# Wisconsin Fast Plants Module


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**2005-06 Academic Year**

Link to Engineering Discipline: Agricultural Engineering

After approximately fifteen years of planting, growing, and selective breeding, Dr. Paul H. Williams Professor of Plant Pathology from the University of Wisconsin-Madison, reduced the six month life cycle to five weeks for *Brassica rapa.* Wisconsin Fast Plants (*Brassica rapa)* are members of the plant family called crucifers, which include mustard, Brussels sprouts, kohlrabi, cabbage, cauliflower, broccoli, turnip, Chinese cabbage, collard, kale, and rapeseed. The brassica vegetables are a main food supply in many countries around the world. Dr. Williams reduced the life cycle to speed up genetic research to improve the disease resistance of plants in this family.

Objectives: Numerous Michigan Curriculum Framework Science and Math Benchmarks are covered throughout this unit. In addition, language arts benchmarks apply.

Strand I. Constructing New Scientific Knowledge

Standard 1.

Benchmarks 1-6 Middle

1. Generate scientific questions about the world based on observation.
2. Design and conduct scientific investigations.
3. Use tools and equipment appropriate to scientific investigations.
4. Use metric measurement devices to provide consistency in an investigation.
5. Use sources of information in support of scientific investigations.
6. Write and follow procedures in the form of step-by-step

instructions, formulas, flow diagrams, and sketches.

Stand II. Reflecting on Scientific Knowledge

Standard 1.

Benchmark 5 Middle

5. Develop an awareness of and sensitivity to the natural world.

Strand III. Using Life Science Knowledge

Standard 1. Cells

Benchmarks 1 and 2 Middle

1. Demonstrate evidence that all parts of living things are made of cells.
2. Explain why and how selected specialized cells are needed by plants and animals.

Standard 2 Organization of Living Things

Benchmarks 1, 2, and 3 Middle

1. Compare and classify organisms into major groups on the basis of their structure.
2. Describe the life cycle of a flowering plant.
3. Describe evidence that plants make and store food.

Standard 3 Heredity

Benchmarks 1 and 2 Middle

1. Describe how the characteristics of living things are passed on through generations.
2. Describe how heredity and environment may influence/determine characteristics of an organism.

Standard 5 Ecosystems

Benchmarks 1, 2, and 5 Middle

1. Describe common patterns of relationships among populations.
2. Describe how organisms acquire energy directly or indirectly from sunlight.
5. Explain how humans use and benefit from plant and animal materials.

Michigan Department of Education Mathematics GLCE

N.ME.05.09 Understand percentages as parts out of 100, use % notation, and express a part of a whole as a percentage.
N.ME.05.23 Express ratios in several ways. 3 cups to 5 people 3:5 3/5 Recognize and find equivalent ratios.

N.MR.05.01 Understand the meaning of division of whole numbers, with and without remainders.
N.MR.05.03 Write mathematical statements involving division for given situations.
N.MR.05.05 Solve applied problems involving multiplication and division of whole numbers.
N.MR.05.22 Express fractions and decimals as percentages and vice versa.
D.RE.05.02 Construct line graphs from tables of data; include axis labels and scale.
M.UN.05.02 Know the units of measure of volume: cubic centimeter, etc, and their abbreviations.
M.TE.05.09 Use measuring to find the volume of rectangular prisms (cylinders).
M.PS.05.10 Solve applied problems about the volumes of rectangular prisms (cylinders) using multiplication and division with appropriate units.
D.AN.05.03 Given a set of data, find and interpret the mean using the concept of fair share and mode.

Intended Audience: Range of fifth grade students from special education to the gifted. 188 students taught by five classroom teachers.

Main Materials and Resources: Wisconsin Fast Plants with light bank set up and all needed materials, Exploring with Wisconsin Fast Plants by Paul Williams, Studying Plants by Milliken Publishing Company (transparencies and reproducible pages), McGraw-Hill Science textbook Plants with accompanying activity and assessment book, Bill Nye videos (Food Web, Flowers, Forests, and Plants), Sir David Attenborough's video set The Private Life of Plants, www.carolina.com/fastplants and www.fastplants.org

Teaching Methodologies: State standards, curriculum, teacher and student directed activities. Includes structured lessons based on lab work and textbook. Also includes numerous opportunities for open inquiry along with guided inquiry.

Assessment Strategies: Anecdotal records on class and individual discussions, participation, quality and effort put into daily work including labs, unit test, textbook and resource book activities.

Budget: $700 approved

Carolina Biological Supply Company
seeds 91.80
dried bees 31.50
water mat 10.95
anti-algal squares 4.50
manual, Exploring with Wisconsin Fast Plants 26.95
freight and handling 15.95
total 181.65

Menards
fluorescent lights 58.35
PVC 11.16
48” fluorescent shop lights 89.64
aluminum angle 13.94
prime 4.99
stainless s hook 4.36
PVC caps 4.80
eyebolt 2.56
PVC tees 3.92
PVC elbows 3.12
total 196.84

Meijer
plastic shoe boxes 18.06
skewers 5.96
labels 1.77
toothpicks 0.59
aluminum foil 8.34
total 34.72

Lowe’s
fertilizer 8.47

Fruit Basket Flowerland
jiffy 7 pots 29.80

Jo-Ann Fabrics and Crafts
thermolam plus fleece 11.07

total to date $462.55. Still need to purchase notebooks and folders for students. Searching for best price. I also need to check if we have enough Petri dishes for germination experiments.

Project:

For the Pine Street School staff, I will provide daily lesson plans for our entire plant unit in a 3-ring binder. Plans will cover all the mentioned benchmarks along with benchmarks in reading and writing. Staff will have all materials needed for the unit. Jan Goodwin, our science materials coordinator, is working with me to build and supply necessary items.

Challenges: Although professional development time will be provided for 5th grade staff to discuss this unit, there won't be adequate time to cover all issues that arise. Therefore, the challenge will be to provide appropriate support for our staff to successfully utilize the lesson plans and grow Wisconsin Fast Plants. Staff will, of course, be allowed to modify plans as they see fit for their classrooms.

For the Western Michigan University website, I will provide original and adapted lessons for use with Wisconsin Fast Plants. I have some ideas already and will develop more as the unit progresses. I will also ask for ideas from other participating teachers.

Wisconsin Fast Plants
Students will keep a journal with labeled diagrams to report their observations on Wisconsin Fast Plants. In addition, they will have a folder with additional charts and graphs of organized classroom and individual data. They will note unity among the plants: form leaves, stems, flowers, require light, are green, etc. They will note diversity among plants: height, leaf shape, leaf color, number of flowers, seed size, etc. We will keep a list of classroom questions as they arise. Will Wisconsin Fast Plants grow outside of the light bank? Why are some plants taller? What would happen if we tried to grow the plants outside? What would more fertilizer do for the plants? What if we changed the distance from the light source? Students will predict, measure, organize data, and design future investigations.

Along with lessons obtained from the websites and manual, my students will make stem and leaf plots using millimeters to record heights of our plants.

Then they will determine landmarks of maximum, minimum, range, mean, median, and mode.

They will graph scatterplots in groups and find a trend line showing the number of seeds produced compared to the length of the pod in centimeters.

We will do many math problems as they arise. How much does each seed cost? How much was the light bank set up? How much would it cost to set up an individual light bank system at home to experiment with Wisconsin Fast Plants? What is the ratio of seeds per plant? What is the volume of the Jiffy 7 peat pot before being placed in water? How much water did the peat pot absorb, and what is the volume after twenty minutes of being in the water?

Research possibilities include looking at the cancer prevention role of the plants in the Wisconsin Fast Plant group. Also, students could research invasive species such as Purple Loosestrife.

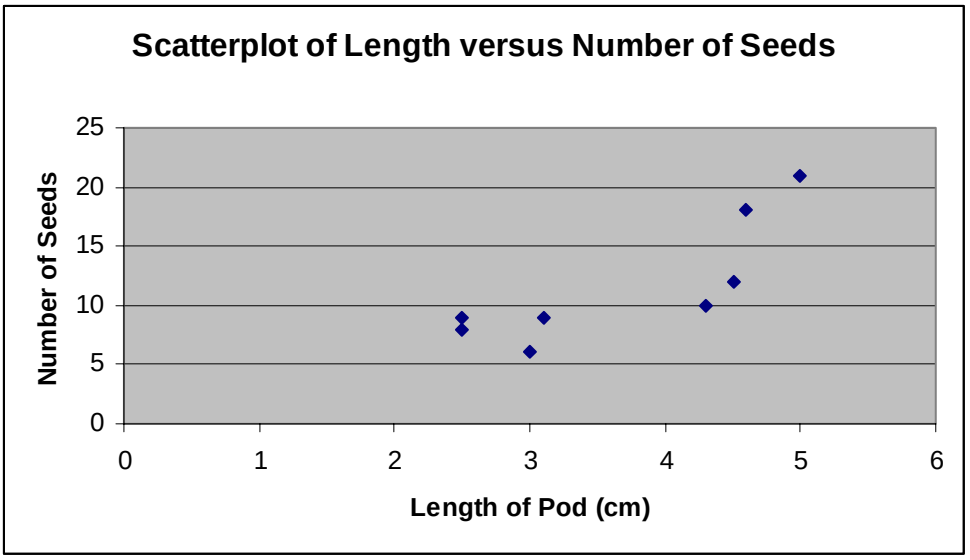
**Math with Wisconsin Fast Plants**

1. Give students a Wisconsin Fast Plant seed pod. Students make observations about their seed pod including the length. Students use group data to construct a table on the length of the pod and the number of seeds within the seed pod.

Group A's Data on Seed Pods

| Length of Seed Pod | Number of Seeds |
|---|---|
| 2.5 cm | 8 seeds |
| 2.5 cm | 9 seeds |
| 3.0 cm | 6 seeds |
| 3.1 cm | 9 seeds |
| 4.3 cm | 10 seeds |
| 4.5 cm | 12 seeds |
| 4.6 cm | 18 seeds |
| 5.0 cm | 21 seeds |

Students write a hypothesis regarding the length of the seed pod and the number of seeds the pod contains. After growing Wisconsin Fast Plants, students can consider their hypothesis once again. Students can draw a scatterplot as well to study their data.



2. Teachers and students can write and answer multiplication and division problems using real data.

One package of 200 seeds cost $22.95 including tax. We purchased 200 seeds for our school, how much did we spend?

Given that 200 seeds cost $22.95, how much does each seed cost?

How much is your seed pod worth?

3. If your class is using Jiffy Peat Pots to grow Wisconsin Fast Plants, students can determine the volume of the peat pellet before the pellet is placed in water and also determine the volume after it has absorbed water for approximately twenty minutes.

Radius=2.1 centimeters
Diameter= 4.2 centimeters
Height=0.8 centimeters
Area=Pi * the radius squared=13.9 square centimeters
Volume=Area of the base times the height=11.1 cubic centimeters
After absorbing water volume =55.6 cubic centimeters (since the height is now 4 centimeters)

4. Ratios can be used at various times throughout the unit.

Four seeds to one student 4:1
Three fertilizer pellets to four seeds 3:4

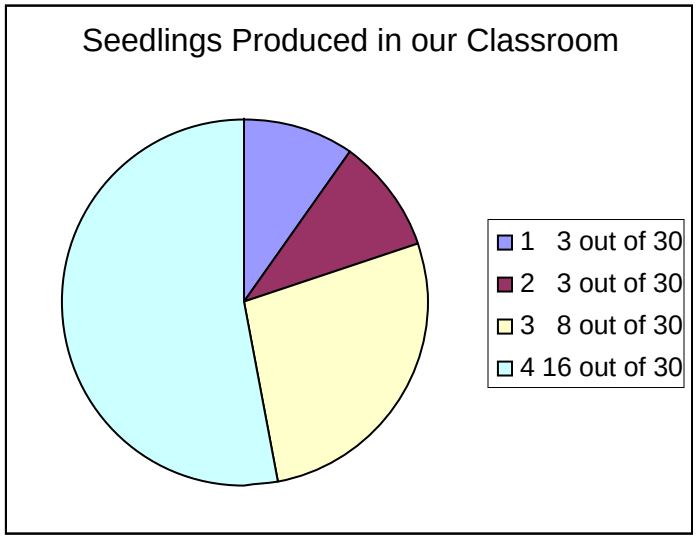
5. Fractions, decimal, and percents can be used to denote the number of seeds that germinated.

Student B had one out of four seeds grow.
¼=0.25=25%
The classroom had eighty one out of one hundred twenty seeds grow.
81/120=0.675=67½%

Students can make a table and pie chart for the seedlings produced in the class. Note: Students were each given four seeds to plant.

Seedlings Produced in Our Class

| Seedlings | Fraction | Decimal | Percent |
|---|---|---|---|
| One | 3/30 | 0.1 | 10 % |
| Two | 3/30 | 0.1 | 10 % |
| Three | 8/30 | 0.27 | 27 % |
| Four | 16/30 | 0.53 | 53 % |



6. Using class data, construct a stem and leaf plot for the height of the plants or for the number of seeds produced per plant.

Stem and Leaf Plot for Classroom Data on Number of Seeds Per Plant

| Stem (100s and 10s) | Leaves (1s) |
|---|---|
| 2 | 6 |
| 3 | 0 4 7 9 9 |
| 4 | |
| 5 | 0 |
| 6 | 2 7 7 |
| 7 | 1 3 5 5 6 8 9 |
| 8 | 2 2 6 9 |
| 9 | 1 6 |
| 10 | |
| 11 | |
| 12 | 4 |
| 13 | |
| … | |
| 22 | 1 |

Landmarks for Stem and Leaf Plot
minimum: 26 seeds
maximum: 221 seeds
range: 195 seeds
median: 75 seeds
mean: 77 seeds

Michigan Department of Education Mathematics GLCE (related GLCEs for Fifth Grade)

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