgreens
- Herbs: Sage, Mint, Thyme, Rosemary, Oregano

**Activities**

- Describe a leaf/Taste a leaf
- Lemon Vinaigrette Demonstration – prepare and premeasure ingredients ahead of time.
### Materials for Describe a Leaf/Taste a Leaf

- Fruit and Vegetable Chart
- Drawing of plant and carrot from previous lesson
- Powerhouse Leaves Power Point presentation
- Describe a Leaf handout
- Pen or pencil

### Tools for Describe a Leaf/Taste a Leaf

- 4 cups of washed and dried baby spinach
- 4 cups of washed and dried baby spinach
- 4 cups of washed and dried arugula
- 4 cups of washed, dried, and chopped romaine lettuce
- 1 bunch of rosemary, mint, or basil (herb) with leaves rinsed and divided
- 1 small disposable cup filled with water
- 1 large water pitcher filled with potable water
- 1 paper towel per student
- Describe a leaf handout
- Two jars of vinaigrette salad dressing (Aldi’s Pantry Select Garlic and Olive Oil Salad Dressing is a good, inexpensive option)

### Tools for Lemon Vinaigrette Demonstration

- Medium bowl
- Medium bowl
- Whisk
- 6 cups of rinsed and dried baby spinach or romaine leaves
- Plastic spoons for each student.
- 1/2 cup extra virgin olive oil
- 1/4 cup freshly squeezed lemon juice
- zest of 1 lemon (1/4 tsp packed)
- 1 tsp Dijon mustard
- 2 garlic cloves minced or pressed (1 tsp)
- 1/2 tsp salt
- 1/4 tsp freshly ground black pepper
## Lesson Plan

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<td></td>
<td>Set up</td>
<td>Set up materials and ELMO. Send kids to take 5 minutes to wash their hands.</td>
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<tr>
<td>Welcome/Recap</td>
<td>Welcome/Recap</td>
<td>Hi everyone! I’m ______ and I’m from NIU. We have talked about many different plant parts that are edible. We started with the parts of the plant that are underground such as seeds and roots. Do you remember what we discussed last week? <em>Allow the kids time to respond.</em> That’s right. Last time, we challenged you to try different stalks. Raising your hand to answer, did anyone have any celery? What about bamboo? How about asparagus? Did anyone have any figs? Which was your favorite? <em>Allow the kids time to respond.</em> What meals did you help your family plan and prepare since we last met? <em>Allow the kids time to respond.</em> Were there any new or familiar foods that you tried since we met? <em>Allow the kids time to respond.</em> You are doing really great with trying new foods. Now, let’s pull out our Fruit and Vegetable Charts and I will pull out the master chart for the class and place it on the Elmo. Unfortunately, we cannot easily grow figs or bamboo in this part of the country. It also takes about five years to establish asparagus in a garden. However, it is possible to grow it. It is also possible to easily grow celery. What are your thoughts on growing celery or asparagus? <em>Allow the kids time to respond.</em></td>
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<td>Learner Objective</td>
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<td>Thank you for sharing. Let’s move on.</td>
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<td></td>
<td>Background</td>
<td>We recall that seeds are the embryonic stage of plants. We know that roots help take up water and nutrients from the soil and then become the place where some plants store energy for colder days. And stalks and stems of plants help transport water and nutrients from the leaves to the roots and back. What do you think are the function of leaves? Allow the kids time to respond.</td>
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<td>Do you recall the image we drew of the plant and the carrot from the first week? Place drawing of plant and carrot on the ELMO.</td>
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<td>We have plants all around us. We need them as much as they need us. When we breath air in, we breath in oxygen. When we breath out, we breath out carbon dioxide. If we look here, we see that leaves take up the carbon dioxide that we breath out, and produce oxygen, which we breath in. Plants use water and the carbon dioxide that we breath out and change it into energy, or food, and oxygen through the process of photosynthesis. Photosynthesis is a big, fun word to say. Let’s all say it together! Ready. Say together Photosynthesis. Man, you all sound smart! Well, photosynthesis happens in the leaves of green plants. Does anyone know what the green pigment in leaves is called? Allow the kids time to respond.</td>
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<td>It is called chlorophyll. In plants with leaves that change colors in the fall, the cells with green chlorophyll begin to die off leaving a red, orange, or yellow color. This red, orange, and yellow color comes from a pigment called</td>
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<td>a carotenoid. When you hear the word “carotenoid” think “carrot.” Carrots are usually orange, like the carotenoid pigments. Did you know that the leaves always have red, orange, or yellow carotenoid pigments in them. When the cells that produce chlorophyll are alive, the green chlorophyll is so bright, that they overpower the red, orange, and yellow carotenoid pigments. As the leaves are exposed to shorter days and cooler temperatures, the cells with chlorophyll die off and the red, orange, and yellow colors can be seen. Pretty neat stuff. If we look at a leaf, we may notice several features. The first feature is the color. The second is the shape. The third is the veins all over the leaf. The vein down the middle is called the midrib. Then we see veins coming off of the midrib. The veins and the midrib work together to position the leaf so that it faces the sun directly. The plant is smart and knows that to produce the most amount of energy possible, it needs to get the flattest part of each leaf to face the sun. Option: *If time allows, you may show this approximately 4 minute video in addition to the lesson above. Photosynthesis</td>
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<td>Describe a Leaf/Taste test comparison Each student gets 4 leaves:</td>
<td><strong>Instruct 6-7 volunteers to pass out a paper towel, a cup, and one of each leaf to each student. Fill the cups of each student with water. Pass out the Describe a Leaf handout.</strong> Each of you is receiving a handout and several leaves. Be very gentle with these leaves as</td>
<td>8</td>
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</table>
they can bruise. Once you get your leaf, you are going to take a few moments to study it, draw it and then describe it.

On your handout, put your name. Make sure that your leaves are arranged like this: Leaf 1 is this leaf (*hold up the romaine leaf but do not say the name*), leaf 2 looks like this (*hold up the spinach leaf*), Leaf 3 looks like this (*hold up the arugula leaf*), and Leaf 4 looks like this (*hold up the herb leaf*). Now, take a moment to draw the shape and vein pattern of your leaf. Then try to describe each leaf. First, describe the color. Is it dark green, light green, white, yellow or something else? Then try to identify the texture. Is it soft, smooth, rigid, flexible? Next, try to describe the smell. Does it smell light, like dirt, like pine trees, minty, or spicy? Finally, taste each leaf. Each leaf has a distinct flavor. You may enjoy the flavor of some more than others. One tip I have for you is to save the smallest leaf for last. Sometimes, big flavors come in small packages. Also, you have some water, so take a sip of water between each leaf taste. You have 5 minutes to study your leaves.

*After 5 minutes, move onto the leaf reveal in the Name That Leaf PPT.*

**Material:**
- *Name That Leaf PPT*
<table>
<thead>
<tr>
<th>Learner Objective</th>
<th>Tools/Activity</th>
<th>Script</th>
<th>Time in Min</th>
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<tr>
<td>Have the 4 volunteers come up to the front of the class. They can bring their handouts. Place them in teams of two. One pair stands on the right and the other to the left. Here are the rules, I will read the description of the leaf off the ELMO. When you think you know which leaf I am describing, raise your hand. Whoever raises their hand first will get an opportunity to guess which leaf they think I am describing. If they guess right, they will get a point. If they guess wrong, the other team will get to steal the guess for the point. Whoever gets the most points by the end wins these bottles of salad dressing! Are you ready?</td>
<td></td>
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<tr>
<td></td>
<td>This leaf is described as medium to large in size with an elongated shape and stiff, upright leaves. The leaves range from darker green with a white midrib, to almost white. This leaf is often described as crisp, succulent, and crunchy with a mild, slightly bitter taste. <strong>Leaf 1 – Romaine</strong></td>
<td></td>
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<td></td>
<td>This leaf is smaller and round or oval in shape. It is evenly colored dark green and has thin stem. The flavor is mild, earthy, and slightly bitter. <strong>Leaf 2 – Spinach</strong></td>
<td></td>
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<tr>
<td></td>
<td>This leaf is described as soft and is smaller to medium in size with a thinner shape and medium green color. This leaf tends to have a spicy, peppery, or mustard flavor which blends nicely with other greens in a salad. <strong>Leaf 3 – Arugula</strong></td>
<td></td>
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<td></td>
<td>This leaf is described as small, narrow, dark green and firm. It is not very flexible. It has a distinct pine-tree smell and a strong</td>
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<tr>
<td>Learner Objective</td>
<td>Tools/Activity</td>
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<tr>
<td>peppermint to pine tree taste. <em>Leaf 4 – Rosemary</em>&lt;br&gt;This was a kind of leave we call an herb. Herbs can often be used dried or fresh to help enhance the flavor of a food. We use dry herbs when a food is going to cook for a long time, like a soup. We use fresh herbs right before we serve or eat a dish.&lt;br&gt;&lt;br&gt;<strong>Option for Herb</strong>&lt;br&gt;This leave is often described as soft, flexible, small, and medium green. It is slightly sharp on the edges and has a minty smell and tastes like peppermint. <em>Leaf 4 opt – Mint or Basil.</em>&lt;br&gt;&lt;br&gt;Award the winning team their bottles of salad dressing.</td>
<td></td>
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<tr>
<td>Cooking Demonstration&lt;br&gt;• Lemon Vinaigrette Salad dressing</td>
<td>As you may have noticed, salad greens on their own have a lot of flavor but, they are routinely dressed up to taste a little better with salad dressing. I am going to show you how easy it is to make salad dressing from scratch.&lt;br&gt;&lt;br&gt;To a bowl, we will add:&lt;br&gt;• 1/2 cup extra virgin olive oil&lt;br&gt;• 1/4 cup freshly squeezed lemon juice&lt;br&gt;• zest of 1 lemon (1/4 tsp packed)&lt;br&gt;• 1 tsp Dijon mustard&lt;br&gt;• 2 garlic cloves minced or pressed (1 tsp)&lt;br&gt;• 1/2 tsp salt&lt;br&gt;• 1/4 tsp freshly ground black pepper&lt;br&gt;&lt;br&gt;Whisk all ingredients together for 30 seconds. Vinaigrettes are really neat because they take two ingredients that usually do not get along, oil and water, and help them become friends. They do this by using an emulsifier. In our</td>
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<tr>
<td>Learner Objective</td>
<td>Tools/Activity</td>
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<td>case, the Dijon mustard and spices are acting as our emulsifier. This is a kind of food that helps oil and vinegar get along. And voilà! We have lemon vinaigrette. If you would like to try it, come up, get a leaf, and I will drizzle some on your leaf for you to try. Or you can grab a spoon to try it on.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wrap-up</td>
<td>We learned a lot today. I hope you enjoyed trying the different leaves we brought in. We eat a lot of different leaves in our diet. A lot of them come in the form of herbs, however, over the next few weeks, see if there are other kinds of leaves you can try. Remember to keep up with your chart. We’ll review what you tried next time then.</td>
<td></td>
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<td></td>
<td>Clean-up</td>
<td>Place all of the items into a large Rubbermaid container with a lid and bring them back to NIU to be washed or if possible clean them in the kitchen at the school.</td>
<td></td>
</tr>
</tbody>
</table>
## Describe a Leaf

<table>
<thead>
<tr>
<th>Leaf 1</th>
<th>Leaf 2</th>
<th>Leaf 3</th>
<th>Leaf 4</th>
</tr>
</thead>
</table>

- In the boxes above, draw each leaf, then study each leaf. Then, describe each leaf:
  - **Color:** is it dark green, light green, white, yellow?
  - **Texture:** is it soft, smooth, rigid, flexible?
  - **Smell:** does it smell light, like dirt, like pine trees, or spicy?
  - **Taste:** chew it slowly and try to describe the taste; peppery, minty, like dirt...
Powerhouse Leaves
CATCH Rainbow

NAME THAT LEAF
Describe Your Leaf
Leaf #?

- Shape: smaller and round to oval shaped.
- Color: evenly colored dark green with a thin stem.
- Taste: mild, earthy, and slightly bitter.

Leaf #2

- Shape: smaller and round to oval shaped.
- Color: evenly colored dark green with a thin stem.
- Taste: mild, earthy, and slightly bitter.
Leaf #4

- Shape: small, narrow, and firm.
- Color: dark green.
- Taste: pine-tree smell and peppermint to pine taste.
Leaf #1

- **Shape:** medium to larger in size with an elongated shape and stiff, upright leaves.
- **Color:** leaves range from darker green with a white midrib, to almost white.
- **Taste:** crisp, succulent, and crunchy with a mild, slightly bitter taste.
Leaf #? • Shape: soft and is smaller to medium in size with a thinner shape. • Color: medium green color. • Taste: spicy, peppery, or mustardy flavor.

Leaf #3 • Shape: soft and is smaller to medium in size with a thinner shape. • Color: medium green color. • Taste: spicy, peppery, or mustardy flavor.
Featured Recipe

Crispy Lettuce Wraps

Lettuce can be unappetizing to some kids. Bibb lettuce has a buttery, soft texture and slightly sweet taste. It retains its shape well enough to serve as a wrap in Asian-inspired lettuce wraps that resemble kid-friendly burritos.

Ingredients
- 1 lb ground turkey
- 2 cans diced water chestnuts
- 1/2 cup diced white mushrooms
- 1/2 diced bell pepper, rinsed and diced
- 2 minced garlic
- 3 Tbsp hoisin sauce
- 2 tsp of sesame or canola oil
- 3 Tbsp low sodium soy sauce
- 2 heads of bibb or butter lettuce
- 2 medium carrots, washed and shredded on a grater
- 2 green onions diced

Directions
1. Mix together garlic, hoisin sauce, and soy sauce in a small bowl.
2. Add oil to a large skillet over medium heat. Add ground turkey and cook for 5 minutes, breaking it up into small pieces as it cooks.
3. Add mushrooms and pepper to the turkey. Continue to cook for 3 more minutes.
4. Add the sauce to the mixture and cook for 3 more minutes until it is well incorporated.
5. Scoop into individual leaves. Top with carrots and green onions and enjoy!

Tips for Family Meals

For some kids, salad greens can be an unwelcome sight on the dinner table. There are several ways to help kids get more interested in this crisp, crunchy treat. Make sure to chop heartier salad greens into small pieces. Provide plenty of kid-friendly toppings such as peas, apples, berries, and cheese. When shopping, allow children to pick out a salad dressing they would like to try. If you are feeling adventurous, help your kids make a simple vinaigrette at home by whisking together 1/2 cup of olive oil, 1/4 cup of lemon juice, 1 tsp of Dijon mustard, 2 cloves of minced garlic, 1/2 tsp salt and 1/2 tsp of pepper.
Recipes from the Classroom

Lemon Vinaigrette

Ingredients
- 1/2 cup extra virgin olive oil
- 1/4 cup freshly squeezed lemon juice
- zest of 1 lemon (1/4 tsp packed)
- 1 tsp Dijon mustard
- 2 garlic cloves minced or pressed (1 tsp)
- 1/2 tsp salt
- 1/4 tsp freshly ground black pepper

Instructions
1. Place all ingredients in a bowl and whisk to combine. Or, place all ingredients in a jar, and shake to combine.
2. Store leftovers in the refrigerator for up to 10 days. Enjoy over fresh salad greens!

Notes
If the dressing loses its emulsification, simply whisk it again (or shake it in the jar).

Nutrition
Calories: 163kcal | Carbohydrates: 1g | Protein: 1g | Fat: 18g | Saturated Fat: 2g | Sodium: 204mg | Potassium: 10mg | Sugar: 1g | Vitamin C: 4mg | Calcium: 2mg | Iron: 1mg

Source: https://www.fifteenspatulas.com/lemon-vinaigrette/
APPENDIX G

COOKING LESSON FIVE: EDIBLE FLOWERS
Lesson Overview

The fifth lesson in the series introduces the concept of edible flowers. The lesson begins with a review of the previously discussed topics. Students are encouraged to share what meals they helped their families prepare since the last lesson. Additionally, they add to the “Fruit and Vegetable Chart.” The body of the lesson opens with *The Dr. Binos Show* YouTube video, Parts of a Flower and Pollination. Then students are encouraged to raise their hands to fill-in the blank of a video summary. The concept of edible flowers is introduced in the context of common cruciferous vegetables such as broccoli and cauliflower. A PowerPoint Slideshow is available to help demonstrate the different vegetables that fall into this category. Students are given small pieces of broccoli crowns to examine with magnifying glasses. Finally, students assist with assembling a “High Fiber Broccoli Smoothie” and end the session with a taste test activity. The session closes with a challenge to continue trying new flowering foods and cruciferous vegetables. The supplemental Family Newsletter provides a brief overview of the nutritional benefits of cruciferous vegetables, ways to help families dealing with food insecurity, a recipe for broccoli & cauliflower bites, and the “High Fiber Broccoli Smoothie” recipe prepared in class.

**Learner Objectives**

- Describe 1 function of plant flowers
- Reproduce/make new plants
- List 3 different varieties of flower plants/cruciferous vegetables that we eat
  - Broccoli
  - Cauliflower
  - Romanesco
  - Brussels sprouts
  - Cabbage
  - Kohlrabi
  - Kale

**Activities**

- Fill in the Blank
- Watch Parts of a flower and Pollination from The Dr. Binocs Show on YouTube then raise your hand to “fill-in the blank” as a review within the lesson plan script
- High Fiber Broccoli Smoothie
Materials

- Fruit and Vegetable Chart
- PowerPoint Slides
- Smoothie Taste Test worksheet
- Pen or pencil

Tools

- 8-12 2” pieces of broccoli crowns for students to examine
- High powered blender
- 40-50 2 oz disposable cups
- Rubber spatula
- Dry Measuring cups
- Paper towels for spills
- 2 cup wet measuring cup like a Pyrex or similar
- Cooler with ice to transport chopped and frozen produce
- 2.5 cups of frozen pitted cherries
- 2.5 cups of chopped broccoli crowns (rinsed and drained)
- 3 medium ripe avocados (skins and stones removed)
- 4 medium bananas
- 3.5 Tbsp of ground flaxseed
- 4 cups of 100% apple juice
<table>
<thead>
<tr>
<th>Learner Objective</th>
<th>Tools/Activity</th>
<th>Script</th>
<th>Time in Min</th>
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<tbody>
<tr>
<td>Set up</td>
<td>Set up materials and ELMO. Send kids to take 5 minutes to wash their hands.</td>
<td>5</td>
<td></td>
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<tr>
<td>Welcome/Recap</td>
<td>Hi everyone! I’m ______ and I’m from NIU. Last time we were here, we talked about different kinds of edible plant leaves; edible means those that we eat. We did a taste test of different plants and tried to figure out which one was which. Some plant leaves were firm and crunchy and others were soft and velvety. If you tried really hard you could taste different flavors between the leaves. How would you describe what your favorite leaves tasted like? <em>Allow the kids time to respond.</em> You are all pretty good at remembering all that detail. Last time before we left, we challenged you to try different lettuces and herbs. Raising your hand to answer, please share with us the different leaves you tried? <em>Allow the kids time to respond.</em> What meals did you help your family plan and prepare since we last met? <em>Allow the kids time to respond.</em> Were there any new or unfamiliar foods that you tried since we met? <em>Allow the kids time to respond.</em> You are doing really great with trying new foods. Now, let’s pull out our Fruit and Vegetable Charts and I will pull out the master chart for the class and place it on the Elmo.</td>
<td>5-8</td>
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<td>Learner Objective</td>
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| Lettuce and herbs are very easy and fun to grow. Are there any specific kinds you would like to try to grow in our garden in the spring? *Allow the kids to respond.*  
Thank you for sharing. Let’s move on. |  |  |  |
| Describe 1 function of plant flowers | Background Elmo with the YouTube link pulled up. Fill in the blank activity | Over the past few months, we've covered most parts of the plant starting underground where seeds get planted, sprout roots and the stalk. The stalks reach up above the ground and leaves fill the space all around the stalk. In most plants, flowers are the next thing to appear. What do you think is the function of flowers? *Allow the kids time to respond.*  
Today, we have a short video to watch that does a great job of showing the different parts of plant flowers and describes their function.  
*!!! Pause the video right before the trivia!!!*  
Parts of a flower and Pollination | The Dr. Binocs Show | Learn Videos For Kids  
https://www.youtube.com/watch?v=djPVgip_bdU  
*If you are unable to play the video you can talk through the following description, otherwise use this script below to review the video. If using as a review, have the kids raise their hands to “fill in the blanks” which are the underlined words in the script:*  
Flowers are the reproductive organs of plants. They allow the plants to reproduce and make new plants. Flowers are usually colorful and fragrant in order to attract bugs and bees so that they might get the nectar from one flower. In the process the bugs get dusted with pollen, and then buzz over to another flower and pass the pollen along.  
Pollen |  |  | 10 |
Learner Objective

Tools/Activity

Script

Time in Min

8-12 Broccoli crown pieces

Edible Flowers PowerPoint Slides

fertilizes the ovum in the plant. A fertilized flower turns into fruit. Inside fruit are seeds.

We’ll talk more about fruits next week. For now, we’re going to focus on plant flowers.

You all did a really great job with that. What did you think of the video?

So now, I want you to think: can you think of any plant flowers that we commonly eat? Allow the kids time to respond.

Did you know that the fluffy part of broccoli are actually flowers? The little top parts of broccoli are clusters of green flower buds. Pass around a few small cuts of broccoli crowns so the kids can examine them.

Now that you know broccoli crowns are flowers, are there any other similar plants that you can think of that are flowers?

That’s right! Cauliflower is also small flower clusters. The name “cauliflower” has the word “flower” right in it. Do you know what all colors cauliflower comes in? White, light green, yellow, orange, purple...

Another flower we eat is the artichoke. It is technically part of the daisy family. We treat it like a vegetable though.

Can use the Edible Flower Power Point Slides to help illustrate the various kinds of cruciferous vegetables.

Broccoli and cauliflower are considered cruciferous vegetables. That is because if you look really closely, each flower makes a shape of a cross by
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<td>the way the little petals fold over each other. Other cruciferous vegetables include brussels sprouts, cabbage, Romanesco, kohlrabi and kale.</td>
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<td><em>If using the Edible Flowers Power Point Slides include the following script:</em> Our last slide of the PowerPoints shows other kinds of edible flowers besides those that grow into vegetables. It is extremely important that you do not consume any flowers unless you are positive, they are not poisonous. Some flowers are poisonous and should not ever be eaten. Other plants have edible flowers that you may not think you could eat. These include things like squash blossoms, certain kinds of pansies, and lavender.</td>
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<tr>
<td>Smoothie Taste Test</td>
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<td>By a show of hands, how many of you enjoy broccoli?</td>
<td>3-5</td>
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<td>Today, we are going to become product analysists. A product analyst is a person who tries out a product and then reports on their experience with it to the manufacturer. I have a recipe that uses broccoli in an unusual way. We are going to make a smoothie that has broccoli in it and then conduct a taste test with the smoothie. I have Smoothie Taste Test handouts for everyone. Make sure you have a pen or pencil to fill it out.</td>
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<td><em>Pass out the forms.</em></td>
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<td>Take a look at the form. We are going to first look at the smoothie and use a word or two to describe its color. We are going to use a word or two to describe its smell. Think of words like “fruity, flowery” or whatever best describes it. The words for flavor might be similar to the words for smell. This is because 75% of sense of taste is tied to our sense of smell. Next, we will think about the texture. This can get a little tricky but think, is it thick like honey, or smooth like melted ice cream,</td>
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<td>or thinner like water. Finally, is the row to describe your overall impression. This is just your overall description. You could say, “too tart,” or “perfectly sweet” or “earthy like dirt,” or whatever you think. I want you to think of this as if you were to describe it to someone who has not tried this before. For each row, you’ll notice a smiley face. You can use these to rate each description.</td>
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</table>
|                   | High Fiber Broccoli Smoothie | I need several volunteers to help me make this smoothie. *Invite the students to help you measure out the proportions of the fruit into the blender.*  
*Recipe makes 44, 2oz servings.*  
*Depending on the size of the blender, you may need to make this in two batches. If blender is small, add in the following proportions, serve, and then repeat. Use the spatula to scrape down the sides of the blender between batches.*  
To a blender add:  
1.25 cups of chopped broccoli crowns  
1.25 cups of frozen cherries  
1.5 medium ripe avocados  
2 medium bananas  
1.25 Tbsp of ground flaxseed  
2 cups of 100% juice apple juice  
*Pour into 2 oz cups and have the volunteers distribute the samples or have the kids come up to grab a cup to try.* | 10 |
<p>|                   | Wrap-up and Challenge | We learned a lot today about the function of flowers and the different flowers we commonly eat such as broccoli, cauliflower and other cruciferous vegetables like cabbage, brussels sprouts, and kale. | 3 |</p>
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<td>Sometimes people describe these foods as bitter and do not prefer them. Others enjoy their flavor. The way we prepare these types of vegetables changes the chemicals that make the taste bitter, so I encourage you try as many of these types of vegetables prepared in many different ways. My favorite way to eat these kinds of vegetables is ____________.</td>
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<td></td>
<td>Keep track on your chart of the different cruciferous vegetables you have tried and would like to grow in the garden.</td>
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<tr>
<td>Clean up</td>
<td>Place all items into a large Rubbermaid container and return to a kitchen to properly wash them.</td>
<td>5</td>
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</tbody>
</table>
## Smoothie Taste Test

<table>
<thead>
<tr>
<th></th>
<th>Use the space below to describe the smoothie.</th>
<th>Not for me</th>
<th>Eh...</th>
<th>It's okay</th>
<th>I enjoyed this</th>
<th>Can I have some more?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Color</strong></td>
<td><img src="image1.png" alt="Emojis" /></td>
<td><img src="image2.png" alt="Emojis" /></td>
<td><img src="image3.png" alt="Emojis" /></td>
<td><img src="image4.png" alt="Emojis" /></td>
<td><img src="image5.png" alt="Emojis" /></td>
<td><img src="image6.png" alt="Emojis" /></td>
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<tr>
<td><strong>Smell</strong></td>
<td><img src="image7.png" alt="Emojis" /></td>
<td><img src="image8.png" alt="Emojis" /></td>
<td><img src="image9.png" alt="Emojis" /></td>
<td><img src="image10.png" alt="Emojis" /></td>
<td><img src="image11.png" alt="Emojis" /></td>
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<td><strong>Flavor</strong></td>
<td><img src="image13.png" alt="Emojis" /></td>
<td><img src="image14.png" alt="Emojis" /></td>
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<tr>
<td><strong>Texture</strong></td>
<td><img src="image19.png" alt="Emojis" /></td>
<td><img src="image20.png" alt="Emojis" /></td>
<td><img src="image21.png" alt="Emojis" /></td>
<td><img src="image22.png" alt="Emojis" /></td>
<td><img src="image23.png" alt="Emojis" /></td>
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<td><strong>Overall</strong></td>
<td><img src="image25.png" alt="Emojis" /></td>
<td><img src="image26.png" alt="Emojis" /></td>
<td><img src="image27.png" alt="Emojis" /></td>
<td><img src="image28.png" alt="Emojis" /></td>
<td><img src="image29.png" alt="Emojis" /></td>
<td><img src="image30.png" alt="Emojis" /></td>
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</tbody>
</table>
Edible Flowers
CATCH Rainbow

Broccoli
Romanesco
Artichoke
Cauliflower
**Cruciferous Vegetables**

- Broccoli
- Cauliflower
- Brussels sprouts
- Cabbage
- Romanesco
- Kohlrabi
- Kale
- Bok Choy
- Collard Greens

**Other Edible Flowers**

- Some flowers are edible and while they do not provide nutrition, they are pretty

**DO NOT EAT FLOWERS UNLESS YOU KNOW THEY ARE SAFE TO EAT**

- Zucchini Blossoms
- Johnny Jump-ups
- Lavender
- Edible Pansies
**Featured Recipe**

**Broccoli & Cauliflower Bites**

Veggie Bites are a tasty way to encourage kids to eat more vegetables. This is a family-friendly recipe that kids of all ages can help prepare.

**Ingredients**
- 1 cup of broccoli florets
- 1 cup of cauliflower florets
- 2 eggs, beaten
- 3/4 cup of bread crumbs
- 1/2 cup of shredded cheese
- 1 tsp Italian seasoning
- 1/2 tsp salt
- 1/4 tsp onion powder
- 1/4 tsp garlic powder

**Directions**
1. Steam broccoli and cauliflower florets on the stove or in the microwave until they are fork-tender.
2. While the broccoli and cauliflower are steaming, mix together the remaining ingredients in a large bowl and allow to rest.
3. Pulse the steamed florets in a food processor, blender, or use a knife to mince. Squeeze out excess water with a towel.
4. Incorporate the broccoli and cauliflower mixture to the egg and cheese mixture until they are well mixed. Let rest for 5 minutes before scooping.
5. To bake, place tablespoon-sized bites on a parchment-lined baking sheet. Bake at 350°F for 10 minutes, turning after 8 minutes. Theses can also be cooked on the stovetop in a little oil for 8 minutes each side.

---

**Tips for Families in Need**

In the U.S., 1 in 9 people struggle with food insecurity. For many families this may mean having choose between other necessities like medication and food. Food pantries offer relief from the stress associated with locating affordable foods. It is still possible to eat healthy when shopping at a local food bank. Items like beans, rice, pasta, and canned meat and vegetables are among the best to look for because they are versatile, filling, and have a long shelf life. If you are considering donating items to a food pantry, chose low sodium canned goods, unsweetened dried fruit, and nut butters. To find a local food bank go to www.FeedingAmerica.org.
Recipes from the Classroom

High Fiber Broccoli Smoothie Recipe for Kids

Ingredients
- 1 cup cherries
- 1 cup chopped broccoli
- 1 medium avocado
- 1 medium banana
- 1 tablespoon flaxseed, ground
- 1 cup pomegranate juice or apple juice

Instructions
1. Blend all ingredients in a high-powered blender and drink!

Nutrition
Calories: 179kcal | Carbohydrates: 27g | Protein: 3g | Fat: 8g | Sodium: 17mg | Fiber: 6g | Sugar: 17g

Source: https://www.superhealthykids.com/recipes/high-fiber-broccoli-smoothie-kids/
APPENDIX H

COOKING LESSON SIX: FRUIT
Lesson Overview

This is the sixth and final lesson within the cooking curriculum. The cooking lessons culminate with an examination of the fruiting parts of plants. This is a large topic so the instructor may choose to focus more on specific aspects of the lesson over others. The lesson starts with a review of all the previous lessons and encourages the students to share the different foods they consumed since the previous lesson. Students are provided with an overview of different fruits through a discussion and brainstorming session. A 30-second YouTube time-lapse video of a pear growing from a flower to a fruit may be used as an extra visual aid to demonstrate how fruit grow. Students are then given the opportunity to make “No Bake Fruit Pizzas” as a snack using a variety of fruit. The lesson closes with a preview of what the coming semester will entail, including beginning to plan their school garden. The supplemental Family Newsletter provides tips on purchasing fresh and frozen fruit, tips for picky eaters, a recipe for Pumpkin Apple Muffins, and a recipe for No Bake Fruit Pizzas.

Learner Objectives

• Describe 1 function of plant fruit
• Protect seeds
• Provide nutrients for seeds to grow
• List at least 5 different varieties of fruits that we eat (*In the culinary world, foods with "*" are considered vegetables. See list below)
  • Pome Fruit: Blueberries, Pomegranate, Apples, Pears, Cranberries
  • Aggregate Fruit: Raspberries, Blackberries, Strawberries
  • Citrus Fruit: Oranges, Tangerines, Mandarins, Grapefruit, Lemons, Limes
  • Drupe/Stone Fruit: Peaches, Pears, Apricot, Plums, Avocado
  • Melon/Gourd Fruit: Cucumber*, Zucchini*, Spaghetti Squash*, Watermelon, Pumpkin, Butternut Squash*
  • Simple Fruit: Grapes, Tomatoes*, Eggplant*, Peppers*
  • Multiple Fruit: Pineapple

Terms
• Berries: a fleshy fruit that has numerous seeds on the inside, embedded in the flesh of the ovary
• Aggregate fruit: edible fruit with seeds on the outside.

Activity

• No Bake Fruit Pizza

Materials

• Fruit and Vegetable Chart
Tools

- Disposable tablecloth for under everything
- Assortment of whole wheat tortillas cut in half, be sure to get at least one package of GF options
- Assortment of 1-2 cups of each of the following fruit cut into small pieces and separated into disposable bowls with spoons in each
  - Grapes
  - Strawberries
  - Blueberries
  - Apples
  - Bananas
  - Kiwi
  - Cuties
- 2-3 cups of fat-free vanilla greek yogurt
- Container of Sun butter
- 2 cups of premade, nut-free/gluten-free granola in a bowl with a spoon
- Paper plates, one for each student
- Role of paper towels
- Trash bag
- Disinfecting wipes for cleaning up
## Lesson Plan

<table>
<thead>
<tr>
<th>Learner Objectives</th>
<th>Tools/Activities</th>
<th>Script</th>
<th>Time in Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set up</td>
<td>Set up materials and ELMO. Send kids to take 5 minutes to wash their hands.</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
| Welcome/Recap      | Hi everyone! I’m ______ and I’m from NIU. Last time we were here, we talked about different kinds of edible flowers. These included foods like broccoli, cauliflower. These vegetables are all members of a family of vegetables called cruciferous vegetables. We also tried broccoli in a smoothie. Tell us about the different kinds of cruciferous vegetables you tried since we saw each other last. *Allow the kids time to respond.*
|                    | What meals did you help your family plan and prepare since we last met? *Allow the kids time to respond.* |
|                    | Were there any new or familiar foods that you tried since we met? *Allow the kids time to respond.* |
|                    | You are doing really great with trying new foods. Now, let’s pull out our Fruit and Vegetable Charts and I will pull out the master chart for the class and place it on the Elmo. |
|                    | Cruciferous vegetables take a long time to grow. These are vegetables we would need to plant early in the planting season so they have time to grow. Are there any you would like to try to grow? *Allow the kids to respond.* |
|                    | Thank you for sharing. Let’s move on. |
| Describe 1 function of plant fruit | Background | Today we’re going to talk about fruit. Believe it or not, fruit is a huge topic. First, let’s recall what fruit is. In the Dr. Binocs video we | 12 |

---

### Description of one function of plant fruit

**Background**

Today we’re going to talk about fruit. Believe it or not, fruit is a huge topic. First, let’s recall what fruit is. In the Dr. Binocs video we...
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<tbody>
<tr>
<td>List at least 5 different varieties of fruits that we eat</td>
<td>ELMO pull up YouTube time lapse video</td>
<td>watched on pollination last time, we learned that once a female flower is pollinated, the ovary of the plant will grow as it protects the developing seeds. Once it gets large enough, it will ripen. Sometimes we see this happen as a fruit changes from green to other colors like red, purple, darker green, white or orange. I have this neat video to show you. It is a time lapse video of a pear growing from a flower to a baby pear. Watch to see if you spot the growing pear.</td>
</tr>
<tr>
<td>Fruit PPT Slide 1</td>
<td></td>
<td>Time lapse of pear from flower to baby pear. <a href="https://www.youtube.com/watch?v=SHHkmOh942A">https://www.youtube.com/watch?v=SHHkmOh942A</a></td>
</tr>
<tr>
<td>Slide 2</td>
<td></td>
<td>Could you see the pear growing? It was upside down. Next time you eat a pear or an apple, look at the bottom, you’ll see what used to be the center of the flower.</td>
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<td>Slide 3</td>
<td></td>
<td>There are all kinds of fruit. Some fruits grow on trees or shrubs. Trees take years of growing in order to produce fruit. Can you think of fruit that grows on trees or shrubs? <em>Allow the kids to respond. Examples: Pears, apples, citrus fruits, blueberries...</em></td>
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<td>Some fruits grow on vines. These typically take many months to mature into fruit. Let’s see if we can name some fruits that grow on vines. <em>Allow the kids to respond. Examples include peas, raspberries, blackberries, grapes, tomatoes, melons, squashes, cucumber, pumpkin...</em></td>
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<td>Other fruits grow on bushy plants. These typically take several weeks to a few months to mature. Which do you think grow on bushy plants?</td>
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<td>Learner Objectives</td>
<td>Tools/Activities</td>
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<td>Slide 4</td>
<td>Allow the kids time to respond. Examples include peppers, eggplants, strawberries, ...</td>
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</table>

It is important to keep a couple of things in mind when you are deciding what to grow in your garden. The first is the amount of time it takes for the plant to mature. We will not have time to grow a tree in one year so think of the other options that we talked about.

The second thing to keep in mind is the climate of where we live. You mentioned some great fruits that are tasty, and we are lucky that we get to enjoy fruits like bananas. However, it is not possible for us to grown fruit like bananas, pineapples, kiwi, or even citrus fruits outside because they are tropical plants. They require hot, humid weather. We experience cold weather here.

*If the ‘is tomato a fruit or a vegetable’ question comes up, here are the facts.*

*There are two ways to classify all fruits: the botanical way and the culinary way.*

*Botanically speaking, nearly all fruits are considered berries as a berry is any fruit with its seeds inside. Then there are aggregate fruits. These are fruits with seeds on the outside. This means blackberries and raspberries are technically not berries but in fact aggregate fruit because the seeds are on the outside. Even strawberries are not a berry. They are an accessory aggregate fruit since their seeds are on the outside.*

*Culinarily speaking, foods like tomatoes, cucumbers, peppers, eggplants and squashes are considered vegetables. So, a*
<table>
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<tr>
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<td>No-bake Fruit Pizzas</td>
<td><em>tomato is botanically a fruit but culinarily a vegetable.</em></td>
<td>15-20</td>
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<td><em>Arrange the plates, fruit, bread options, yogurt, sun butter and granola on a table. Have volunteers help if necessary.</em></td>
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<td>Today, we are going to have a little fun making, no-bake fruit pizza snacks! This is a simple activity that allows you to be a little creative. We are going to form 2 lines. One for either side of this table. Then each of you are going to make a fruit pizza. Before we get started, let’s review the options we have up here.</td>
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<td><em>Hold up each bowl of fruit and have the kids say what they are. Then have the students try to identify what foods are able to grow locally and which are considered tropical fruit.</em></td>
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<td>Some fruits require very hot and moist climates. Others require dry and arid climates with spells of very cold temperatures. The fruits that require warm temperatures are called tropical fruits. Which of these do you think can be grown locally?</td>
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<td><em>Hold up the Kiwi.</em> These are typically grown in areas that have a 240-day growing season. A growing-season is the amount of days that do not have frost or freezing temperatures. In northern Illinois, we only have a 160-day growing season. That is 80-days shorter than what a kiwi needs to grow. Places like southern California, New Zealand, Italy, South Africa and Chile are known for growing Kiwi.</td>
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<td></td>
<td><em>Hold up Cuties.</em> Citrus fruit are grown throughout the world but require warm temperatures. In the United States, citrus fruit</td>
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</table>
is grown in Florida, California, Arizona, and parts of Texas.

*Hold up bananas.* It is possible to grow bananas in the same states that citrus fruit are grown but most bananas we eat are from Central America and South America. They are picked way before they are yellow so that they can make the long trip to our houses.

The rest of the fruit we have here have varieties that can be grown locally. In fact, during the summer, most of the blueberries we eat come from Michigan. As soon as fruit is picked, it starts to lose its nutrients or the things that make it a Go-food. Foods that are grown locally, may only take a few days from the time they are picked until we see them at our table. This means they keep most of their nutrients and remain the best kind of Go foods. If it is winter here, choosing fruits at the store that are frozen is a great choice because they are frozen right after they are picked so their nutrients are frozen in place.

Okay, who is ready to make a no-bake fruit pizza snack?

*Find out ahead of time from the teacher if any of the students have a food allergy. Ensure that they go first to reduce risk of cross-contamination.*

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<td>is grown in Florida, California, Arizona, and parts of Texas. <strong>Hold up bananas.</strong> It is possible to grow bananas in the same states that citrus fruit are grown but most bananas we eat are from Central America and South America. They are picked way before they are yellow so that they can make the long trip to our houses. The rest of the fruit we have here have varieties that can be grown locally. In fact, during the summer, most of the blueberries we eat come from Michigan. As soon as fruit is picked, it starts to lose its nutrients or the things that make it a Go-food. Foods that are grown locally, may only take a few days from the time they are picked until we see them at our table. This means they keep most of their nutrients and remain the best kind of Go foods. If it is winter here, choosing fruits at the store that are frozen is a great choice because they are frozen right after they are picked so their nutrients are frozen in place. <strong>Okay, who is ready to make a no-bake fruit pizza snack?</strong> <em>Find out ahead of time from the teacher if any of the students have a food allergy. Ensure that they go first to reduce risk of cross-contamination.</em></td>
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<td><strong>Have a couple of volunteers help clean everything up and place the trash in a trash bag.</strong> This is our last meeting of the semester. When we come back, we will start to plan our garden. Over the next several weeks, until we meet</td>
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<td>Learner Objectives</td>
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<td>The script states: again, your challenge is to try as many fruits and vegetables as you can and identify things you would like to grow in your garden. Keep your Fruit and Vegetable charts close at hand so you can take notes of what you enjoy most. I hope you have a wonderful winter break!</td>
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</table>

| Clean up          | Place all items into a large Rubbermaid container and return to a kitchen to properly wash them. Or, bring them back to NIU, wash them, and put them away. | 5       |
Slide 1 of 4

Slide 2 of 4

Fruits

CATCH Rainbow

Cherries

Blueberries

Citrus

Nectarines, Plums, Apricots

Apples

Pears

Fruits that grow on trees
Slide 3 of 4

Fruit that grows on vines

Blackberries
Zucchinis
Beans

Grapes
Squash
Melons

Slide 4 of 4

Fruit that grows on plants

Strawberries
Pepper
Eggplant
For some families, mealtimes are fraught with stress and tears as power struggles emerge between caregivers and children. Get everyone on the winning side of the struggle by using a few different strategies.

1. Allow kids to serve themselves at mealtimes.
2. Make sure one or two of their favorite food items is available with every meal.

1. Encourage positive interaction with new foods or foods your kids might not care for.
2. Model the behavior you want to see.
3. Have theme nights such as Mexican Monday and Italian Tuesday so that kids can look forward to their favorite foods.

Empower kids to choose different items and be flexible with their preferences.

**Featured Recipe**

**Pumpkin Apple Muffins**

Muffins are a delicious way to get the whole family to eat more fruits and vegetables.

**Ingredients**

- 2 cups of whole wheat flour
- 3/4 cup of sugar
- 1 tbsp pumpkin pie spice
- 1 tsp baking powder
- 1 tsp baking soda
- 2 large eggs
- 15 oz canned pumpkin
- 1/2 cup olive oil or canola oil
- 1 cup apple, quarters and chopped
- 16 cupcake liners

**Directions**

1. Preheat oven to 350°F.
2. Mix flour, sugar, pumpkin pie spice, baking powder, and baking soda in a large bowl.
3. In a separate bowl, mix together the pumpkin and olive oil.
4. Add the wet ingredients to the dry ingredients and combine. Do not over mix.
5. Fold in chopped apples.
6. Place the muffin liners in a muffin tin and fill each cup 3/4 of the way full. Bake for 25-30 minutes or until a toothpick inserted into the middle comes out clean.
Recipes from the Classroom

No-Bake Healthy Fruit Pizza Minis

Ingredients

- 4 medium tortilla, whole wheat
- 1/2 cup Greek yogurt, plain
- 1 teaspoon honey
- 1/2 teaspoon vanilla extract
- 3/4 tablespoon orange juice
- 1/4 cup strawberries
- 1/4 cup kiwi
- 1/4 cup mandarin oranges, canned in juice
- 1/4 cup blackberries
- 1/4 cup grapes, green

Directions:

1. Using a small cookie cutter or drinking glass, cut circles into tortillas. Set aside.
2. In a small mixing bowl, blend together yogurt, honey, vanilla and orange juice until fully blended.
   Slice strawberries; peel kiwi and slice; drain oranges and slice into smaller pieces; slice blackberries and grapes into quarters.
3. Spread yogurt mixture onto tortillas and top with fruit.

Nutrition

Calories: 130kcal | Carbohydrates: 21g | Protein: 5g | Fat: 3g | Saturated Fat: 2g | Cholesterol: 2mg | Sodium: 148mg | Fiber: 4g | Sugar: 7g

Source: https://www.superhealthykids.com/recipes/healthy-fruit-pizza-minis/
APPENDIX I

GARDENING LESSON ONE: DESIGN YOUR GARDEN
Lesson Overview

This is the first in a series of six gardening lessons designed to start in late January or early February in the northern Illinois region of the United States. This lesson introduces students to the elements required to sustain plants within a garden. The students are divided into groups and assigned a category from the “Fruit and Vegetable Chart,” which they filled in throughout the previous semester during the cooking lessons. They are instructed to choose a fruit, vegetable, or herb from their assigned category (for example: leaves) and utilize the Burpee Seed Catalogue to identify varieties of plants that belong in each of their assigned garden categories (ie. for leaves they might choose spinach or watercress.) Within groups, students fill out the “Plant Spacing Chart” worksheet to learn about the different requirements which help plants grow such as spacing, sowing depth, thinning, sunlight and water. Students retain their “Plant Spacing Chart” worksheet and utilize it for the next lesson. The supplemental Family Newsletter provides an overview of the benefits of gardening with children and directions on how to start an herb garden at home.

Learner Objectives

- Identify at least 3 plant-growing requirements
  - Spacing
    - Sowing spacing
    - Thinning spacing
    - Growing spacing
  - Soil
    - pH may be high or low depending on the plant
    - Easily drained, sandy, or holds water
  - Water
    - Daily
    - Every few days
    - Rarely watered
  - Sunlight
    - Full sun
    - Partial shade
    - Full shade
  - Nutrients (nitrogen and phosphorus)
    - Compost
    - Fertilizer
- Interpret information from a seed catalogue and apply the information to planning out a garden

Activity

- Planning the garden
Materials

- Plant Spacing Chart

Tools

- Computers with access to online seed catalogs. Each group of students should share a computer. If computers are not available, secure several printed copies of a seed catalog from a seed and plant company like Burpee.
- Fruit and Vegetable Chart (from previous semester)
# Lesson Plan

<table>
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<tr>
<th>Learner Objective</th>
<th>Activities</th>
<th>Script</th>
<th>Time in Min</th>
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</thead>
<tbody>
<tr>
<td>Welcome/Recap</td>
<td>Hi everyone. My name is ________________ and I am from NIU. We are here today to talk about gardening. Last semester we met every few weeks to learn about different parts of a plant, the function of each of those parts, and how they are used for food. We also prepared a few snacks and enjoyed tasting new foods. We filled in a Fruit and Vegetable Chart to keep track of all of the different foods we tried. Does anybody still have their chart? It is okay if you don’t. I kept a master chart of the suggestions we came up with throughout our sessions last semester. This semester, we are going to grow a garden here at school. Your families will also receive a newsletter with tips to help you grow a garden at your own home. If you look outside, it is pretty cold. It’s not great conditions for growing a garden. However, it is a great time to start planning your garden. Let’s get planning!</td>
<td>2</td>
<td></td>
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</tbody>
</table>
| Identify at least 3 plant-growing requirements | Gardening Background | First, let’s brainstorm some things plants need to grow: *Allow students to answer but aim for the following list:*  
- Water  
- Soil  
- Sunlight/shade  
- Nutrients  
- Proper spacing  
Plants need all these things but in the proper amounts. Some plants need more water than others. Some need more or less sunlight than others. Some require different nutrients or different kinds of soil to grow. For the most part, the plants we will grow in your school garden will have similar requirements. | 3-4 |
<table>
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<tr>
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<td>to each other. That is because we do not have a lot of space and the plants will have to compete for available nutrients. If we plant too many plants, then they will all have a hard time growing or producing fruit and they might even die just because they can’t get enough of the nutrients, sunlight, or water that they need. Spacing is very important.</td>
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<td>Each species of plant has different varieties. For instance, if we all imagine a tomato right now, some of us might imagine a small, cherry tomato like you see in some salads and some of us might imagine a tomato large enough to slice up and put on a burger. They are both from the plant species “tomato,” but one is the cherry tomato variety and the other is a beefsteak tomato variety. Those are two different varieties of the same plant. Each variety has different requirements, and some are easier to grow than others. We’re going to explore what this means for your garden.</td>
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<tr>
<td>Interpret informatio from a seed catalogue and apply the information to planning out a garden.</td>
<td>Planning the garden</td>
<td>The first thing I am going to do is break you up into small groups of three or four. Be sure to take a pencil or pen with you and if you still have your Fruit and Vegetable Chart, get it ready so that you can share it with your group members.</td>
<td>15</td>
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<tr>
<td></td>
<td>Materials:</td>
<td>Break students up into groups of three or four. Make sure there are at least 6 groups. Once students are settled, pass out the seed catalogs or if using computers, instruct the students to go to <a href="http://www.burpee.com">www.burpee.com</a>.</td>
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<tr>
<td></td>
<td>• Pull up <a href="http://www.burpee.com">www.burpee.com</a> on the ELMO.</td>
<td>I will assign each group a column from the Fruit and Vegetable Chart to focus on. Assign each group one of the following:</td>
<td></td>
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</tbody>
</table>
|                   | • Burpee Seed Catalog | 1. Seeds and Legumes  
2. Root Vegetables  
3. Stems  
4. Leaves  
5. Edible Flowers | |
### Learner Objective

- previous semester
  - Plant Spacing Chart worksheet

### Activities

<table>
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| 6. **Fruits**  
7. **Leaves/Herbs** (if there are more than 6 groups, include herbs. If there are more than 7 groups assign the extra groups to look up “fruits.”)

**Pass out one Plant Spacing Chart worksheet and one seed catalog to each group. If you are using the online seed catalog, then make sure each group of students is at a computer.**

Each group has received a different category from the Fruit and Vegetable Chart. As a group, go down your assigned column and choose one kind of vegetable or fruit from that column that you all agree upon. For instance, if you were assigned “Fruit,” look at your “Fruit” column. “Tomato,” might be the species you listed within the “Fruit” column, so then you can choose that. You will use the seed catalog to find some different varieties of your chosen fruit or vegetable. You might find there are hundreds of varieties for some of your vegetables or fruits. Do not choose any fruits that grow on trees. Stick with things that will grow in a garden bed.

We are going to look at one together first. Then your group will work on your own.

**For online catalog only** walk students through the following steps to get them acclimated to the process:

1. **Pull up** [www.burpee.com](http://www.burpee.com).
2. **Hover the cursor over the word “Vegetables” in the upper left-hand side of the website but do not click.** The dropdown menu will appear.
3. **In the “Vegetable” dropdown menu under “Featured” on the left-hand side, click on “Easy to Grow.”**
4. **Click on the first option which should be “Tomato, Fourth of July Hybrid.”**
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<td>5. <em>Practice using the information on this page to fill out your Plant Spacing Chart.</em></td>
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<td>6. <em>For these tomatoes, the variety is “Fourth of July Hybrid.”</em></td>
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<td>7. <em>Scroll down to “Grow Calendar” and click on the “+” to expand the information. Repeat for “Product Details.”</em></td>
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<td>8. <em>Use the information on the webpage to fill in the Plant Spacing Chart worksheet as in the example.</em></td>
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<td>9. <em>After reviewing the example, which is listed on the Plant Spacing Chart, instruct the students to use the Burpee seed catalog to identify up to three varieties of their chosen vegetable or fruit that they would like to grow and enter the information on the chart. They will have 10 minutes.</em></td>
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<td>In preparing this lesson plan, the author did not have access to a printed seed catalog. If they are available for the lesson, then prepare for this lesson by following and adapting the basic steps using the online catalog.</td>
<td></td>
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<tr>
<td></td>
<td>Wrap-up</td>
<td>Today we covered a lot of information. We identified varieties of species of vegetables and fruits we can grow in our garden and we discussed why it is important to leave space between plants We hope you had fun today. We’ll see you next time.</td>
<td></td>
</tr>
</tbody>
</table>
### Plant Spacing Chart

<table>
<thead>
<tr>
<th>Vegetable or Fruit Species: (ex. Tomato)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variety</td>
<td>Ex: Fourth of July</td>
</tr>
<tr>
<td>Type (function)</td>
<td>Slicer</td>
</tr>
<tr>
<td>Height (full grown)</td>
<td>55”</td>
</tr>
<tr>
<td>Sun (full/shade)</td>
<td>Full Sun</td>
</tr>
<tr>
<td>Sow Time (Before Last Frost)</td>
<td>6-8 weeks BLF</td>
</tr>
<tr>
<td>Spread (Width at full grown)</td>
<td>55”</td>
</tr>
<tr>
<td>Thin (seedlings)</td>
<td>36”</td>
</tr>
<tr>
<td>Sow Method (indoor/outdoor)</td>
<td>Indoor</td>
</tr>
<tr>
<td>Sow Month</td>
<td>March</td>
</tr>
<tr>
<td>Transplant Month</td>
<td>May</td>
</tr>
<tr>
<td>Days to Maturity</td>
<td>49</td>
</tr>
<tr>
<td>Fruit Bearing</td>
<td>Indeterminate</td>
</tr>
<tr>
<td>Fruit Weight</td>
<td>4 oz</td>
</tr>
</tbody>
</table>

The website [www.burpee.com](http://www.burpee.com) provides definitions for each of the above terms within the descriptions of the different fruits and vegetables. To access the definition, click on the icon.
PLANNING A GARDEN

Feature: Windowsill Herb Garden

Featured Plan
Windowsill Herb Garden
Adding fresh herbs is a quick and easy way to increase flavor and add color to any meal. Certain herbs are easy to grow and maintain. They do not require a lot of space so are perfect to perch on a windowsill for easy access and added decor.

Materials
- 1 small basil, chives, or thyme plant. You can find these at your local nursery, hardware store, or grocery store.
- 1 6” deep pot or container that allows for drainage. Purchase a pot for each plant or combine plants together in one larger pot.
- Enough potting soil to fill the containers. Make sure you purchase soil specific for container gardens.

Directions
1. Add at least 2 inches of potting soil to the bottom of the pot or container you are transplanting your herb into and spray it with water.
2. If the plant comes in a cardboard pot, remove any plastic wrappers from the outside, saturate the cardboard with water, and tear away pieces on the bottom of the cardboard pot to reveal the roots. Be sure to leave the sides intact.
3. Place the herb in the prepared container. Use more potting soil to fill-in the pot around the herb.
4. Moist the soil with water and place on the windowsill. Place a small dish under the pot if there is a risk the water will drain out.
5. Check the top of the soil daily. Lightly water when the topsoil starts to feel dry. Pick off leaves and enjoy!

Tips for Families

Winter is the perfect time to plan a garden with your family.
To begin, consider available space. Raised bed gardens are simple to install and easy to maintain. If outdoor space is limited, consider a container garden for your patio or deck. Additionally, many towns have plots available at community gardens.
If you are unsure what kind of plants you would like to include, consider a themed garden. Herb gardens are simple but beautiful. Salsa gardens include a variety of plants such as jalapeños, tomatoes, onions, garlic, and cilantro that can be harvested to make delicious homemade salsa.
There are many resources online to guide you through the planning process. One of these, www.Gardener.com, has an interactive “Kitchen Garden Planner” tool under the “Advice” tab on their website that allows you to map out a custom garden or choose from one of their pre-planned gardens.
When planning your garden, be sure to involve all members of your family and enjoy the process.

Children who garden are more likely to consume fruits and vegetables than those who do not. To increase your family’s fruit and vegetable intake, consider starting a garden.
APPENDIX J

GARDENING LESSON TWO: COMPANION PLANTING
Lesson Overview

This is the second lesson in the series of six gardening lessons. This lesson continues the process of leading the students through planning their garden. The concept of companion gardening is introduced so students may start to identify plants that are compatible and incompatible with one another. Students work in their previously assigned groups to use the information provided from the website www.unclelukes.com and their previously filled out “Plant Spacing Chart” worksheet to complete the “Plan Your Garden” worksheet. The lesson ends with an interactive game where one student from each group represents their plant. The class works together to place the “plants” near companion plants while maintaining distance from the noncompatible plants. Students may use the “Garden Layout Grid” worksheet to keep track of their garden plan. The supplemental Family Newsletter provides an overview of companion planting, links to the companion planting resource from class, and a kitchen gardening project.

Learner Objectives

• Identify at least 2 sets of companion plants
• Interpret information from the Companion Planting Chart to plan out where in the garden the plants will go.
• Demonstrate using companion planting to design a garden layout.

Activities

• Planning a Garden
• Layout a Garden

Materials

❑ Plan Your Garden worksheet
❑ Garden Layout grid worksheet
❑ Pencil or pen

Tools

❑ Fruit and Vegetable Chart
❑ Plant Spacing Chart (filled out from previous lesson)
Lesson Plan

<table>
<thead>
<tr>
<th>Learner Objective</th>
<th>Activities</th>
<th>Script</th>
<th>Time in Min</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Welcome/Recap</td>
<td>Hi everyone. My name is ________________ and I am from NIU. We are here today to talk about gardening. Last time, we learned the difference between plant type and variety. This week we are going to learn about companion planting. Let’s get planning!</td>
<td>2</td>
</tr>
</tbody>
</table>
| Identify at least 2 sets of companion plants. | Gardening Background | When I say the word “companion” what does that mean to you? *Allow students to answer.*  

Well, did you know that certain plants get along really well and others do not? There are a variety of reasons for this. As we discussed last time, each plant has specific needs when it comes to sunlight, water, space, and nutrients.  

For instance, some plants, like beans, need space to grow upwards. They release a lot of nitrogen into the soil around them. Nitrogen is one of the main nutrients plants need but some need more than others. Other plants, like corn grow tall and need lot of nitrogen to grow. If you plant beans next to corn, the beans can use corn stalks to climb up, getting the space they need and the beans give the corn nitrogen (food) through the soil. Then, there are low lying plants like summer squash. They have large, prickly leaves that shade the ground, preventing pests from coming nearby and weeds from growing. They grow nicely near corn and beans. Together beans, corn, and summer squash are known as the “three sisters” and are a very common combination of plants that are planted together by Native Americans.  

Some plants ward off pests that attack other plants. Marigolds, for instance deter many insects that like garden vegetables. | 3-4         |
<table>
<thead>
<tr>
<th>Learner Objective</th>
<th>Activities</th>
<th>Script</th>
<th>Time in Min</th>
</tr>
</thead>
</table>
| Other plants are enemies to one another and must be planted at least four feet apart. Otherwise, they risk stunting one another’s growth. We are going to learn more about this today through our activities. | Planning the garden Materials: • Pen/Pencil • Plant Spacing Chart worksheet • Plan Your Garden worksheet • Copies of the Companion Planting Chart from [http://www.unclelukes.com/companion-planting/companion-planting-chart](http://www.unclelukes.com/companion-planting/companion-planting-chart) or access to the website | The first thing I am going to do is have you break up into your small groups from last time. Be sure to take a pencil or pen with you and the Plant Spacing Worksheet from last time. 

*Break students up into their groups from the previous class. Each group was assigned one of the following:*

1. Seeds and Legumes
2. Root Vegetables
3. Stems
4. Leaves
5. Edible Flowers
6. Fruits
7. Leaves/Herbs (if there are more than 6 groups, include herbs. If there are more than 7 groups assign the extra groups to look up “fruits.”)

*Pass out the Plant Spacing Chart worksheet to the groups. Also pass out a copy of the Companion Planting Chart and a Plan Your Garden worksheet.*

You are going to use the information you gathered last time on the Plant Spacing Chart to answer the first 6 questions on the Plan Your Garden worksheet. First, as a group, you will need to decide which of the three varieties you would like to grow in your garden. Then move on to the remaining
Learner Objective | Activities | Script | Time in Min
---|---|---|---
questions. Once you answer the first 6 questions, raise your hand so I know that you are done.

*Once the students have filled in the first 6 questions on the Plan Your Garden worksheet, instruct them to use the Companion Planting Chart from [http://www.unclelukes.com/companion-planting/companion-planting-chart](http://www.unclelukes.com/companion-planting/companion-planting-chart) to determine the information for the last three questions.*

I have handed you a great chart that lists the friends or enemies of many plants. You will use this information to answer the last three questions on your Plan Your Garden Worksheet. When you have finished answering the last three questions, raise your hand so I know that you are done.

**Demonstrate using companion planting to design a garden layout.**

<table>
<thead>
<tr>
<th>Lay Out the Garden</th>
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</thead>
<tbody>
<tr>
<td>Materials</td>
</tr>
<tr>
<td>• ELMO</td>
</tr>
<tr>
<td>• Garden Layout Grid</td>
</tr>
<tr>
<td>• Pencil</td>
</tr>
<tr>
<td>• Filled out Plan Your Garden worksheets</td>
</tr>
<tr>
<td>• Companion Planting Chart</td>
</tr>
<tr>
<td>• Garden Layout Grid</td>
</tr>
</tbody>
</table>

The first thing we must do is to have each group identify the type and variety of plant they would like to grow.

*Write this on a blank piece of paper using the ELMO or overhead so everyone can see the information. Have each group tell you their plant type and chosen variety (ie. Tomato, Hybrid Cherry.)*

Now, I am going to have a representative from each group come up when I call you. When I call you up, I want you to stand at the front of the class.

*Have the first group send their plant representative up. For subsequent groups, have the group send their representative up but they must also identify if any of the other plant representatives already at*
<table>
<thead>
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<th>Learner Objective</th>
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<th>Script</th>
<th>Time in Min</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
<td>the front of the class is a friend or an enemy of their plant.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Have the students stand next to their plant’s friends but away from their plant’s enemies. Students should not stand in a line but rather like they are in a grid. This may be a 3 x 3 grid, 2 x 4, 2 x 3 or whatever size is similar to the garden beds in the school’s garden. Some plants may not do well near any other plants. Those need to be planted in a separate bed or container.</td>
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<tr>
<td></td>
<td></td>
<td>Once everyone has gone, instruct the students to copy layout on their Garden Layout Grid.</td>
<td></td>
</tr>
<tr>
<td>Wrap-up</td>
<td>Today we covered a lot of information. We identified varieties of species of vegetables and fruits we plan to grow in our garden. We also learned about companion plants and made a map of how we want to lay out our garden.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>We hope you had fun today. We’ll see you next time.</td>
<td></td>
</tr>
</tbody>
</table>
Plan Your Garden

1. List the three varieties of plants you would like to grow.

2. Select your preferred variety and write it below.

3. How much distance should there be between this plant and the plant next to it once it is full grown?

4. How tall does this plant grow?

5. In what month and where should your plant's seeds be sown?

6. In what month should your plant be transplanted to the garden?

For the next 3 questions, use the Companion Planting Chart from http://www.unclelukes.com/companion-planting/companion-planting-chart.

7. List the friends of your plant below.

8. List the enemies of your plant below.

9. List any special notes about your plant below.
Garden Layout Grid

1 square = 1 square foot
**Featured Plan**

**Food Scrap Plants**

With proper technique, many popular fruits and vegetables are able to regrow into full-size, edible plants. Save your kitchen scraps and reduce landfill waste by re-growing foods from their scraps. While this is possible with many foods, try it out with celery first as it is easy to regrow.

**Materials**
- Bunch of celery
- Shallow bowl
- Area with direct sunlight
- Potting soil
- Large container

**Directions**
1. Cut the stocks off of the base of the celery, leaving the base intact.
2. Place the celery base in a shallow bowl filled with about 1/2" - 1" water and place the bowl in an area of your house that gets direct sunlight throughout the day.
3. Add more water each day to ensure the water level remains the same.
4. Once the base starts sprouting roots and leaves begin to sprout (at about 5-8 days), transplant the celery into a large container with container garden potting soil. Be sure to water the soil during transplantation.
5. Keep soil moist but do not overwater.
6. Once the stocks reach 3", you may harvest a stock. Harvesting the stocks encourages more to grow. You can continue to harvest the celery stock at a time or you may allow your plant to mature, which might take about 3 months and then harvest the entire plant.

**Tips for Families**

Setup your family garden for success. Be sure to choose plants that complement one another. Some plants readily share nutrients and help each other grown. Others compete for root space or nutrients. Knowing which plants are good neighbors to one another can be the difference between a lush, thriving garden and one that struggles to grow.

Container gardens are a great idea for first time gardeners. Ensuring each plant has its own plot can make it easy to customize soil nutrients and water levels for each plant. However, if you are attempting to plant in a garden bed, do a little research to ensure that your preferred plants will receive the space, water, and nutrients they need to grow. A comprehensive “Companion Planting Chart,” can be found at www.unclelukes.com under the “Companion Planting” tab.

Resources like this help aid the planning process for both amateur and experienced family gardeners.
Lesson Overview

This is the third lesson in the series of six gardening lessons. Students are introduced to the terms associated with sowing seeds. They review conditions required for plants to grow and see how they apply to germinating seeds. The discussion is fortified with the short YouTube video How Does a Seed Become a Plant. The students then raise their hands to fill-in-the blank using terms provided to them that were introduced in the first part of the lesson. Students are led through the activity of planting their seeds in cardboard egg cartons. They are provided with a “Seed Growth Journal” worksheet and “Care Instructions for Seedlings” handout. A supplemental Family Newsletter includes an introduction to starting seeds indoors and provides a description of how to start seeds in a cardboard egg carton.

Learner Objectives

- Identify at least 3 seed-sowing requirements
  - Spacing
    - Sowing spacing
    - Thinning spacing
    - Growing spacing
  - Soil
    - pH may be high or low depending on the plant
    - Easily drained, sandy, holds water
  - Water
    - Daily
    - Every few days
    - Rarely watered
  - Sunlight
    - Full sun
    - Partial shade
    - Full shade
  - Nutrients (nitrogen and phosphorus)
    - Compost
    - Fertilizer
- Apply information from a seed catalog to plant seeds
- Discuss care for seedlings.

Activities

- Sowing Seeds Background
- Sowing Seeds
### Materials

- Blank piece of paper and pencil for listing conditions for germination
- Plant Care Instructions

### Tools

- ELMO
- Germination Terms (for fill-in the blank)
- Cardboard egg cartons. Enough for each student to have at least 2 wells.
- Potting soil (Seed Starting Mix)
- Trays for containing the planting mess
- Bowl
- Spray Bottles (1 per every 5 kids)
- Water
- Seeds
- Trays for under the egg cartons
- Disposable paper tablecloths for quick clean-up
# Lesson Plan

<table>
<thead>
<tr>
<th>Learner Objective</th>
<th>Activities</th>
<th>Script</th>
<th>Time in Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welcome/Recap</td>
<td>Welcome/Recap</td>
<td>Hi everyone. My name is ________________ and I am from NIU. We are here today to talk about gardening. Last time we identified several of the plants we wanted to grow in the garden. Some of them can be planted directly outside in our garden once it gets warm enough. Those plants grow quickly. Others, however, must be started indoors. Today, is very exciting because we are going to sow some seeds indoors. Let’s get started!</td>
<td>2</td>
</tr>
<tr>
<td>Identify at least 3 seed-sowing requirements.</td>
<td>Sowing Seeds Background</td>
<td>First let’s learn some gardening terms. Did anyone hear me say, “we are going to sow some seeds?” What does that mean to you? Allow students to answer. When we sow seeds, we plant the seeds in soil. Placing the seed in the soil is not enough to get it to <strong>germinate</strong>. Germinate is our next term. Do you know what it means? Allow students to answer. Germination is the process by which an organism like a plant grows from a seed. There are several conditions the seed requires to germinate. These are similar to the conditions a plant requires to grow. Let’s see if we can list them: Allow kids to create the list. Write the answers up on the board/ELMO.</td>
<td>8</td>
</tr>
</tbody>
</table>

- Water/moisture
- Temperature/warmth
- Nutrients in soil
- Sunlight

Materials:
- Piece of blank paper
- Pencil/pen
- Germination Terms

Turn on ELMO. Get it set to write on the board. Have Germination video pulled up on the YouTube.
We’re going to watch this short video that reviews some of the concepts we learned last semester but then explains germination as well.

https://www.youtube.com/watch?v=tkFPyue5X3Q

*For the following activity, you may need to place the Germination Terms on the board.*

Let’s review. (I have put a piece of paper with terms up on the board. Use these terms to help me finish the sentences.) Raise your hand when you think you know the answer:

1. The act of placing seeds in soil is called _____ (sowing seeds).
2. A seed remains _________ (dormant) until it gets exposed to moisture.
3. Once enough moisture has reached the seed, this part of the seed cracks open: ________ (seed coat).
4. The _______ (endosperm) inside the seed provides the seed enough nutrients to grow until it has roots.
5. Soil must be rich with ______ (nutrients) such as nitrogen to provide the plant the building blocks to grow.
6. The plant _______ (sprouts) leaves which grow toward the sun.
7. The plant uses _______ (sunlight) to create energy through the process of _______ (photosynthesis).
8. The process of a seed growing into a plant is called ________ (germination).

Some of the plants you chose to grow in your garden take several weeks to grow into seedlings. Because of this, we need to sow them indoors so we can control the conditions needed for germination.
<table>
<thead>
<tr>
<th>Learner Objective</th>
<th>Activities</th>
<th>Script</th>
<th>Time in Min</th>
</tr>
</thead>
</table>
| Apply information from a seed catalog to plant seeds. | Sowing Seeds | The first thing you need to do is get into your small groups. These were the groups we formed based on each of plants you chose to grow. Be sure to take a pencil or pen with you.  
*Ask for volunteers from each group to come up and collect: a plastic spoon for each group, a baggie of potting soil, a spray bottle filled with water, a package of their seeds, a paper tablecloth, and their group’s Plant Spacing Chart.* | 20 |
| | Materials: | *Here are each of the groups as a reference:*  
1. *Seeds and Legumes*  
2. *Root Vegetables*  
3. *Stems*  
4. *Leaves*  
5. *Edible Flowers*  
6. *Fruits*  
7. *Leaves/Herbs (if there are more than 6 groups, include herbs. If there are more than 7 groups assign the extra groups to look up “fruits.”)* | |
| | • Disposable paper tablecloths | 1. Spread the paper tablecloth out on your workspace.  
2. Use the water bottle to spray enough water into your baggie of soil to get it damp but not wet.  
3. Close your baggie tightly and mix the soil up to get the moisture to mix evenly throughout the soil.  
4. Use your pencil or pen to write on the outside of each egg well the name of your plant (ie. Sunset Tomato), your initials, and the number “1, 2,” or “3.” Depending on the number of wells you have. This will help us to know which plant is which.  
5. Using your pencil or pen to poke 3 holes in the bottom of each of your egg wells to allow for drainage. | |
<table>
<thead>
<tr>
<th>Learner Objective</th>
<th>Activities</th>
<th>Script</th>
<th>Time in Min</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>6. Use a plastic spoon to scoop damp soil out of the baggie of potting soil and place a spoonful of soil at a time into each of the egg carton cups until they are full.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>7. Look at your package of seeds. There are instructions on the back that tell you how deep the seed needs to be sown. Some will need planted ½&quot; deep and others not very deep at all.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>8. Use the tip of your finger to make an indent or divot in the center of each of your wells. For some of you, you may not need to make a divot.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>9. Place one to two seeds onto the top of the soil in each cup.</td>
<td></td>
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<td></td>
<td></td>
<td>10. Gently pat soil over top of the seed, lightly covering it. Do not pack soil onto the seed. Leave it loose enough so moisture can reach the seed and the seed can grow.</td>
<td></td>
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<tr>
<td></td>
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<td>11. Use the water bottle to mist each egg carton cup with water.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>12. Place the egg cartons on the trays.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>13. Bring the remaining seeds in the envelops and bring them to the front of the class.</td>
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<tr>
<td></td>
<td></td>
<td>14. Toss the spoons onto the tablecloths and wrap them up and toss them in the trash.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>15. On your Seedling Growth Journal, write down notes of how many seeds placed into each well and how many sprays of water you sprayed on each of your wells.</td>
<td></td>
</tr>
</tbody>
</table>
| Discuss care for seedlings. | Seedling Care Instructions | You all did great work gardening today. You sowed your seeds and now you need to start caring for them. We will not be back for a few weeks so the next part is up to you. You need to:  
• check on your seeds every day  
• spray your seedlings with water at least every other day and give them extra sprays of water on Friday since they won't get any water until you return on Monday | 3 |
<table>
<thead>
<tr>
<th>Learner Objective</th>
<th>Activities</th>
<th>Script</th>
<th>Time in Min</th>
</tr>
</thead>
</table>
|                   |            | • if someone misses school, help them take care of their seedlings  
|                   |            | • note how often you spray each well with water  
|                   |            | • how many sprays you gave each of your wells.  
|                   |            | • note when you start to observe any sprouting |
|                   |            | You can expect some seeds to start sprouting as soon as 5 days but others may take longer. Once plants emerge, you must move them to a location where they will get sunlight for at least 10 hours a day.  
|                   |            | Once they get 2 sets of leaves, you will need to thin them out. This is kind of sad but it ensures your strongest plants will have the best chance at surviving. If you happen to get two seedlings growing in the same well. You must choose one. Use scissors to trim the other one off at soil level. You may notice that it tastes like a version of the eventual food it will produce.  
|                   |            | Wrap-up |
|                   |            | Today, we officially started planting. Good luck in caring for your plants. We can’t wait to see how much they have grown. We’ll see you next time. |
# Germination Terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunlight</td>
<td>Seed Coat</td>
</tr>
<tr>
<td>Sprouts</td>
<td>Sowing Seeds</td>
</tr>
<tr>
<td>Dormant</td>
<td>Photosynthesis</td>
</tr>
<tr>
<td></td>
<td>Germination</td>
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<tr>
<td></td>
<td>Endosperm</td>
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<td></td>
<td>Nutrients</td>
</tr>
</tbody>
</table>
Name:

**Seedling Growth Journal**

<table>
<thead>
<tr>
<th>Plant:</th>
<th>Well 1</th>
<th>Well 2</th>
<th>Well 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Seeds Planted:</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**Observations:**
Note if you sprayed your seed, how many sprays you used, observations of the seedling, where the seeds were in the room, how much light you think they got each day, any other observations

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<td>Day 10:</td>
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<td></td>
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<tr>
<td>Day 11:</td>
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<td></td>
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<tr>
<td>Day 12:</td>
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</table>
Care Instructions for Seedlings

Care for your seedlings is not up to you. To give your seedlings the best chance at growth you need to:
- Check on your seeds every day.
- Spray your seedlings with water at least every other day and give them extra sprays of water on Friday since they won’t get any water until you return on Monday.
- Keep the soil damp but not wet. The seeds will need to get oxygen through soil. You can vary the amount of water you give each of your seedlings but note it on your Seedling Growth Journal.
- If a classmate misses school, help them take care of their seedlings until they return.

On your Seedling Growth Journal note:
- how often you spray each well with water
- how many sprays you gave each of your wells (you may want to vary this from well to well and note if it had an effect on the plants)
- when you start to observe any sprouting
- when two sets of leaves appear
- height of the plants

You can expect your seeds to start sprouting as soon as 5 days but others may take longer. Conditions like water, temperature, and nutrients all effect the time it takes the seeds to sprout and grow. Once plants emerge, you must move them to a location where they will get sunlight for at least 10 hours a day.

**Thinning Your Plants**

Once they get 2 sets of leaves, you will need to thin out your plants. This is can be a sad process but it ensures your strongest plants will have the best chance at surviving. If you happen to get two seedlings growing in the same well. You must choose one. Use scissors to trim the other one off at soil level. You can either discard it or eat it! You may notice that it tastes like a version of the eventual food it will produce.
Tips for Families

Many garden plants are easy to start from seeds in the home. When choosing your seeds, note conditions required for germination. These include the amount of sunlight, water, and room temperature. It is also important to note the timeframe for when your seed should be started indoors compared to when it should be transplanted outdoors.

Some seeds do not need to be sown indoors and can simply be placed in the soil of your outdoor container garden or garden bed once the threat of frost has passed. Watching a tiny seed grow into a plant and then harvesting and enjoying the foods provided by that plant is a rewarding process.

Featured Plan

Egg Carton Seed Starter

Certain seeds must be started indoors and then transplanted outside once the threat of frost has passed. Starting seeds can be a fun and simple project for the entire family.

Materials

- 1 egg carton, cardboard works best instead of plastic or Styrofoam
- 1 Pencil/pen
- Spray bottle of water
- Potting soil or seed starting mix
- Coffee grounds
- Seeds of choice
- Tray or plate

Directions

1. Mix the soil with coffee grounds in a ratio of 1 part coffee grounds to 3 parts potting soil.
2. Poke 3-4 holes in the bottom of each egg carton cup.
3. Fill each cup with soil/coffee ground mixture.
4. Use your fingertip to make a 1/2” well in the soil of each cup.
5. Place 1-2 seeds in each well and cover over with soil.
6. Spray with water until soil is moist.
7. Place the egg carton on a tray or plate and move it to a sunny spot.
8. Water lightly every other day to keep the soil moist but not wet.
9. After 4-5 weeks, tear the egg carton into individual cups and transplant each plant into a large container prepared with potting soil or a garden bed. You can leave the young plant in the egg carton cup when you transplant it.

Note: Follow the spacing guidelines on the seed package when transplanting your plant in the garden.
APPENDIX L

GARDENING LESSON FOUR: TRANSPLANT AND GARDEN ACTION PLAN PART 1
Lesson Overview

This is the fourth lesson in the six-lesson garden curriculum series. In this lesson, students are walked through the process of transplanting their young plants from cardboard egg cartons, where they started as seeds, to plastic cups where they will continue to grow until they are ready to be transplanted into the garden. The second half of the lesson gives the students an opportunity to develop organizational skills. First, students brainstorm the summertime needs of the garden. Then they form groups and determine administrative action steps to take to care for the garden over summer break and organize their thoughts using the “Action Plan Worksheet.” A family newsletter accompanies this lesson with family-friendly ideas for starting container gardens and directions for growing garlic scapes.

Learner Objectives

• Demonstrate how to transplant a seedling into a container
• Identify at least 3 gardening care resources
  • Weeding
    ▪ Identify weeds in the garden
    ▪ Routine removal of weeds
  • Watering Schedule
    ▪ Daily
    ▪ Every few days
    ▪ Rarely watered
  • Harvesting
    ▪ When to harvest
    ▪ Harvest schedule
    ▪ What to do with produce once harvested
  • Nutrients (nitrogen and phosphorus)
    ▪ Compost
    ▪ Fertilizer
  • Pest Control
    ▪ Natural predators
    ▪ Chemical insecticide
• Brainstorm solutions to needs
• Apply information to determine Action Plan

Activities

• Transplanting seedlings
• Making an Action Plan
Materials

- Action Plan Worksheet

Tools

- Cardboard egg cartons with seedlings.
- Potting soil (container mix)
- 16 oz. Solo cups (Need to have pre-cut drainage holes: using a pair of sharp scissors, snip the bottom edge of the cup in two places to allow water drainage).
- 12 oz. Solo cups
- Wooden popsicle sticks
- Spray Bottles (1 per every 5 kids)
- Water
- Disposable paper tablecloths for quick clean-up
- ELMO
- Seed envelopes
## Lesson Plan

<table>
<thead>
<tr>
<th>Learner Objective</th>
<th>Activities</th>
<th>Script</th>
<th>Time in Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welcome/Recap</td>
<td></td>
<td>Hi everyone. My name is ____________ and I am from NIU. This semester we have been talking about gardening and we have taken some steps to start a garden here at your school. Last time we were here, we helped you plant some seeds in cardboard egg cartons. How are your seedlings doing? <em>Allow students time to respond.</em> Did you learn anything from keeping your Seedling Growth Journal? <em>Allow students time to respond.</em> Last time we left you instructions on how to care for your seeds. One part that can be kind of hard is thinning out your seedlings, but it is necessary so that there are enough resources for the plants to survive. Did anyone have to thin out their seedlings? <em>Allow students time to respond.</em> This week we are going to transplant your surviving seedlings to larger containers so they can have enough space to continue growing. Let’s get started!</td>
<td>5</td>
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<tr>
<td>Demonstrate how to transplant a seedling into a container</td>
<td>Transplanting seedlings</td>
<td>This can be a delicate process so take your time and move carefully when you transplant your seedlings. Each person is going to get two cups per seedling. One cup will be a 16 oz cup with slits cut into the bottom. The slits are to allow for water to drain out so as the plant grows, the roots won’t sit in water and rot. The other cup, which is smaller, will act as a drip tray for the larger cup. 1. You will each need to get enough potting soil to almost fill your larger cup completely. Leave about an inch or two from the top of the soil to the top lip of the cup.</td>
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<tr>
<td>Learner Objective</td>
<td>Activities</td>
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<td>Time in Min</td>
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<tr>
<td><strong>Materials:</strong></td>
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<tr>
<td>• 16 oz solo cups with slits cut in the bottom</td>
<td>2. Using your popsicle stick, you will need to make a well in your cup of soil large enough to fit one egg carton well.</td>
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<tr>
<td>• 12 oz solo cups</td>
<td>3. Very carefully, separate your egg carton well from one another if they are not separated already.</td>
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<tr>
<td>• Container potting soil</td>
<td>4. Very carefully tear the bottom of the egg carton well off so that dirt is exposed. You may see some roots. This will allow your plants' roots to grow beyond the egg carton cup as the seedling grows into a plant.</td>
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<td>• Popsicle stick</td>
<td>5. Place the entire egg carton well (with the bottom removed) into the well you made in the soil in the cup.</td>
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<td>• Sharpie marker</td>
<td>6. Level out the soil around the egg carton cup and water your seedling with enough water to saturate all of the soil. Do not press the soil down or else you may risk crushing the roots.</td>
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<td>7. Place the larger cup into the smaller cup and use the Sharpie to write your initials and your plant type on the outside of the cup.</td>
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<td>8. Store your plant in an area that gets a lot of sunshine or under a grow light.</td>
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<td>Your plants will live in these cups until we transplant them into the garden outside.</td>
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<td></td>
<td>Once you are done, clean up your area and throw any trash into the trashcan.</td>
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</table>

Identify at least 3 gardening care resources.

<p>| Making an Action Plan | In the time remaining, we are going to devise a plan for caring for our garden. Does anybody recall how many days it takes for your plant reach maturity? This information is on the back of seed packets. Let’s take a look at this packet. <em>Place envelope on the ELMO so the students can see where the information is and talk through the maturity date. While you explain this, have a volunteer pass out the Action Plan worksheet.</em> | 10 |          |</p>
<table>
<thead>
<tr>
<th>Learner Objective</th>
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<tbody>
<tr>
<td>Brainstorm solutions to needs.</td>
<td>This plant is _________ and it will be full grown in ________ days which is approximately _______ months from now. That plant still has a lot of growing to do before it will be able to provide fruit. So, this plant will be growing during the summer, when nobody is here.</td>
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<td>Let’s brainstorm some of the things we think the plants in the garden will need in order to grow even when nobody is at school. Make sure to write these things down on you Action Plan Worksheet under the Brainstorming side.</td>
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<td>The list should include the following: (Please look up these terms before teaching)</td>
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<td>1. Weeding</td>
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<td>2. Watering</td>
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<td></td>
<td>3. Feeding</td>
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<td>4. Harvesting</td>
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<td>5. Pest Control</td>
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<td></td>
<td>Let’s quickly form small groups and develop some ideas for how we will care for our garden over the summer. Make sure to take notes on the Action Steps side.</td>
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<td></td>
<td>Assign each small group a different topic from the list above (there will be repeat topics) and give them the remaining time to come up with ideas on Who, What, Where, and When their topic should be addressed.</td>
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<td>Collect the sheets from each group and review them at the beginning of the next session.</td>
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<td></td>
<td>Wrap-up</td>
<td>Today, we began the discussion of how to care for your garden over the summer. We also transplanted your seedlings to larger containers so they can continue to grow. Be sure to water them regularly but try not to overwater them. Good luck in caring</td>
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<td>Learner Objective</td>
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<td>for your plants. We can’t wait to see how much they have grown. We’ll see you next time.</td>
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Name: 

**Action Plan Worksheet**

Part 1: Brainstorm Task Ideas

1. 
2. 
3. 
4. 
5. 

Part 2: Action Steps

What is the task you were assigned:

Why is this task needed?

Who oversees this task:

Who helps out:

When is this done: (example: daily, weekly, every other week, monthly)

Where are the tools to complete this task: (Do we have the tools, can we get them donated, or do we need to purchase some?)

How do we make sure the task is getting done?
**Small Containers Big Harvest**

Container gardens take up minimal space, yet they have the ability to provide a large harvest.

**Tips for Families**

A container garden is a great project for all family members. Nearly anything can act as a container for your garden, assuming there is proper drainage. As a rule of thumb, ensure that there is some sort of hole in the bottom of the container so that excess water can drain out. It is possible to use a container without a hole in the bottom such as a mason jar. First, add a layer of pebbles or rocks to the bottom to help with drainage. Then top that layer with a sprinkle of horticulture charcoal to control moisture, provide nutrients, and prevent fungus and bacteria from growing. Finally, fill your container the rest of the way with potting soil and gently place your plant inside. Allow children to get creative with their container gardens and enjoy the benefits together.

---

**Featured Plan**

**Coffee Can Garlic**

Garlic is a potent root vegetable that is featured in many cuisines. The green parts that grow above the ground are called garlic scapes and are as equally tasty. It is easy to grow your own garlic scapes indoors.

**Materials**

- 1 Empty coffee can or large can-sized container
- 1 Can opener
- Mesh, pebbles or small rocks
- Potting soil for containers
- Fresh head of garlic

**Directions**

1. Clean and dry an empty coffee can or large can-sized container.
2. Use a church key can opener to puncture several holes in the bottom around the outside edge of the can to allow for drainage.
3. Place a piece of mesh in the bottom of the can. Alternatively, you can place a 1” layer of pebbles in the bottom of the can.
4. Fill the can with potting soil leaving a 2” space from the top.
5. Separate but do not peel the cloves of garlic. Tuck each one with the pointed end up, about ½” into the soil, making certain they do not touch each other.
6. Cover the cloves with 1” of soil.
7. Water until water comes out of the bottom.
8. To care for them, water enough to keep the soil damp.
9. Once greens are at least 1” tall, you can start snipping away but always leave at least an inch of greens remaining.
APPENDIX M

GARDENING LESSON FIVE: GARDEN ACTION PLAN PART 2 AND WHEN TO HARVEST
Lesson Overview

This is the fifth lesson in the six-lesson garden curriculum series. This lesson continues the work from the previous lesson and starts by giving students time to review and present their concerns and ideas on how the garden will be cared for over the summer. Next, the students reform their plant-specific groups and use www.almanac.com to identify common pests who might pose a threat to the health of their plants and when their plant will be ready for harvesting. Students use this information to fill out the “Harvest and Pest Control” worksheet. A supplemental Family Newsletter provides tips for gardening for families and directions on how to start a microgreen garden.

Learner Objectives

▪ Identify at least 3 gardening care resources
  • Weeding
    o Identify weeds in the garden
    o Routine removal of weeds
  • Watering Schedule
    o Daily
    o Every few days
    o Rarely watered
  • Harvesting
    o When to harvest
    o Harvest schedule
    o What to do with produce once harvested
  • Nutrients (nitrogen and phosphorus)
    o Compost
    o Fertilizer
  • Pest Control
    o Natural predators
    o Chemical insecticide
▪ Brainstorm solutions to needs.
▪ Apply information to determine Action Plan.
▪ Identify when to harvest different fruits and vegetables.

Activities

▪ Making an Action Plan
▪ Harvest and Pest Control
<table>
<thead>
<tr>
<th>Materials</th>
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<tbody>
<tr>
<td>☐ Action Plan Worksheet</td>
</tr>
<tr>
<td>☐ Harvest Time Worksheet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ ELMO</td>
</tr>
<tr>
<td>☐ Seed envelopes</td>
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<tr>
<td>☐ Computers with access to <a href="https://www.almanac.com/">https://www.almanac.com/</a></td>
</tr>
</tbody>
</table>
Lesson Plan

<table>
<thead>
<tr>
<th>Learner Objective</th>
<th>Activities</th>
<th>Script</th>
<th>Time in Min</th>
</tr>
</thead>
</table>
| **Welcome/Recap** | Welcome/Recap | Hi everyone. My name is ________________ and I am from NIU. This semester we have been talking about gardening and we have taken some steps to start a garden here at your school. Last time we were here, we transplanted your plants to plastic cups. How are your seedlings doing? **Allow students time to respond.**  

Last time, we also started to discuss an action plan for how to care for your garden once it is planted outside. Let’s finish this discussion before we move on to our next activity. | 3 |
| **Identify at least 3 gardening care resources.** | Making an Action Plan | I want everyone to get into your groups so you can review your ideas with your group before presenting them to the class for discussion. **Allow students time to get into groups. Pass out their Action Plan Worksheets form last time.**  

You will have 5 minutes to review your ideas with your group.  

*After 5 minutes, have each group present:*  
*What their assigned task was.*  
*Why this task needs to be done.*  
*Who will oversee the task throughout the summer.*  
*Who will help with the task.*  
*How often the task needs to be done.*  
*What tools are required and where they should get the tools from.*  
*How they will make certain the task is getting taken care of.*  
*Allow the class to ask one or two questions from each group.* | 15 |
You all had wonderful ideas on how we should take care of your garden over the summer. At this point you all realize the great amount of work it will take in order to keep your garden growing healthy and strong. It will take a lot of teamwork from everyone in your class even when you won’t be coming to school for classes.

This is where you can alert the students to the volunteer sign-up their parents will be receiving if you are doing that with this program.

We are going to move on to our next activity.

| Identify potential garden pests. | Harvest and Pest Control Worksheet  
- Harvest and Pest Control Worksheet  
- Pen or pencil  
- Computer  
- [www.almanac.com](http://www.almanac.com)  
You need to get into your groups based on the plant you are growing.  
1. Seeds and Legumes  
2. Root Vegetables  
3. Stems  
4. Leaves  
5. Edible Flowers  
6. Fruits  
7. Leaves/Herbs (if there are more than 6 groups, include herbs. If there are more than 7 groups assign the extra groups to look up “fruits.”)  
As the students are getting into their groups pass out the Harvest and Pest Control Worksheet.  
We are going to fill the Harvest and Pest Control Worksheet by going to The Old Farmer’s Almanac’s website.  
1. Go to [www.almanac.com](http://www.almanac.com).  
2. Scroll over “Gardening” until the menu pops down.  
3. Click on “Growing Guide Library”  
4. Scroll down to your fruit or vegetable and click on the picture.  
5. There is a lot of helpful information on growing your plant. There may even be videos that summarize all of the information about your plant. You may look |
at this and refer to this at a later time. For now, we are concerned with identifying when to harvest your plant’s fruit or leaves and what pests might also be interested in harvesting your plant’s fruit or leaves.

6. Scroll down until you find the information about harvesting and fill in your worksheet.

7. Identify some of the pests that might attack your plant.

You have about 10 minutes to fill in your worksheets.

*When the students are done or time is up, collect the worksheets.*

Thank you for your hard work today. I have collected all of this valuable information on when to harvest your plant and what pests to look for. What do you think I should do with all of this valuable information? *Allow the students to answer.*

We are going to put it together so that garden volunteers can access it while they are helping to care for your garden.

| Wrap-up          | Today, you outlined plans for how to care for your garden over the summer. You also spent time looking into how and when to harvest your plants. This will be a valuable resource to garden volunteers. Don’t forget to keep watering your seedlings. We can’t wait to see how much they have grown. We’ll see you next time. | 2 |
Name:

🏆 Harvest and Pest Control 🌿

What is your plant:
How many days does your plant take to mature?

If one month equals 30 days, about how many months will it
take for your plant to mature?

What month will your plant mature?

What do you need to look for to know your plant is ready to
harvest?

How do you harvest it?

What are some of the pests or diseases that may affect
your plant?

What are some ways to get rid of some of the pests?
Tips for Families

There are many factors that play into gardening. Some are easily controlled while others are not. Weather, for instance, is a factor that is not easily controlled. Some years may be hotter than others while some years have brutally cold and long winters. Sometimes, both phenomena occur in the same year. This may seem discouraging to any gardener. Try not let these circumstances deter you from trying to grow your own food.

For the best shot at success, start small. A smaller garden is easier to study and learn from than a larger one that may get out of hand. Encourage your family to study the family garden. Take notes on what worked and what didn’t. Keep a simple photo journal to document your garden’s growth. View every planting season as a new opportunity to learn.

Featured Plan

Microgreens are all the rage among foodies due to the intense amount of nutrients they contain. It is very easy to get in on the trend with a simple windowsill, microgreen garden.

Materials

- Small container with holes in the bottom such as an old blueberry or raspberry container
- Tray or plate for placing under the blueberry container
- Seed starting potting soil
- Seeds for kale, spinach, broccoli, or any leafy green or herb with edible leaves
- Spray bottle with water
- Sunshine or light

Directions

1. Wash and dry the old blueberry or raspberry container.
2. Fill the container with a little bit of seed starting potting soil.
3. Evenly wet the soil by spraying it liberally with water from a spray bottle.
4. Spread the seeds evenly over the soil.
5. Lightly cover the seeds with a little bit of soil and spray with water.
6. Place the container in a south-facing window sill that gets direct sunlight. Alternatively, place it under a light that gets turned on 6 to 8 hours a day. Fluorescent is best.
7. Check daily and spray with water to keep the soil moist.
8. Once greens sprout two sets of leaves, they are ready to harvest. Simply use scissors to trim the plant at the soil level and enjoy the greens on salads, sandwiches.
APPENDIX N

GARDENING LESSON SIX: TRANSPLANT DAY
Lesson Overview

This is the final lesson in the CATCH Rainbow program. This lesson is designed to have the students work in shifts. While half are preparing the beds and transplanting their seedlings, the other half will be on the scavenger hunt using the “Senses in the Garden Scavenger Hunt” worksheet. Then the students will switch roles. To determine who will be working when, it is recommended to determine companion plants ahead of time. The location for each of the plants will need to be mapped out. This will have been done during the first two lessons within the gardening sessions. For instance, leeks and carrots are companion plants. If there are a group of students with carrots, have them transplant their plants first and have the students with leeks do the scavenger hunt first. Then once the carrots are transplanted, switch roles. This way the space does not get too crowded.

If available space does not allow for all of the students’ plants to get transplanted in the school garden, have them vote ahead of time on the best-looking plant or two of each variety. The remaining plants can be sent home with the students to grow at home or sold in a plant sale.

A supplemental Family Newsletter accompanies this lesson. It provides tips on how to control pests within a family garden and includes directions for how to build birdfeeder from an upcycled water bottle.

Note: Prior to leading this lesson, garden tools must be obtained and available. These include: watering cans; a water source; tomato cages; stakes and twine; netting, summer-weight garden fabric or newspaper; organic shake and feed plant food/fertilizer; pine mulch or other kind of mulch.
Learner Objectives

- Demonstrate how to transplant seedlings into a garden bed
- Identify elements of nature
- Demonstrate initial care of transplanted seedlings

Activities

- Garden Scavenger Hunt
- Prepare garden beds and transplant seedlings

Materials

- Senses in the Garden Scavenger Hunt Worksheet

Tools

- Outdoor garden
- Seedling plants in cups
- Hand towels – enough for the class to share
- 3-tine or 4-tine handheld gardening fork
- Brown paper grocery bags (for collecting weeds and plastic cups)
- Tomato cages for any plant that requires them (tomatoes, cucumbers, and any other vining plants that are being planted)
- Stakes and twine for peas
- Garden fabric (optional)
- Organic shake and feed plant food/fertilizer
- Mulch
- Popsicle sticks
- Sharpie Marker
# Lesson Plan

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<tr>
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</thead>
</table>
| Welcome/Recap     | Hi everyone. My name is ________________ and I am from NIU. Today we are meeting in your garden. Are you excited to transplant your plants? *Allow students to answer.*
|                   | Today we will be working in shifts. *See note above to determine which students will be working in the garden first and which ones will be doing the scavenger hunt first.*
|                   | Separate the students into “gardening first” and “scavenger hunt first” groups. |
| Identify elements of nature | Senses Scavenger Hunt | *Pass out the “Senses in the Garden Scavenger Hunt” worksheet to the students. The following directions can be given to the “scavenger hunt” group.*
|                   | We have a Garden Scavenger Hunt for you. You are to walk around the school grounds and garden and find the items on this list. Make sure you write down the name of the object. You will have about 20 minutes. |
| Demonstrate how to transplant seedlings into a garden bed | Preparing Garden Beds and Transplanting Seedlings outdoors • Outdoor garden | *Students working in transplanting will need to have their seedlings ready to go.*
|                   | *First Transplanting Group:* Before we transplant our plants in the ground, we need to prepare the beds. You need to identify the area where your plants will go. There are a few tasks that will need taken care of before you can put your plants in the soil.
|                   | 1. Remove any weeds that may be present. Place the weeds in the brown paper bags.
|                   | 2. Water the soil and use the hand fork to loosen the soil so it is easy to work with.
|                   | 3. Use the hand trowel to dig a hole large enough to fit your plant. Make sure the hole... |
is deep enough, so the top of your plant’s soil is even with the top of the garden bed.

4. With one hand on top of the cup and the other on the bottom, carefully turn your plant upside down. Crunch the sides of the cup to wiggle your plant out but do not pull on your plant. Keep wiggling until your plant slides out.

5. Gently place your plant in the hole you made and pat soil around it in the hole.

6. Dispose of cups in a bag for recycling.

7. Repeat with your other plants.

8. Mark the popsicle stick with your plants’ name and place it next to your plant.

9. The other half of the class will finish up while you are on your scavenger hunt.

Second Transplanting Group:
Your classmates prepared the garden bed for you. Now you will transplant your plants and then prepare the garden bed so the plants will grow on their own. Locate the area where your plants will go.

1. Use the hand trowel to dig a hole large enough to fit your plant. Make sure the hole is deep enough, so the top of your plant’s soil is even with the top of the garden bed.

2. With one hand on top of the cup and the other on the bottom, carefully turn your plant upside down. Crunch the sides of the cup to wiggle your plant out but do not pull on your plant. Keep wiggling until your plant slides out.

3. Gently place your plant in the hole you made and pat soil around it in the hole.

4. Dispose of cups in a trash bag.

5. Repeat with your other plants.

6. Mark the popsicle stick with your plants’ name and place it next to your plant.

7. Gently place tomato cages in the soil around the tomato plants and cucumber plants.
|   | 8. Place stakes next to any peas or beans and use twine to loosely secure the shoots to the poles.  
9. Water the plants and add the plant food/fertilizer  
10. Spread mulch around the plants |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrap-up</td>
<td>You have done an amazing job this year growing some plants and transplanting them to the garden. You have devised a plan for tending to the garden during the summer and identified possible pests and how to harvest your plants. We hope you will enjoy the fruits of your labor as your plants continue to mature and produce food.</td>
</tr>
</tbody>
</table>
Name:

**Senses in the Garden Scavenger Hunt**

Look around the garden. Locate items that fit the description. Check off the boxes and write name of the object.

<table>
<thead>
<tr>
<th>Things to Hear 🎧</th>
<th>Things to See **</th>
</tr>
</thead>
<tbody>
<tr>
<td>Something that crunches</td>
<td>Something that is patterned</td>
</tr>
<tr>
<td>Something quiet</td>
<td>Something that is solid</td>
</tr>
<tr>
<td>An animal sound</td>
<td>Something heart-shaped</td>
</tr>
<tr>
<td>Something that snaps</td>
<td>Something oval-shaped</td>
</tr>
<tr>
<td>Something loud</td>
<td>Something green</td>
</tr>
<tr>
<td>Something that can make music</td>
<td>Something brown</td>
</tr>
<tr>
<td></td>
<td>Something sharp</td>
</tr>
<tr>
<td></td>
<td>Something long</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Things with Taste 🍃</th>
<th>Things to Touch ➡</th>
</tr>
</thead>
<tbody>
<tr>
<td>Something humans can eat</td>
<td>Something that is wet</td>
</tr>
<tr>
<td>Something animals can eat</td>
<td>Something that is soft</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Things to Smell 🌸</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Something that is sweet</td>
<td>Something that is rough</td>
</tr>
<tr>
<td>Something you really like</td>
<td>Something that is bumpy</td>
</tr>
<tr>
<td></td>
<td>Something that is squishy</td>
</tr>
</tbody>
</table>
GARDEN PROTECTION

Tips for Families

Gardens can attract unwanted visitors such as bugs and rodents. After all, a well-tended garden is appetizing to humans and pests alike. There are a few tricks that can help keep these pests away.

To deter larger garden predators such as squirrels, rabbits, and mice, create a mixture of water and cayenne pepper in a spray bottle. Spray the leaves of plants under attack. Don’t forget to thoroughly rinse the produce before consuming it.

Many animals do not like peppermint. Place peppermint plants in a small pots on the parameter of your garden. Periodically check to make sure the peppermint does not grow into the soil of your garden as it can take over.

Check your plants’ leaves often for bugs. Simply wiping larvae away with a damp paper towel can do wonders in preventing the spread of insects.

Find more gardening tips, go to www.almanac.com.

Featured Plan

Up-cycled Bird Feeder

Birds are wonderful garden companions as they help prevent bugs from taking over your garden. Attract birds to your garden by placing a bird feeder nearby.

Materials

- Old plastic water bottle, cleaned
- Push pin or tack
- Sharp scissors
- 2 unsharpened pencils, bamboo skewers, or wooden chopsticks
- Twine or yarn
- Birdseed

Directions

1. Use the push pin to poke a hole in the side of the water bottle approximately 1" from the bottom.
2. Use scissors to widen the hole to a size a little smaller than the chopsticks, pencils or skewers.
3. Repeat on the opposite side of the bottle so that you can run the chopsticks through the bottle, creating a perch.
4. Repeat steps 1-3 approximately 1" higher and halfway between the initial two holes.
5. Create several small drain holes in the bottom of the bottle.
6. Using the push pin and scissors, make two small holes near the top of the bottle and fish the twine through and tie in knot.
7. Using the push pin, make a small hole about 1-2" above each of the perches. Carefully widen the hole with the scissors and cut openings so the birds can get to the seed.
8. Slide pencils, chopsticks or skewers through the perch holes.
9. Fill with birdseed and hang near your garden.
APPENDIX O

FOCUS GROUP QUESTIONS
Focus group script for CATCH Rainbow Cooking and Gardening Program

Opening questions

1. What are your thoughts about healthy eating?
2. Do you enjoy eating fruits and vegetables?

Introductory questions

1. Before participating in the program sessions, did you cook or prepare any foods with fruits and vegetables?
2. Before participating in the program sessions, did you grow any fruits and vegetables at home or in school?

Key questions:

1. What new information did you learn from participating in the cooking and gardening sessions?
2. What did you like about the cooking sessions?
3. What did you like about the gardening sessions?
4. As part of the program, did you feel like you got adequate assistance from the program leaders?
5. Have you tried eating any new fruits and vegetables since participating in the cooking and gardening program?
6. Have you tried preparing any foods with fruits and vegetables since participating in the cooking and gardening program?
7. Have you tried planting and growing any fruits and vegetables since participating in the cooking and gardening program?
8. Would you recommend a friend to participate in this program? If yes, why? If no, why not?

Ending questions:

1. What did you like the most about the CATCH Rainbow Cooking and Gardening Program?
2. If you were to design a cooking and gardening program, what would your ultimate program look like?