From Academic to Practical: Application of Academic Knowledge of Plants to Practicing Horticulture and Preparing Food

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This curriculum unit is recommended for:
Extensions Science, Grades 9-12

Keywords: reproduction, adapt, pollination, autotroph, stem, leaf, photosynthesis, glucose, chlorophyll, chloroplast, gymnosperm, angiosperm, bryophytes, seedless vascular plants, seed, nursery, greenhouse, cutting, seed, grafting, propagation, vegetative reproduction, and budding

Teaching Standards: See Appendix 1 for teaching standards addressed in this unit.

Synopsis: This focus of this unit is to teach students with intellectual disabilities about plants, the different types of plants, plant reproduction, the different types of plant propagation, and how to turn plants that are grown into food. This unit will provide a completed adapted chapter and worksheets. The unit will begin with an introduction to to plants, plant cells, and different types of plants. The students will compare and contrast plant and animal cells, the different types of plants, and how the different plants reproduce. The second lesson will focus on applying the knowledge of plants to the process of horticulture and growing. The students will study the different plant reproduction and apply the knowledge to growing different plants in a small garden. The students will determine the best soil and methods for the plants grown, The final lesson will cover the practical application of growing plants as a vocation. This section/lesson will involve trips to different greenhouses and visiting different growers to learn about growing a cultivation as a job. This section will be hands on. The students will grow different plants and create different dishes with the plants. The lessons will involve hands-on experiences as well as adapted assessments and worksheets.

I plan to teach this unit during the coming year to 20 students in Extensions Science Classes, grades 9-12.

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Introduction

Individuals with disabilities are educated in a variety of settings in public schools. In order to receive special education services, the student must have a condition that is defined as a disability by the Individuals with Disabilities in Education Act 2004 (IDEA)[i], the disability must have an adverse effect on educational performance, and, as a result, the student requires specially designed instruction in order to access the general education curriculum. Once students meet all three criteria, they are given an Individualized Education Program (IEP) that is used to create goals and objectives along with other supports to help the student access the general education curriculum. Students with IEPs must have them addressed annually and adjusted as progress is or isn't made. IEPs ideally involve parental input and have resulted in positive outcomes when student needs are addressed[ii]. Most students with disabilities are educated using the inclusion model. The inclusion model of education has given many students with disabilities the opportunity to receive instruction along with their same age peers without disabilities. This movement has allowed students and individuals with disabilities to become more integrated into the school environment at large. Inclusion is most prevalent among students with higher incidence, or less severe, disabilities (learning disabilities, some Autism) than it is for students with lower incidence, or more severe, disabilities (students with intellectual disabilities).[iii] [iv]

Much of the change in how individuals with disabilities have received instruction is based on the requirements of IDEA 2004. IDEA 2004, much like its predecessors, requires that students with disabilities be provided with a Free and Appropriate Education (FAPE) in the Least Restrictive Environment (LRE). LRE refers to the amount of school time students with disabilities spend with peers without disabilities. The more time in a general education setting, the less restrictive the environment. Students with higher incidence disabilities are typically provided with fewer supports and less service time than students with lower incidence disabilities. Many students with high incidence disabilities are able to progress on the general curriculum and are able to take honors and Advanced Placement classes.[v] [vi]

In contrast to students with high incidence disabilities, students with intellectual disabilities are typically served in classrooms where they are removed from their peers without disabilities for the majority of their school day. Students with mild to moderate intellectual disabilities are typically served in separate classrooms. A mild intellectual disability is defined as having an IQ two or more standard deviations below the mean of 100 (50-70) and deficits in adaptive behavior. A moderate intellectual disability is defined as having an IQ three standard deviations below the mean of 100 (35-49) and deficits in adaptive behavior. Students served in the separate classrooms have significant delays in cognitive processing as compared to their peers without disabilities. According to Browder et al. (2007), prior to the implementation of No Child Left Behind (NCLB) and IDEA 2004, many students with significant disabilities were not exposed to academic content. Students were typically taught functional tasks and were not expected to take end of grade assessments[vii]. However, after the passage of IDEA and NCLB, districts were held accountable for student performance.[viii] The change in law also lead to an increase of research based strategies for instructing students with intellectual disabilities. The majority of research on the academic development and skill acquisition of students with intellectual disabilities is

through single subject design experiments using Applied Behavior Analysis, behavior shaping, chaining, and systematic instruction, which involves the use of task analyses.[ix] [x]

Following the requirements of the new laws, students with intellectual disabilities were expected to be exposed to and make progress on academic content. Students who receive instruction on academic content and standards have improved independence, demonstrate increases in self-determination, and an improved ability to make choices.[xi] [xii] However, students with intellectual disabilities have difficulties with accessing plain text information, writing information, reading, information recall, fluency, and generalization. In order to access grade level material, the students must receive information that has been adapted. Adaptations can be created in a variety of ways. The most popular research based methods are adapted text using picture symbols, use of videos, use of the prompt hierarchy and errorless learning, and development of materials using the Universal Design for Learning. These adaptations can be used in isolation, but they are more commonly used in combination in order to get the best outcomes and student responses. These adaptations also operate on the idea of developing stimulus discrimination and shaping behavior; which is typical in the use of applied behavior psychology strategies.[xiii]

Rationale

The purpose of the unit is to expand the educational opportunities for students with intellectual disabilities. Students with intellectual disabilities have limited options for academic programming. Science instruction in the self-contained classroom is largely limited to brief lessons about safety, different animals, brief discussions of illness, and health. This unit will expand the science curriculum offered to students in the Extensions Program and is designed to provide students with intellectual disabilities access to information provided to their peers without disabilities. The goal of this unit is to create a multi-year unit on plants. The initial instruction will focus on the academic study of plants. This information will be adapted using text and symbols so students of a variety of ability levels can access the information. The text will include activities and assessments to check for understanding. The next goal is to provide a practical application of the material where students will practice different propagation methods, assess the best areas to grow different plants, and to grow plants for different purposes. The reason for the multi-year unit is to ensure that academic lessons and learning can be used in a more functional way and that learning is not lost as students move to different classroom locations. The main goals of instruction in the Extensions classroom are fluency and generalization. Fluency requires repetition of information. For students to become fluent, they must have the opportunity to practice. A multi-year unit will provide ample opportunity for both repetition and practice. Once the student is fluent, then they will be able to use the information in different settings.

The science curriculum for students with intellectual disabilities is very broad and general. Prior to 2008, the Extensions Program of Charlotte Mecklenburg School System's EC Department did not have a standard curriculum or materials for teachers to use in the classroom. Many teachers were not given age appropriate teaching materials. The focus was more on functional education and grade appropriate education, which was based on IQ, reading ability, and adaptive behavior. Beginning in 2007, teachers were required to teach students grade appropriate science that would prepare students to access the North Carolina alternate assessment

for 10th graders called the Extend 1. Many teachers began to adapt grade appropriate textbooks in order to provide instruction; however, the teacher made curriculum varied in complexity and depth. In 2008, the system adopted Attainment's *Teaching to Standards: Science* by Ginevra Courtade as the science curriculum. The book was based on peer-reviewed research in teaching students with intellectual disabilities. The curriculum included picture symbols, choice cards, instructions for use with the prompt hierarchy and the use of systematic instruction when teaching lessons.[xiv] The book covered topics on earth science, plants, cells, and the water cycle and was designed for grades 6 to 12. The book did not have information about different animals, food chains, pollution, etc. Therefore, many high school teachers were required to develop content using available high school science texts. Another shortcoming of *Teaching to Standards: Science,* is the depth of information presented.[xv] Each of the chapters presented a survey of the topics and did not require much complexity of thought in terms of vocabulary, information presented, assessments, and hands on activities. The scarcity of adapted and complex content and the age of the district provided materials has created an opportunity for the development of a new unit that will stimulate and challenge students in the separate classroom.

The Attainment Company also released a book called *Exploring Science through Symbols and Words: Exploring Life Science.*[xvi] This book was not provided by the district. It is a valuable supplement. It provides basic vocabulary and covers plants, the structure of plants, how plants get energy, and the relationship with other living things. It also provides very basic experiments to help provide students with a general understanding of what the different parts of plants do. This book however, does not cover taxonomy, cell structure, reproduction, and the different parts of plants. A common problem with curricula designed for students with disabilities is that there are no opportunities for the students to perform compare and contrast, analysis, and synthesis activities. These books are also written for the learners who require the most supports. This leaves room for elaboration for the students who require fewer supports. My goal is to adapt a grade level text book with information about plants with opportunities for deeper understanding embedded in the text. The text will be adapted for the students who require fewer supports, but it can be used with students of all learning levels.

School Setting

William A. Hough High School is a large suburban high school in Cornelius, North Carolina. Hough is a comprehensive high school that offers a variety of educational opportunities. Hough offers 26 Advanced Placement classes, an Exceptional Children's Program, an English Language Learner program, a Junior ROTC program, a Visual Arts and Fine Arts program, and a variety of Career and Technical Education (CTE) courses. Hough is becoming more culturally diverse as the communities it serves continue to grow. The school has a total enrollment of 2,512 students during the 2019-2020 school year. The school continues to grow, but this information is the most current. The student body is 73% White, 11% African American, 10% Hispanic, 3% Asian, 2% multiracial, and 1% other nationalities. 16.8% of Hough students receive free and reduced lunch. Hough had a 94% graduation rate in 2019.

I teach in a program for students with mild to moderate intellectual disabilities. The students can also have concomitant Autism or physical disabilities. The four classrooms for students in my program comprise the Extensions Program (EP). The program has 21 students. All students are educated on the Extensions of the Common Core course of study. The Extended content standards are based on the standard course of study, but are adapted to address only the basic ideas and concepts presented in the standard course of study. For example, students on the

standard course of study are expected to analyze sources of energy for organisms and to analyze different adaptations. Students on the extensions are only expected to identify very concrete examples of plants and energy. Students on the extensions are not expected to develop a deeper understanding of the plants, reproduction, and energy consumption. However, teachers of the extensions are given significant leeway in how to design lessons and to vary the complexity of the content presented to the students.

The two classrooms are divided by grade band. The students in the 9-11 grade band are in the high school program. Once the students turn 19, they are placed in the transitions program, which seeks to prepare students for life after high school. This year, the 12th grade students are included with the transition program. Each of the teachers has a homeroom that meets daily. My homeroom of twelve students completes writing or typing a daily schedule, a daily journal entry, and collects weather data. Prior to beginning science, my homeroom completes a daily KWL/Scientific Method activity where data collected during the day is recorded and compared to the hypotheses from the previous day and from student homework. Following homeroom, I teach the 8 students in the 12-Transitions grade band science and social studies. My science unit for these students is focused on the human body, food, nutrition, mammals, and, eventually, plants and horticulture. My social studies for these students focuses on the Constitution, current events, maps, and psychology. Following elective, I teach the students in the 9-11 grade band. My science units are focused on the features of organisms, application of the features of organisms to real life examples and videos, the study of reproduction, cells, food chains, systems, energy, taxonomy, evolution, and the different chordates. I also plan to incorporate information on plants as an organism. My social studies lessons are focused on current events, the Constitution, maps, psychology and sensory processes. All of the Extension Program teachers teach different applied vocational activities in order to give the students a survey of skills required to complete different jobs (packaging, clerical, custodial, etc.).

Content Research

My Science Class

I have created an adapted textbook covering the features of organisms, taxonomy, and the different chordates. I have made different assessments and worksheet activities that involve application and analysis level student responses. I use a wide variety of YouTube videos, pictures, preserved specimens, and word cards to supplement and extend the content. I am not interested in the speed with which I move through the different topics. I prefer to work on depth of understanding and helping students to discover connections between the different organisms discussed. I also use models and specimens to demonstrate the similarities between humans and different animals. My lessons will usually last one month or more with time for review and continual assessment. I have started to teach my students on the importance of sunlight on the development of different terrestrial and aquatic ecosystems. My lessons involve analyzing food chains described in videos and pictures. The students are also beginning to draw connections between evolution, the involvement of food chains, and organism growth and development. I use an interactive whiteboard to project adapted chapters, tests, and information. The students also receive adapted textbooks with information adapted from grade appropriate texts so they can access the lessons. Adapted text provides pictures with words, which help students to read using context clues. My books and lessons are updated with new information and research continually.

Teaching Strategies

Picture symbols (see Figure 1) involve combining a picture with a word to provide context cues in text. The symbols can be either abstract drawings or concrete pictures. They can also be presented in isolation or as a part of a whole narrative. Picture symbols can help improve independent reading and comprehension in students with intellectual disabilities.[xvii] When text is supplemented by picture symbols, students are able to point to the picture and word combination. The association helps to promote retention, especially following repeated trials learning and repetition of the content. Evmenova and Behrmann (2011) also discussed the use of videos in instruction. When coupled with picture symbol text, closed captioning, and frequent checks for understanding, videos help to provide concrete examples to abstract and difficult topics. *For example,*

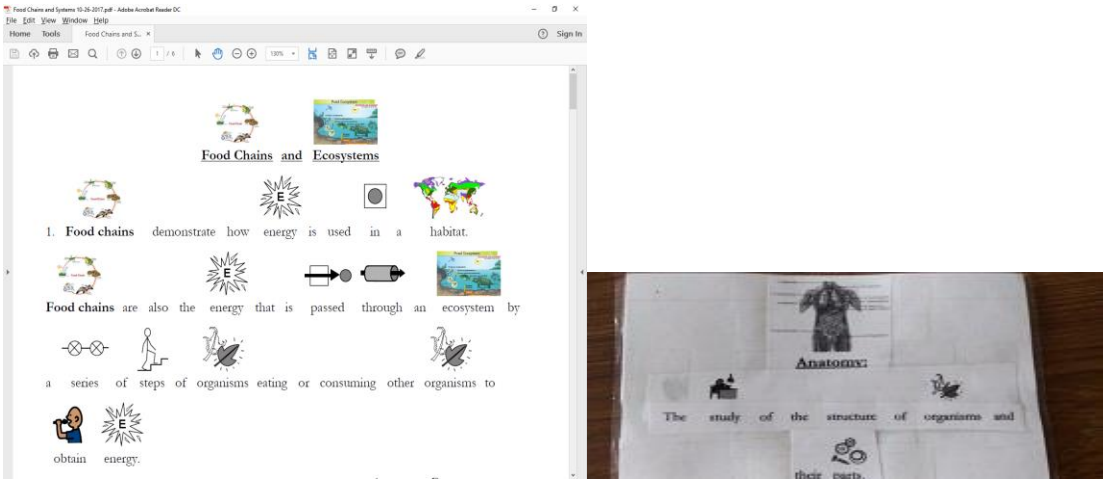

Figure 1.

The prompt hierarchy (see figure 2) is a continuum that is used to indicate the level of support required by a student when presented with academic materials and activities. The levels of the prompt hierarchy are, from least intrusive prompting to most intrusive prompting, independent, gestural, verbal, visual/picture, modeling, partial physical, and full physical. Errorless learning is teaching the correct response over the incorrect during trials. Prompting is used to make sure the student focuses on the correct response and not the incorrect in order to promote generalization and fluency. Independent means that the student is able to access the academic material or activity without supports from the teacher. Independence is different for different students based on ability level. For example, one student may able to complete a worksheet by writing the answers, another student may be able to complete the activity with a worksheet with picture symbol answer choices, and another student may be able to answer the same questions with the answer choices presented in an array and the worksheet items one at a time. Gestural prompting involves the use of pointing to the choices after the instruction is given and the student has not responded or has responded incorrectly. Verbal prompting involves the use of a sound, word, or phrase to prompt correct responding by the student. Verbal prompts can be non-specific, using only a small sound, or specific, using a whole word or phrase. Picture/visual prompt involves the use of a picture symbol in isolation in order to prompt the correct response following an instruction. Modeling prompts involve the teacher or peer modeling the correct response

following an instruction or question. Physical prompts are used when the student is unable to complete the correct response following use of all other prompts. Best practice with the prompt hierarchy is to expect independent responding and to move down from least intrusive prompts to most intrusive prompts until the student is able to perform the correct response. The goal with prompts is to fade the use until the student is able to respond independently.

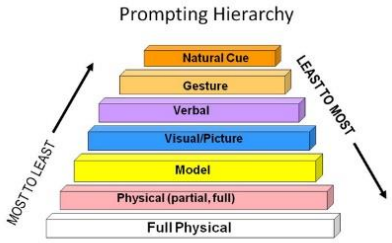

Figure 2 (M.A.S.T.) [xviii]

The students are also provided information and academic materials based on their ability to read and understand symbolic representation of information. The levels are Readers/Level 3, Level 2, and Level 1. Students who are classified as Readers/Level 3 are able to read some words and are able to access information presented in either plain text or using more abstract symbols. These students are able to write or read with more independence than students classified as either Level 2 or Level 1. Students classified as Level 2 are beginning to associate abstract symbols or letters/words with concepts or words. However, these students require more concrete images to help them grasp concepts without error. For example a students may need a picture or drawing of a ball to represent the word ball. Students classified as Level 1 are just beginning to associate words and information with objects. These students require actual objects or concrete representations of concepts in order to demonstrate comprehension. Many students in self-contained classrooms are unable to speak (are non-verbal). These students are provided with Augmented and Alternative Communication (AAC) devices such as a “cheap talk”, a Big Mack, etc. These devices allow an instructor to record vocabulary or requests. The student can then push the button in order to play the word or request in order to participate in class verbally.

Universal Design for Learning (UDL) is a classroom practice based on architectural principles (the curb cut, handicap access, etc.). The goal is to create lessons or materials that provide access for the most students and making the classroom accessible to all learners.[xix] UDL combines all of the teaching strategies, especially the use of videos and picture symbols. Picture symbols are usually paired with words. Therefore, the students who are able to read plain text can access the material and use the pictures for context cues to help them define the word. The pictures will also allow the student who is unable to read to access the academic content. UDL also involves the use of technology to present information and to create communication adaptations.[xx] Many of the classrooms for students with intellectual disabilities in Charlotte Mecklenburg Schools come equipped with interactive whiteboards. This allows for all students

to be able to see the information, control videos, complete adapted writing activities, and to make presentations. UDL promotes inclusion in the classroom by making the content accessible to all students.

All of these strategies are common practice in the self-contained classroom. There is a wide variation in ability level among students; however, all can benefit from use of the best practice methodology. Some students in self-contained classes are able to read and write. Simple picture symbols promote independence by allowing them to use the picture to determine meaning. Other students, who are unable to read, can use the picture symbols to make choices. All of the students benefit from the use of the prompt hierarchy to learn correct responses and to increase independence in responding to learned and novel stimuli.

New Unit

The new unit will be a long-range curriculum unit designed to prepare students with disabilities for careers in applied plant science and cooking. The unit will be unique in that the academic information will be applied in the post-high school setting to growing plants that can be used for food. The unit will be divided into three lessons or parts. Two of the lessons will be taught when the students are in high school classes, while the third will be taught during the students' transition years. Lesson 1 will focus on teaching students the basics about plants. It would start with information on the different types of plants, the basic mechanisms of plants, the role of plants in an ecosystem, and the similarities and differences between plants and other organisms. Lesson 2 will be an instruction to horticulture and cultivation. The students will learn about how to grow plants, when the best time to grow plants is, and how to grow plants successfully. Lesson 3 will focus on applying academic information about plants, specifically. The students will apply growing methods, apply information about food and nutrition, and will maintain a small garden of edible and ornamental plants.

Prerequisites

Prior to teaching the unit, teachers should teach students about the different levels of taxonomy. Students should learn the differences between the different kingdoms in the domains of bacteria and eukarya. This knowledge will help students understand the interactions between the different organisms in an ecosystem. The students should specifically learn about the kingdom Protista, kingdom Animalia, kingdom Plantae, and kingdom Eubacteria.[xxi] The importance to learning about the different taxonomic kingdoms is so the students can learn about the interdependence of different organisms in an ecosystem. For example, when discussing food chains, the students will have to be able to discuss the role of plants in supporting the entire food chain or web. The students will also learn about the endosymbiotic theory[xxii] and how cyanobacteria were absorbed by what would become plant cells to carryout photosynthesis.[xxiii] The students will also review sexual and asexual reproduction as it relates to all members of domain eukarya.

Unit

The new unit will serve as both an introduction to plants and an application of that knowledge to growing both edible and ornamental plants in a school garden. The students will also, after attaining fluency, generalize their knowledge and skills by volunteering at local greenhouses and community gardens.

Lesson 1/section 1 will focus on an introduction to the basics of plants. Students will learn about the different types of plants, plant reproduction, plant evolution, and the different parts of plants. The students will review the differences between autotrophs and heterotrophs and explore photosynthesis. The students will also compare and contrast plant and animal respiration. Students will use adapted text from Miller and Levine (2007) to access grade appropriate information about plants. The students will also view short BrainPOP videos on seedless plants[xxiv], seed plants[xxv], photosynthesis[xxvi], and pollination[xxvii]. Students will also have opportunities to explore both the school and home environments to find different plants. The students will also apply knowledge of reproduction to determine how the different plants reproduce and will learn about how plants are also able to asexually reproduce through grafting and cutting.[xxviii] Finally, the students will explore the different plant habitats. The students will take multiple choice tests to demonstrate their learning. The students will also complete analysis activities involving various plants and present their information to the class.

Lesson 2/section 2 will be an introduction to horticulture. The students will work with an adapted textbook based on a high school introduction to horticulture. The students will apply the information from the first section to planning a garden and exploring the appropriate ornamental and edible plants for the garden. The students will use the internet to explore the best plants for the area and will determine what the plants need to grow successfully. The students will explore a presentation on horticulture[xxix] that will use the words learned in the first section in the context of hands on growing and caring for plants. The students will learn about different soils, proper temperatures, appropriate amount of water, and when to harvest. This section will culminate in a multiple-choice test and a design activity, where the students will present plans for a garden. The students will also explore how to write a grant to get a small greenhouse for the school.

Lesson 3/section 3 will be the applied section. The students enact their plans and begin preparing the garden. This section will take place during the students' transition years in high school. A great resource will be the work of Joe Lamp'l.[xxx] The students will first have to determine the seeds they want. They will then have to determine the soil and fertilizer needed. Next, they will have to compile a shopping list to obtain all of the seeds and soil they will need. This section will involve trips to greenhouses and home improvement stores so they can practice shopping in the community and practice searching for materials needed to complete a project. Next the students will have to decided on the tools needed to prepare the garden and to care of the plants once they start growing. The end product of this section is a working garden; however, failure of the plants to grow will be used as an evaluative teaching tool for the students. The students will use data to determine why a particular plant either thrived or failed and to use the to make plans to improve the next planting and growing activity. The end goal for this section is to help the students think more critically about careers and to help them to attain the skills to get a job in horticulture or landscaping following completion of high school. The more

the students can think critically, evaluate their own work, and use data, the more prepared they will be for independent living following school.

Instructional Implementation

Lesson 1

OBJECTIVE:

1. **Given You Tube videos and note taking sheets, the students will analyze the video using the features of living things to describe the plant in the video in groups and present the answers to the class.**
    a. Given adapted text, videos, word cards, pictorial examples, and questions, the students will be able to identify the similar characteristics of all living things (Cells and adapt affecting the majority of the features).
    b. Given evolution vocabulary and pictures, the students will apply the vocabulary to the development of Plants.
2. **Given AAC devices and adapted text, and worksheets/observation sheets, the students will read passages from the Attainment text book chapter on Plants (in binders and projected on the Smart Board).**
    a. Given pictures, adapted text, and videos, the students will differentiate the different parts of plants (leaves, stems, trunks, flowers).
    b. Given animal analysis sheets, the students will describe the relationship between animals (specifically humans) and plants (food, shelter, hobbies, etc.).
    c. Given a taxonomy worksheet with or without choices, students will describe the different classes of plants and determine the taxonomic level.
    d. Given videos and teacher made worksheets, the students will demonstrate the differences in reproduction (flowers/pollination and seeds/fruit) and animal involvement (bees, butterflies, etc.).
3. **Given the adapted textbook, pictures, and videos (Brain Pop, You Tube), the students will use the pictures and choices to determine that a plant is a living thing.**
    a. Given videos and during observations, the students will determine how plants move, how they get energy, and will identify adaptations.
    b. Given Taxonomy information/worksheets and videos on different organisms, the students will differentiate plants from other kingdoms (multi-cellular, autotrophic, non-motile).
    c. Given adapted text, research, and videos, the students will determine how
4. **Given information on plants and photosynthesis, the students will be able to demonstrate how plants are living things.**

a. Given adapted text, videos, word cards, pictorial examples, and questions, the students will be able to demonstrate how plants are living things (from cells to self-healing).

b. Given seeds, soil, and water, the students will use the steps of the scientific method to demonstrate how plants (specifically grass) are living things.

c. Given living plants, the students will create instructions on how to care for the plants (water, sun, fertilizer).

5. **Given videos, adapted text, and word cards, the students will be able to differentiate the different plants.**

    a. Students will compare and contrast bryophytes, seedless vascular plants, and seed plants (gymnosperms and angiosperms.

    b. Students will compare and contrast the reproduction of different plants.

    c. Given different diagrams and tissue samples, the students will identify the structures of different plants.

    d. Given information about sexual and asexual reproduction, the students will differentiate plant reproduction.

    e. Given adapted information, the students will learn about the different parts of plants, plant responses to stimuli, and how humans use plants,

6. **Given You Tube videos and pictures, the students will be able to differentiate living and non-living things by applying the features of living things.**

7. **The students will answer the following questions in groups:**

    a. Which features allow a plant to adapt?

    b. What feature helps a plant to reproduce and how?

    c. How do plants get and use energy?

Readers/Level 3:

- The students will identify new vocabulary, such as *reproduction, adapt, pollination, autotroph, stem, leaf, photosynthesis, glucose, chlorophyll, chloroplast, gymnosperm, angiosperm, bryophytes, seedless vascular plants, vegetative reproduction, propagation* independently given a choice of four response options.
- Students will identify the characteristics of plants given a choice of four Velcro cards or using the worksheet independently or with verbal prompts.
- The students will complete a worksheet identifying the different features of plants as living things either independently or with verbal prompts.
- The students will point to and verbally identify each vocabulary word.

- The students will be able to differentiate plants and animals (protists, fungi) things based on the characteristics of living things.

Level 2:

- The students will do the same activities as above with more intrusive prompting for errorless learning.
- The students will listen to and read the text using AAC devices.
- Students will identify the characteristics of plants given a choice of three Velcro cards or using the worksheet and verbal and more intrusive prompting as needed.
- Students will attempt to say the vocabulary word(s) and point to the word on the definition sheet.
- Students who have difficulty speaking will press the "Big Mack" to hear the word and will point to the correct vocabulary word on the definition sheet or on the word card given a choice of three response options.

Level 1:

- The students will do the same activities as above with more intrusive prompting for errorless learning.
- The students will listen to and read the text using AAC devices.
- Students will identify the characteristics of plants given a choice of three Velcro cards with more intrusive prompting as needed.
- Students will point to the vocabulary word on the definition sheet or on the word card given a choice of three response options and more intrusive prompting as needed.
- The students will point to or eye gaze to the examples of the vocabulary.

LINKS TO PRIOR LEARNING: Warm-ups, extensions, applications (7:25 to 8:50)

Prior to warm-up, the students will review the steps of the scientific method and sequence the order of inquiry. The students will also identify the steps of the order of science and the relationship to the method.

Warm-up 1

a. Given living things sentences and a video, the students will complete the sentence in order to analyze the object in the video.

Warm-up 2 (Scientific Method Vocabulary)

a. Given seeds, soil, water, and the scientific method vocabulary and steps, the students will make predictions and carry out experiments on plants.

Level 3 students will complete the activity either independently or with verbal prompts.

Level 2 students will complete the activity with verbal/gestural prompts

Level 1 students will complete the activity with gestural/physical prompting.

LESSON PROCEDURES: (What the teacher will do)

- **Assistants:** will work with a small group of students to help them to respond to questions and focus on the textbooks. They will monitor behavior and take data. They will also assist with the use of AAC devices. They will provide data on the level of support provided to the students.

Readers/Level 3:

- The teacher will provide the adapted textbooks and word card choices.
- The teacher will then read the vocabulary with the students to prepare them for the reading.
- The teacher will read the adapted Plant text with the students
- The teacher will have the students follow along with the text. The Smart Board will display the adapted text to help the students follow along.
- The teacher will demonstrate the Velcro boards/worksheets and will have the students differentiate plants and animals (or fungi, protists) based on characteristics.

Level 2:

- The teacher will do the same as above.
- The teacher will present three vocabulary words
- The teacher will read the three vocabulary words and have the students along.
- The teacher will have the students point to the different vocabulary words and use augmentative communication devices if non-verbal.
- The teacher will provide three of the sequencing cards to place on the board.
- The students will point to pictures in the book.
- The teacher will have the students point to the plants and animals (or fungi, protists).

Level 1:

- The teacher will do the same as above.
- The teacher will have the students listen to the text.
- The teacher will have the students to eye-gaze or point to the correct vocabulary word out of a choice of three.

INDEPENDENT PRACTICE (Additional opportunities where you plan to implement the objectives of this lesson for the students to carry over the skills to other areas…this is to help in planning for generalization practice)

- The students will complete a multiple choice and matching quiz on the new vocabulary- *reproduction, adapt, pollination, autotroph, stem, leaf, photosynthesis, glucose, chlorophyll, chloroplast, gymnosperm, angiosperm, bryophytes, seedless vascular plants, vegetative reproduction, propagation* with teacher assistance. The teacher and assistants will circulate the room to provide assistance and prompting.
- The students will watch short videos on You Tube. First, the students will determine of the video is about a living thing and will identify the features represented. Second, the students will classify the organisms based on taxonomy. The students will identify the features shown in each video using a features worksheet. The teacher and assistants will circulate the room to provide assistance and prompting.
- The students will choose an organism or object and complete a report on why it is or isn't a living thing.

Lesson 2

OBJECTIVE:

8. **Given You Tube videos, adapted text and note taking sheets, the students will define propagation and demonstrated that propagation is a name for plant reproduction.**
    c. Given adapted text, videos, word cards, pictorial examples, and questions, the students will be able to identify the two types of plant propagation.
    d. Given propagation vocabulary and adapted text, students will research and provide examples of seeded propagation.
    e. Given propagation vocabulary and adapted text, students will research and provide examples of vegetative propagation.
9. **Given AAC devices and adapted text, and worksheets/observation sheets, the students will explore what is needed for growing plants using different types of media and techniques.**
    e. Given pictures, adapted text, and videos, the students will identify different ways to grow plants for commercial or personal use.
    f. Given computers/adapted text, the students will define:
        a. Hotbeds, cold frames, greenhouses, and farms
        b. The students will determine how the different produce plants.
    g. Given a structured worksheet, the students will determine the best soil and fertilizer for growing plants in different locations.

h. Given computers and adapted text, the students will compare and contrast vermiculate, moss, peat, perlite, and compost and define their role in plant growth.

i. Given videos, testing strips, and recording sheets, the students will test soil and water ph and salinity.

10. Given the adapted textbook, pictures, and videos (Brain Pop, You Tube), the students will learn about the differences between seed and vegetative reproduction.

d. Given videos and adapted text, the students will differentiate seed propagation and vegetative propagation and determine with is sexual and which is asexual.

e. Given different diagrams, the students will explore seed morphology and follow the sexual reproduction of plants.

a. Students will compare and contrast plant and animal cells and DNA.

f. Given adapted text, research, and videos, the students will determine how plants reproduce sexually and asexually.

g. Given videos and demonstrations, the students will identify and define cutting, grafting, and budding.

11. The students will answer the following questions in groups:

d. Which plants benefit from vegetative versus seeded reproduction?

e. What feature helps a plant to reproduce and how?

f. What is the best media for growing different plants?

Readers/Level 3:

- The students will identify new vocabulary, such as *seed, nursery, greenhouse, cutting, seed, grafting, propagation, vegetative reproduction, budding* independently given a choice of four response options.
- Students will identify the characteristics of propagation given a choice of four Velcro cards or using the worksheet independently or with verbal prompts.
- The students will complete a worksheet identifying the different features of plant propagation either independently or with verbal prompts.
- The students will point to and verbally identify each vocabulary word.

Level 2:

- The students will do the same activities as above with more intrusive prompting for errorless learning.
- The students will listen to and read the text using AAC devices.

- Students will identify the characteristics of plant propagation given a choice of three Velcro cards or using the worksheet and verbal and more intrusive prompting as needed.
- Students will attempt to say the vocabulary word(s) and point to the word on the definition sheet.
- Students who have difficulty speaking will press the "Big Mack" to hear the word and will point to the correct vocabulary word on the definition sheet or on the word card given a choice of three response options.

Level 1:

- The students will do the same activities as above with more intrusive prompting for errorless learning.
- The students will listen to and read the text using AAC devices.
- Students will identify the characteristics of plant propagation given a choice of three Velcro cards with more intrusive prompting as needed.
- Students will point to the vocabulary word on the definition sheet or on the word card given a choice of three response options and more intrusive prompting as needed.
- The students will point to or eye gaze to the examples of the vocabulary.

LINKS TO PRIOR LEARNING: Warm-ups, extensions, applications (7:25 to 8:50)

Prior to warm-up, the students will review the steps of the scientific method and sequence the order of inquiry. The students will also identify the steps of the order of science and the relationship to the method.

Warm-up 1

b. Given living things sentences and a video, the students will complete the sentence in order to analyze the object in the video.

Warm-up 2 (Scientific Method Vocabulary)

b. Given seeds, soil, water, and the scientific method vocabulary and steps, the students will make predictions and carry out experiments on plants.

Level 3 students will complete the activity either independently or with verbal prompts.

Level 2 students will complete the activity with verbal/gestural prompts

Level 1 students will complete the activity with gestural/physical prompting.

LESSON PROCEDURES: (What the teacher will do)

- **Assistants:** will work with a small group of students to help them to respond to questions and focus on the textbooks. They will monitor behavior and take data. They will also assist with the use of AAC devices. They will provide data on the level of support provided to the students.

Readers/Level 3:

- The teacher will provide the adapted textbooks and word card choices.
- The teacher will then read the vocabulary with the students to prepare them for the reading.
- The teacher will read the adapted Plant text with the students
- The teacher will have the students follow along with the text. The Smart Board will display the adapted text to help the students follow along.
- The teacher will demonstrate the Velcro boards/worksheets and will have the students differentiate plant propagation.

Level 2:

- The teacher will do the same as above.
- The teacher will present three vocabulary words
- The teacher will read the three vocabulary words and have the students along.
- The teacher will have the students point to the different vocabulary words and use augmentative communication devices if non-verbal.
- The teacher will provide three of the sequencing cards to place on the board.
- The students will point to pictures in the book.
- The teacher will have the students point to the plant propagation method.

Level 1:

- The teacher will do the same as above.
- The teacher will have the students listen to the text.
- The teacher will have the students to eye-gaze or point to the correct vocabulary word out of a choice of three.

INDEPENDENT PRACTICE (Additional opportunities where you plan to implement the objectives of this lesson for the students to carry over the skills to other areas…this is to help in planning for generalization practice)

- The students will complete a multiple choice and matching quiz on the new vocabulary- *seed, nursery, greenhouse, cutting, seed, grafting, propagation, vegetative reproduction, budding, perlite, compost, vermiculate* with teacher assistance. The teacher and assistants will circulate the room to provide assistance and prompting.
- The students will watch short videos on You Tube. The students will determine if the reproduction is sexual or asexual. If the reproduction is asexual, the students will identify the technique used.

Lesson 3

OBJECTIVE:

12. **Given different community greenhouses, the students will visit the greenhouses to learn about propagation in situ.**
    f. Given cameras, note sheets, and vocabulary lists, the students will identify the different forms of propagation in the visited greenhouses.
        a. The students will visit commercial greenhouses and learn about how to grow plants for sale.
        b. The students will visit the UNCC Greenhouse to learn about academic/instructional growing.
        c. Given the different locations, the students will observe professionals planting seeds and preparing plants for vegetative reproduction (grafting and cutting).
13. **Given AAC devices and adapted text, and worksheets/observation sheets, the students will explore what is needed for growing plants using different types of media and techniques.**
    j. Given pictures, adapted text, and videos, the students will identify different ways to grow plants for personal use.
    k. Given different seeds and a computer, the students will research the best seeds to grow in the school's location.
        a. Given different websites, the students will choose herbs, flowers, and fruits/vegetables to plant and grow.
    l. Given different soils and fertilizers and instructional videos, the students will demonstrate how to prepare the soil for seeds.
    m. Given different plants, the students will demonstrate how to perform a cutting and how to graft plants
14. **Given the mature plants, the students will be able to:**
    h. Document the plants that grew and did not grow.

i. Determine the reasons for the success of and failure of the plant growth

j. Determine which plants grew best and the techniques that worked best.

15. Answer the following questions in groups:

g. Which plants grew best at the school?

h. Why did those plants grow best?

i. How can plant growth be improved?

Readers/Level 3:

- The students will review vocabulary: *reproduction, adapt, pollination, autotroph, stem, leaf, photosynthesis, glucose, chlorophyll, chloroplast, gymnosperm, angiosperm, bryophytes, seedless vascular plants, seed, nursery, greenhouse, cutting, seed, grafting, propagation, vegetative reproduction, and budding* independently given a choice of four response options.
- Students will review the characteristics of propagation given a choice of four Velcro cards or using the worksheet independently or with verbal prompts.
- The students will complete a worksheet identifying the different features of plant propagation either independently or with verbal prompts.
- The students will point to and verbally identify each vocabulary word.

Level 2:

- The students will do the same activities as above with more intrusive prompting for errorless learning.
- The students will listen to and read the text using AAC devices.
- Students will review the characteristics of plant propagation given a choice of three Velcro cards or using the worksheet and verbal and more intrusive prompting as needed.
- Students will attempt to say the vocabulary word(s) and point to the word on the definition sheet.
- Students who have difficulty speaking will press the “Big Mack” to hear the word and will point to the correct vocabulary word on the definition sheet or on the word card given a choice of three response options.

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- The students will point to or eye gaze to the examples of the vocabulary.

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c. Given living things sentences and a video, the students will complete the sentence in order to analyze the object in the video.

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Level 1:

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- The teacher will have the students to eye-gaze or point to the correct vocabulary word out of a choice of three.

INDEPENDENT PRACTICE (Additional opportunities where you plan to implement the objectives of this lesson for the students to carry over the skills to other areas…this is to help in planning for generalization practice)

- Given different recipes, the students will use vegetables from the garden to create different dishes:
    - The students will make a salsa
    - The students will make a salad
    - The students will make a smoothie
- The students will demonstrate the following techniques:
    - Cutting
    - Grafting
    - Preparation of soil

    - Mixing different fertilizers with the soil

- Given a chart, the students will measure the height of the mature plant, the size of the flowers, the size of the fruit.

Appendix 1: Standards

- Ex. Biology 1: Understand the structures and functions of living organisms
- Ex. Biology 1.1: Demonstrate that plants make their own food through photosynthesis.
- Ex. Biology 2.1: Understand the interdependence of organisms within their environments.
- Ex. Biology 2.1.1: Differentiate foods (fruits, vegetables, nuts) from plants that are safe to eat and those that are not.
- Ex. Biology 2.1.2 and 2.1.3: Differentiate how plants and animals get energy.
- Ex. Biology 2.1.4: Explain how plants are part of food chains as producers.

Appendix 2: Materials

- Pictures and objects representing plants
- KWL Chart
- *Prentice Hall Biology*[xxxi]
- *Attainment Exploring Life Science*- Lesson 3: The structure of plants.
- *Attainment Exploring Life Science*- Lesson 4: Photosynthesis
- Smart Board
- Smart Board projections of Plant Information and vocabulary.
- Big Mack communication device
- Velcro Board containing the characteristics of living things
- Plant seeds, pots, grass, observation sheets.
- https://www.slideshare.net/joshbearman/plant-phyla[xxxii]
- Adapted text from the Plant Propagation textbook[xxxiii]
- Seeds
- Soil
- Fertilizer
- Perlite, compost, vermiculate, peat, moss
- Ph testing kit

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