



We can all be Scientists: Empowering Individuals with Disabilities to Become Citizen Scientists

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This curriculum unit is recommended for teachers of high school self-contained Special Education classes and for teachers of general education high school biology and chemistry classes in order to provide laboratory experience.

Key Words

Riparian, plant, stream cover, invasive, native, and erosion macro-organism, microorganism, benthic, predator, prey, habitat, macroinvertebrate, protist, algae, pollution tolerance, metamorphosis, larva, turbidity, daylighting, aquatic, point pollution, sediment, run-off, urban stream, urban stream syndrome, wetlands, dissolved oxygen, ph, and water temperature

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 urban streams and the plant and animal life that depend on the water, what the presence of the specific life means to health of the stream, and how to assess the health of the stream through chemical tests, and plant and animal assays. This unit will provide a completed adapted chapter and worksheets. The unit will begin with an introduction to water as a habitat in general and the water around us specifically. The students will explore streams, conduct chemical tests, and report the data. The students will also learn about the influence of human activity on stream health. The second lesson will focus on the plant life around waterways. The students will learn about the basics of plants, the different types of plants, and plant survival needs. The students will then use guidebooks to explore the plants around the streams. The final lesson will cover the animal and protist life around streams. The students will learn about invertebrates and microorganisms in general and will learn about the aquatic organisms that inhabit streams. The lessons will involve the use of different guidebooks and data collection sheets. The students will learn what the presence or absence of specific organisms means for the health of the stream. Finally, the students will understand the interactions between human activity, water pollution, and the effects of pollution on plant, animal, and protist life. 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 13 students in 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)¹, 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 addressed². 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).^{3 4}

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.^{5 6}

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

¹ "About IDEA | Individuals with Disabilities Education Act."

² Lindly, Sinche, and Zuckerman, "Variation in Educational Services Receipt Among US Children With Developmental Conditions."

³ Spooner and Browder, "Scientifically Based Research in Education and Students with Low Incidence Disabilities."

⁴ Browder et al., "Creating Access to the General Curriculum With Links to Grade-Level Content for Students With Significant Cognitive Disabilities."

⁵ "About IDEA | Individuals with Disabilities Education Act."

⁶ Spooner and Browder, "Scientifically Based Research in Education and Students with Low Incidence 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 assessments⁷. However, after the passage of IDEA and NCLB, districts were held accountable for student performance.⁸ The change in law also led 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.^{9 10}

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.^{11 12} 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.¹³

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

⁷ Browder et al., "Creating Access to the General Curriculum With Links to Grade-Level Content for Students With Significant Cognitive Disabilities."

⁸ Browder et al.

⁹ Browder et al.

¹⁰ Spooner and Browder, "Scientifically Based Research in Education and Students with Low Incidence Disabilities."

¹¹ Browder et al., "Creating Access to the General Curriculum With Links to Grade-Level Content for Students With Significant Cognitive Disabilities."

¹² Evmenova and Behrmann, "Research-Based Strategies for Teaching Content to Students with Intellectual Disabilities."

¹³ Curry, Cohen, and Lightbody, "Universal Design in Science Learning."

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 idea for this unit came from the seminar exploration period and the initial seminar meetings in April 2020. The idea of exploring the waterways around Charlotte and teaching students to become scientists has become a goal. The students will learn about fresh water habitats in their neighborhoods and communities. The students will learn about the plant and animal life in the streams. We will also explore what the presence or absence of specific types of life mean about the health of a waterway. The unit will provide adapted text and assessment opportunities to promote literacy and independent reading. The goal for this unit is for the students to draw connections between stream and waterway health and human activities. Another aspect of the unit will be to teach students how to evaluate sources and to connect different aspects of science into a unified whole (biology, chemistry, and physics). The courses will be conceptual and will provide opportunities for students to analyze information and construct learning opportunities.

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.¹⁴ 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.¹⁵ 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.

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

¹⁴ Courtade, *Attainment's Teaching to Standards*.

¹⁵ Courtade.

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 2,683 students during the 2019-2020 school year. The student body is 74% White, 9% African American, 11% Hispanic, 3% Asian, 3% multiracial, and <1% other nationalities. 13% of Hough students receive free and reduced lunch. Hough had a 94% graduation rate in 2019-2020.

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 23 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 energy and animal relationships. Students on the extensions are not expected to develop a deeper understanding of the curriculum. 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 three classrooms are divided by grade band. The students in the 9-12 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. Each of the teachers has a homeroom that meets daily. My homeroom of six 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 13 students in the 9-12 grade band science and social studies. 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. My social studies lessons are focused on 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.).

Background

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.

New Unit

All organisms require water to live. Water is one of the most important resources in the world. Most cities and towns are built near or on sources of fresh water. Waterways near urban areas have been subject to pollution, development, and human and animal waste. The new unit will focus on urban waterways.¹⁶ Most students live near a waterway and can access parks and greenways built around streams and ponds. Many of these waterways are subject to stress that comes with use and development. Many waterways may not have water in them or may be hidden underneath development and roadways. The goal of the new unit is to teach students with disabilities about the life found along urban waterways. The first lesson will focus on aquatic habitats and the different types of habitats. The second lesson will focus on the animal, protist, and bacterial life found in waterways. Identifying the animal, bacterial, and protist life can help to determine the health of the stream.¹⁷ Finally, the third lesson will focus on the plant and photosynthetic protist life found in streams and waterways. Different plants and protists can provide insight into the health of streams.

Content Research

Water

Wikipedia provides a concise definition of urban streams and the effects of human activities on the water quality of the streams. The article highlights different human activities such as engineering, stream lining, and that sewage and sediment can affect water quality. The article also touched on attempts to rescue waterways (daylighting, fixing stream banks, etc.).¹⁸

The North Carolina Department of Environmental Quality has a division devoted to water resources. This section of the website offers information on permitting, different groundwater sources, safe drinking water, highlights federal compliance efforts, and provides information on water quality efforts. The Water Sciences Section provides reports from chemists, biologists, and environmental scientists on the state's water resources. The section has data and reports from water, chemical, and biological assays.¹⁹

The Charlotte Mecklenburg Storm Water Services website provides a lot of resources and information on water quality and the viability of water in the county. The website offers data,

¹⁶ "Urban Stream."

¹⁷ "StudentDataSheet.Pdf."

¹⁸ "Urban Stream."

¹⁹ "Water Resources | NC DEQ."

maps, graphs, and information on how to volunteer. Of particular interest is the information on how to adopt a stream and conduct visual and chemical tests. The website offers direct contacts with employees of the department who will assist in obtaining materials and equipment. The website provides information on student educational opportunities and community involvement.²⁰

The American Rivers website discussed the effects of daylighting streams. Many streams in cities are buried underneath roads and buildings. Daylighting refers to exposing streams that have been buried to air and light. This process helps to reduce flooding and can help to revitalize communities.²¹

Turner (1918) provides an interesting historical perspective on the self-purification of water sources. He discussed how water picks up sewage as it travels around towns and cities. He discussed the effects of sunlight, bacteria, flooding, and dispersal. It was interesting reading about the study of water from over 100 years ago and how views on conservation and preservation efforts have changed over time. I had never heard of water self-purification and found it interesting that the topic continues to be a source of study.²²

Merel et. al (2013) discussed that cyanobacteria was important in the creation of the Earth's atmosphere. Cyanobacteria is frequently associated with toxic blooms that generate toxins that are detrimental to public health. These blooms occur because of higher water temperatures, light intensity, salinity, water movement, and stagnation. These blooms are responsible for the evolution cyanotoxins that are harmful to both aquatic and terrestrial life. These toxins can be reversed using reverse osmosis and chlorination. The researchers determined that human activity is responsible for many of these blooms.²³

Larsen and Ormerod (2014) explored the effects of human activity on water quality. They found that human activity and increases in sediment in streams resulted in changed species distributions and interactions.²⁴

Vorosmarty, et. al (2015) asserted that local communities must work on governing their water supplies. Local activities with water can have a global impact.²⁵

Miguel-Chinchilla (2018) discussed urban stream syndrome, which is the degradation of streams. Urbanization is not consistently associated with turbidity. The researchers had citizen scientists collect data at different water sites. The data indicated that managing both point pollution sources and streamside vegetation could mitigate turbidity.²⁶

Plants

²⁰ "Charlotte-Mecklenburg Storm Water Services."

²¹ "Daylighting Streams."

²² C. Elsmere Turner, "Plant and Animal Life in the Purification of a Polluted Stream."

²³ Merel et al., "State of Knowledge and Concerns on Cyanobacterial Blooms and Cyanotoxins."

²⁴ Larsen and Ormerod, "Anthropogenic Modification Disrupts Species Co-Occurrence in Stream Invertebrates."

²⁵ Vorosmarty et al., "Fresh Water Goes Global."

²⁶ Miguel-Chinchilla et al., "Local and Landscape Influences on Turbidity in Urban Streams."

Lynch (1997) provided a guidebook to exploring the native plants to North Carolina wetlands. The guide was developed for novices to be able to identify plants in different wetland areas. Plants are one of the key indicators of the health of wetlands and waterways. Protecting plants helps to protect food sources, habitats, and recreational sites for citizens.²⁷

Miller and Levine (2007) provided a text on the different phyla and classes in the plant kingdom. They also provide background information on plant phylogeny and habitats. The text also provides information on invertebrates and water.²⁸

Seeney, et. al (2018) explored riparian, or streamside, plants. They found that invasive plants on riverbanks reduce the diversity of macroinvertebrates in streams. The invasive plants also have the effect to reduce the abundance of native plants.²⁹

Invertebrates

The National Park Service website offers information on aquatic invertebrates. The information provided discussed the importance of the different invertebrates to determining the health of the stream. The website discussed that park rangers monitor the health of invertebrates in order to determine stream quality.³⁰

The North Carolina Department of Environmental Quality Water Sciences Section also offers information on the different benthic macroinvertebrates. The website and the reports therein provide information on the different macroinvertebrates in streams and what their presence or absence means about stream health. The department reports provide diagrams of the invertebrates in order to assist with collection and stream assessment.³¹

Beketov, et. al (2013) assessed the effects of pesticides on stream biodiversity. They found that pesticides reduced biodiversity of invertebrates in streams. Pesticides also reduced the richness of life of the affected streams.³²

Meyer and Sullivan (2013) determined that artificial light sources alter the population of invertebrates in streams and along banks. This research has implication for property development and the use of home and street lamps around water sources. Different types of light affects organisms differently.³³

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

²⁷ Lynch, "COMMON WETLAND PLANTS."

²⁸ Miller and Levine, *Prentice Hall*.

²⁹ Seeney et al., "Stream Invertebrate Diversity Reduces with Invasion of River Banks by Non-Native Plants."

³⁰ "Aquatic Invertebrates (U.S. National Park Service)."

³¹ "Water Resources | NC DEQ."

³² Mikhail A. Beketov et al., "Pesticides Reduce Regional Biodiversity of Stream Invertebrates."

³³ Meyer and Sullivan, "Bright Lights, Big City."

the different organisms in an ecosystem. The students should specifically learn about the kingdom Protista, kingdom Animalia, kingdom Plantae, and kingdom Eubacteria.³⁴ 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, the protist called algae is an important unicellular organism in many aquatic or semi-aquatic habitats. When the aquatic ecosystem is balanced, then algae becomes a source of food or energy for many different consumer organisms. However, when pollution or human activity brings a change to an aquatic ecosystem, algae can bloom and remove oxygen from the aquatic habitat; which can affect the lives of all other organisms in the ecosystem³⁵. Cyanobacteria, which is also called blue-green algae (it is a bacteria) is also important in photosynthesizing sunlight, creating food, and developing the atmosphere.³⁶ When cyanobacteria blooms, it can create toxins that are harmful to both aquatic and terrestrial vertebrates. The students should also learn about different ecosystems and food chains. How organisms get and use energy define an ecosystem. Any disruption to an ecosystem can hurt the organisms involved.³⁷ Brain Pop has a great introduction to ecosystems.³⁸ Teachers should also discuss pollution and how pollution affects ecosystems and organisms.^{39 40}

Unit

The new unit will focus on teaching students about rural and urban stream and river habitats. Each lesson will focus on one aspect of a waterway or stream. The first lesson will focus on aquatic habitats. The lesson will also address water pollution, different types of streams, and streams in cities. Lesson 2 will focus on the animal life in streams. Lesson 3 will focus on the plant life around streams and waterways. The overarching goal of this unit is to teach students job skills using science knowledge. My goal for this unit is to show academic professionals that individuals with disabilities are able to succeed in a variety of science based job positions.

Lesson 1 will involve learning about different aquatic habitats. The students will explore text and videos about different aquatic habitats.⁴¹ This lesson will also explore how fresh water sources are used as the drinking supply for many communities.⁴² Urban waterways are affected by a variety of issues. Development and construction, loss of vegetation, and sewage are all issues that affect. When nutrients, heat, light, and stagnation occur in a waterway, then certain organisms can over produce and cause damage to the aquatic ecosystem.^{43 44} Although some

³⁴ Miller and Levine, *Prentice Hall*.

³⁵ Miller and Levine.

³⁶ Merel et al., "State of Knowledge and Concerns on Cyanobacterial Blooms and Cyanotoxins."

³⁷ "Ecosystems - BrainPOP."

³⁸ "Ecosystems - BrainPOP."

³⁹ Miller and Levine, *Prentice Hall*.

⁴⁰ "Water Pollution - BrainPOP."

⁴¹ Miller and Levine, *Prentice Hall*.

⁴² "Water Supply - BrainPOP."

⁴³ Merel et al., "State of Knowledge and Concerns on Cyanobacterial Blooms and Cyanotoxins."

⁴⁴ Miller and Levine, *Prentice Hall*.

streams are able to self-purify when not overloaded⁴⁵, most will require the attention of citizens to monitor and report on the changes to streams.⁴⁶ The students will learn how to become stewards of the waterways and streams in their neighborhoods and at their schools. The students will learn about the different definitions of waterways.⁴⁷ The students will learn how to volunteer in their communities.⁴⁸ The students will also learn about turbidity⁴⁹ and how to measure turbidity.⁵⁰ The students will learn that local action has global consequences.⁵¹ Finally, this lesson will involve field trips to different urban, suburban, and rural streams to compare appearance and the different environmental stressors. The students will learn about various stream reclamation projects, such as daylighting streams⁵², which help streams to rehabilitate and host organisms.

Lesson 2 will address the different micro and macro invertebrates in aquatic habitats^{53 54}. The students will access the information using adapted chapters and activities. The students will learn the taxonomies and the place of the animals in the food chains. This lesson will focus on the invertebrates that inhabit aquatic habitats, as students will be working on the different vertebrates concurrently. The activities for both lessons 1 and 2 will be to collect samples at home and at school, to complete taxonomies on the sampled organisms, and to complete vocabulary and knowledge tests. This lesson will discuss how pesticides⁵⁵, artificial light sources⁵⁶, and human activity. The students will use a pre-made data sheet⁵⁷ to assess the health of various streams based on the presence or absence of various animals.

Lesson 3 will involve instruction in the plants, fungi, and protists in local waterways. The students will be able to determine the taxonomy and will determine their place in the aquatic habitat. The students will be presented with adapted chapters on plants, protists, and fungi. The chapters will be adapted from the grade appropriate textbook with important vocabulary highlighted and turned into vocabulary word cards. The students will use established food chain, organism, and taxonomy analyses to compare and contrast the different organisms to animals. The students and teachers will use a field guide to North Carolina plants⁵⁸ to identify the plants around streams. The students will learn that different plants, or the lack of plants, can help determine the health of a stream. The lesson will also cover the effect invasive plants⁵⁹ have on

⁴⁵ C. Elsmere Turner, "Plant and Animal Life in the Purification of a Polluted Stream."

⁴⁶ Vorosmarty et al., "Fresh Water Goes Global."

⁴⁷ "NC DEQ: WSW FAQ."

⁴⁸ "Volunteer."

⁴⁹ Miguel-Chinchilla et al., "Local and Landscape Influences on Turbidity in Urban Streams."

⁵⁰ *How to Measure Water Turbidity*.

⁵¹ Vorosmarty et al., "Fresh Water Goes Global."

⁵² "Daylighting Streams."

⁵³ "Aquatic Invertebrates - an Overview | ScienceDirect Topics."

⁵⁴ "Aquatic Invertebrates (U.S. National Park Service)."

⁵⁵ Mikhail A. Beketov et al., "Pesticides Reduce Regional Biodiversity of Stream Invertebrates."

⁵⁶ Meyer and Sullivan, "Bright Lights, Big City."

⁵⁷ "StudentDataSheet.Pdf."

⁵⁸ Lynch, "COMMON WETLAND PLANTS."

⁵⁹ Seeney et al., "Stream Invertebrate Diversity Reduces with Invasion of River Banks by Non-Native Plants."

the balance of aquatic ecosystems. Photosynthetic protists⁶⁰ and bacteria⁶¹ can have both a positive and deleterious effect on the health of streams. Many of these effects can have the root cause in human activity. The students will visit different streams and take data on the plants and protists found in the streams.⁶² The students will put all of the information together to create a report on stream health. The students will learn different skills to help protect the environment.

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.⁶³ 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,*

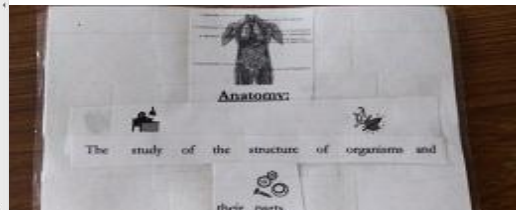
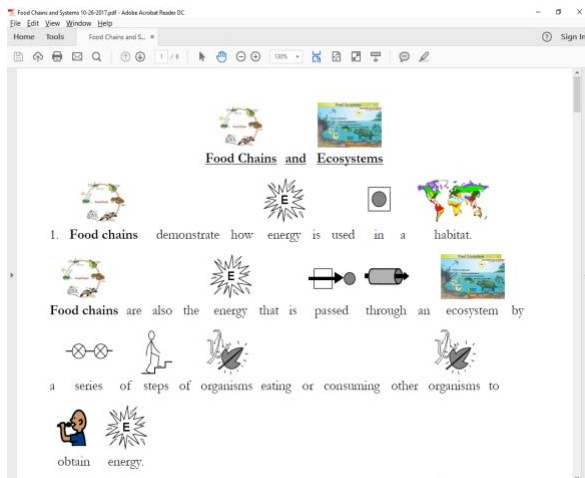


Figure 1.

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

⁶⁰ Miller and Levine, *Prentice Hall*.

⁶¹ Merel et al., "State of Knowledge and Concerns on Cyanobacterial Blooms and Cyanotoxins."

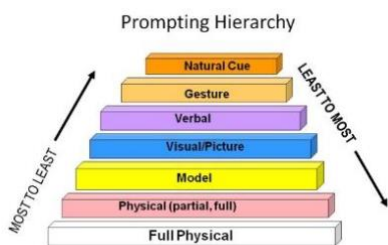
⁶² "StudentDataSheet.Pdf."

⁶³ Evmenova and Behrmann, "Research-Based Strategies for Teaching Content to Students with Intellectual Disabilities."

activity without supports from the teacher. Independence is different for different students based on ability level. For example, one student may be 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.)⁶⁴

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 student 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, —
 Education and Teacher Education (MAST).”

etc.). The goal is to create lessons or materials that provide access for the most students and making the classroom accessible to all learners.⁶⁵ 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.⁶⁶ 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.

Learning Experiences

Lesson 1: Water as a Habitat and Urban Streams

Objective:

1. Given AAC devices and adapted text, and videos on the Smart Board, the students will read the adapted information on the water and the different aquatic habitats.
 - a. Given adapted information on water and how water is important for life, the students will interact with the information by choosing either the correct vocabulary word presented as a choice card or in text that describes the properties of water (chemical make-up, salinity, how water functions as an ecosystem).
 - b. Given information on the different types of aquatic habitat, the students compare and contrast the different aquatic habitats.
 - c. Given different videos or online pictures, the students will describe the aquatic habitats and use context clues to determine the type of ecosystem.
 - d. Given information on different organisms and aquatic ecosystems, the students will explore how the different microorganisms interact in an aquatic habitat.
 - e. Students will define and differentiate urban streams from streams in rural areas and larger bodies of water.
2. Given AAC Devices, adapted text, and videos on the Smartboard, the students will learn about different threats to water habitats.
 - a. Given information via a Storm Water PowerPoint, the students will identify the different threats to local water.

⁶⁵ Curry, Cohen, and Lightbody, "Universal Design in Science Learning."

⁶⁶ Curry, Cohen, and Lightbody.

- b. Given a source of water pollution (sewage, run-off, animal waste, grease, etc.), the students will research the effects of the different pollution and present the information to the class.
 - c. Given information on sediment and the effects of sediments in streams, students will define turbidity and how high turbidity affects organisms in the streams.
3. Given AAC Devices, adapted text, and videos on the Smartboard, the students will learn how to assess the health of an urban stream.
 - a. Given information on urban stream syndrome, the students will learn about how water speed and heat alter the stream
 - i. Given pictures of urban and rural streams the students will compare and contrast the physical features of the stream
 - b. Given a testing kit, the students will collect samples from different water sources.
 - c. Given the water samples and test kits, the students will test for
 - i. Amount of dissolved oxygen.
 - ii. ph of the water.
 - iii. The temperature of the water
 - iv. The turbidity of the water
 - d. Given the data, the students will fill out the data sheets with the information collected. The data will help determine the relative health of the stream.
4. The students will answer the following questions in groups:
 - a. How do people use water?
 - b. How do different animals use water?
 - c. Why is stream health important?

Readers/Level 3:

- The students will identify/apply new vocabulary, such as turbidity, daylighting, aquatic, point pollution, sediment, run-off, urban stream, urban stream syndrome, wetlands, dissolved oxygen, ph, and water temperature independently given a choice of four response options as choice cards
- The students will analyze how pollution and development affect urban streams.
- The students will complete a cloze (fill in the blank) worksheet analyzing the different sources of pollution.
- The students will be able to compare and contrast urban streams from rural streams and will be able to discuss the differences.
- The student will be able conduct a chemical assay of a water source and report the data.

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.
- The students will complete a response option worksheet or cloze worksheet with key words determining the different sources of pollution with 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.
- The students will complete a response option worksheet that has been turned into discrete response choices in order to determine the wavelengths observed when given 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

Links to Prior Learning:

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.

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 water 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 identify the new vocabulary for the Velcro Word wall (turbidity, daylighting, aquatic, point pollution, sediment, run-off, urban stream, urban stream syndrome, wetlands, dissolved oxygen, ph, and water temperature).

Level 2:

- The teacher will do the same as above.
- The teacher will handout 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 students will point to pictures in the book.

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:

- Given a vocabulary test on water and water pollution, the students will choose the correct response to demonstrate comprehension and application of vocabulary. The students will receive immediate praise after selecting a correct response and immediate correction and feedback following incorrect responses. Students, who respond incorrectly, will be provided with an opportunity to provide a correct response.
- Given a testing kit, a data sheet and staff support, the students will collect data on a water sample and write the information on the data sheet. The students will practice the data collection as guided practice. After practice, the students will test different samples of water to demonstrate generalization of skills to different sources of water.

Lesson 2: Microorganisms and macro-organisms in urban and rural streams

Objective:

1. Given AAC devices and adapted text, and videos on the Smart Board, the students will read the adapted information on invertebrates.
 - a. Given adapted information on invertebrates, the students will learn about the features, behavior, and habitats of different invertebrates.
 - b. Given taxonomy analysis, the students will explore the anatomy of the invertebrate in order to determine its taxonomic groups.
 - c. Given videos or online pictures of different invertebrates, the students will determine the phylum and class of the organism and determine its habitat, diet, and phylogeny.
 - d. Given information on different aquatic macroinvertebrates, the students will
 - i. Define benthic
 - ii. Use maps and online information to determine the typical region of the animal.
 - iii. Predict which macroinvertebrates are likely to appear in local streams.
2. Given AAC Devices, adapted text, and videos on the Smartboard, the students will learn about microorganisms.
 - d. Given adapted information on different microorganisms, the students will explore the variety of microorganisms in any habitat.
 - e. Given taxonomy analysis, the students will explore the anatomy of the invertebrate in order to determine its taxonomic groups.
 - f. Given adapted and online information about microorganisms, the students will determine the most common habitats.
 - g. Given videos or online pictures of different microorganisms, the students will determine the phylum and class of the organism and determine its habitat, diet, and phylogeny.

- h. The students will predict which microorganisms are most likely to appear in an urban stream and what their presence or absence means about the health of the stream.
3. Given AAC Devices, adapted text, and videos on the Smartboard, the students will learn how to assess the health of an urban stream by collecting/observing different macroinvertebrates and microorganisms.
 - a. Given a net and container for a water sample, the students will collect samples from different water sources.
 - b. Given the water samples and data sheets, the students will identify different invertebrates and microorganisms in the sample.
 - c. Given the data, the students will fill out the data sheets with the information collected. The data will help determine the relative health of the stream.
4. The students will answer the following questions in groups:
 - a. What does pollution tolerance mean?
 - b. How do the different macroinvertebrates help determine stream health?
 - c. Why is stream health important?

Readers/Level 3:

- The students will identify/apply new vocabulary, such as macro-organism, microorganism, benthic, predator, prey, habitat, macroinvertebrate, protist, algae, pollution tolerance, metamorphosis, larva independently given a choice of four response options as choice cards
- The students will analyze how pollution and development affect the organisms living around a stream.
- The students will complete a cloze (fill in the blank) worksheet analyzing how the presence or absence of different organisms indicates the health of a stream.
- The students will be able to compare and contrast the organism life from urban streams and from rural streams and will be able to discuss the differences.
- The student will be able to conduct a biological assay of the benthic macroinvertebrates and microorganisms and report the data.

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.
- The students will complete a response option worksheet or cloze worksheet with key words determining the meaning of the presence of different organisms with 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.
- The students will complete a response option worksheet that has been turned into discrete response choices in order to determine the wavelengths observed when given 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

Links to Prior Learning:

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. The students will also review water pollution and urban stream syndrome.

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 water 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 identify the new vocabulary for the Velcro Word wall (macro-organism, microorganism, benthic, predator, prey, habitat, macroinvertebrate, protist, algae, pollution tolerance, metamorphosis, larva).

Level 2:

- The teacher will do the same as above.
- The teacher will handout 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 students will point to pictures in the book.

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:

- Given a vocabulary test on the different macro and microorganisms involved in an urban stream ecosystem, the students will choose the correct response to demonstrate comprehension and application of vocabulary. The students will receive immediate praise after selecting a correct response and immediate correction and feedback following incorrect responses. Students, who respond incorrectly, will be provided with an opportunity to provide a correct response.
- Given a net, a collection tube, a data sheet, and staff support, the students will collect samples of water and invertebrates in different streams. They will use microscopes and visual aids to identify the organisms in the samples. They will write the information on the data sheet. The students will practice the data collection as guided practice. After practice, the students will test different samples of water to demonstrate generalization of skills to different sources of water. Finally, the students will use the information to determine the overall health of the stream.

Lesson 3: Plants around urban streams

Objective:

1. Given AAC devices and adapted text, and worksheets/observation sheets, the students will read passages from text book chapter on Plants (in binders and projected on the Smart Board).
 - e. Given pictures, adapted text, and videos, the students will differentiate the different parts of plants (leaves, stems, trunks, flowers).
 - f. Given animal analysis sheets, the students will describe the relationship between animals (specifically humans) and plants (food, shelter, hobbies, etc.).
 - g. Given a taxonomy worksheet with or without choices, students will describe the different classes of plants and determine the taxonomic level.
 - h. 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.).
2. 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).
3. Given AAC Devices, adapted text, and videos on the Smartboard, the students will learn about invasive plants and riparian plants.
 - i. Given Given AAC Devices, adapted text, and videos on the Smartboard, the students will learn about the effects of invasive plant species and their effect on native plants and animals, especially around streams

- j. Given information online, the students will define riparian and will define why riparian plants are important for stream health.
 - a. Erosion control
 - b. Stream cover
 - c. Food
 - d. Slowing and cooling water (bioretention areas)
4. Given AAC Devices, adapted text, videos, pictures, and using s guidebook, the students will learn how to assess the health of an urban stream by collecting observation data on the types plants found around a stream.
 - a. Given a camera, the students will compare streams with plant cover to those without.
 - i. The students will describe the depths of the banks
 - b. Given the water samples and thermometer, the students will compare the temperature of water with many plants to those with few plants.
 - c. Given the data collected, the students will use the information to determine stream health and next steps.
5. The students will answer the following questions in groups:
 - a. What does invasive mean?
 - b. Why do streams need plant cover to survive?
 - c. Why is stream health important?

Readers/Level 3:

- The students will identify/apply new vocabulary, such as riparian, plant, stream cover, invasive, native, and erosion independently given a choice of four response options as choice cards
- The students will analyze how pollution and development affect the plants living around a stream.
- The students will complete a cloze (fill in the blank) worksheet analyzing how the presence or absence of plants affects the health of a stream.
- The students will be able to compare and contrast the plant life from urban streams and from rural streams and will be able to discuss the differences.
- The student will be able conduct a biological assay of the riparian plants and the appearance of the stream and report the data.

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.
- The students will complete a response option worksheet or cloze worksheet with key words determining the meaning of the presence of different plants with 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.
- The students will complete a response option worksheet that has been turned into discrete response choices in order to determine the wavelengths observed when given 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

Links to Prior Learning:

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. The students will also review water pollution and urban stream syndrome. The students will review the different macro and microorganisms in a stream.

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 water 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 identify the new vocabulary for the Velcro Word wall riparian, plant, stream cover, invasive, native, and erosion).

Level 2:

- The teacher will do the same as above.
- The teacher will handout 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 students will point to pictures in the book.

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:

- Given a vocabulary test on plants and plant structure, the students will choose the correct response to demonstrate comprehension and application of vocabulary. The students will receive immediate praise after selecting a correct response and immediate correction and feedback following incorrect responses. Students, who respond incorrectly, will be provided with an opportunity to provide a correct response.
- Given different pictures and videos of urban and rural streams, the students will compare and contrast the streams based on plant life. The students will use an adapted worksheet to differentiate the streams. The students will receive immediate praise after selecting a correct response and immediate correction and feedback following incorrect responses. Students, who respond incorrectly, will be provided with an opportunity to provide a correct response.
- Given a field guide, a camera, a collection tube, a data sheet, and staff support, the students will identify the plant life around different streams. The students will determine if the plants are native or invasive and the effect of the plants on erosion control. They will write the information on the data sheet. The students will practice the data collection as guided practice. After practice, the students will test different samples of water to demonstrate generalization of skills to different sources of water. Finally, the students will use the information to determine the overall health of the stream.

Appendix 1: Implementing Teaching Standards for North Carolina Standard Course of Study

Extended Essential Standards

High School Biology

EX.Bio.1 Understand structures and functions of living organisms.

EX.Bio.1.1 Identify that plants make their own food through a process called photosynthesis

EX.Bio.1.3 Identify that the cell is the smallest basic unit of life and most living things are composed of many cells.

EX. Bio.2.1 Understand the interdependence of living organisms within their environments.

EX. Bio.2.1.2 Identify that plants and animals get energy from food.

EX. Bio.2.1.3 Identify sources of energy for plants and animals (e.g., oats for horses, grass for cows, apple for people, fertilizer for plants).

EX. Bio..2.1.4 Understand simple food chains (e.g., grass gets energy from the sun, grasshoppers from grass, snakes from grasshoppers, and hawks from snakes).

EX. Bio.2.1.5 Understand ways living things compete with each other to get the things they need to live in their environment

Bio.2.1.2 Analyze the survival and reproductive success of organisms in terms of behavioral, structural, and reproductive adaptations

EX.Bio.2.2 Understand the impact of human activities on the environment

EX.Bio.2.2.1 Identify natural resources (e.g. water, air, land) impacted by human activity.

EX.Bio.2.2.2 Understand how pollution (e.g. waste dumping, littering, smog) affects natural resources.

9-10 English Language Arts: Reading Standards for Literature

2. Determine the theme or central idea of the text and select details that relate to it; recount the text.

Appendix 2a: Water Testing Data Sheet

Water Temperature: _____

Water ph: _____

Water Dissolved Oxygen: _____

Water Turbidity: _____

Is there a smell? _____

None

Rotten Eggs

Gas

Mossy

Dead Leaves

How does the water look? _____

Muddy

Clear

Yellow

Reddish

Appendix 2b: Benthic Macroinvertebrates

Directions: Circle the macroinvertebrates and microorganisms found in the creek or stream.

1. None

2. Use the data collection sheets to identify the benthic macroinvertebrates in your sample:

a. Stroud: <https://3jgs2o4a02n22u73bi2gnd31-wpengine.netdna-ssl.com/wp-content/uploads/StroudWebsiteMacroKeyFNL.pdf>⁶⁷

b. Hoosier River Watch: <http://www.orsanco.org/wp-content/uploads/2016/11/makingthemostofyourmacros.pdf>⁶⁸

3. Did you find any aquatic microorganisms? Yes No

Circle what you find:

Amoeba



Hydra



Tardigrade



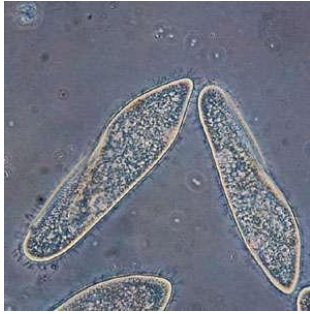
Stentor

⁶⁷ "StroudWebsiteMacroKeyFNL.Pdf."

⁶⁸ "Makingthemostofyourmacros.Pdf."



Paramecium



Rotifer



Didinium



Appendix 2c: Plants around the stream

1. Were there any plants around the stream?

Yes

No

2. Circle the plants you observed:

Trees

Oaks

Pines

Cedars

Maple

Grass

Wildflowers

Weeds

Take a picture of the stream plants

3. Did you find any algae in the water? Yes

No

4. Did the plants provide shade?

- Flashlights
- Adapted tests and quizzes
- Teacher made stimulus cards
- Different videos (YouTube, Brain Pop, etc.)
- microscope
- field guides to plants
- Pictures and objects representing organisms and plants
- KWL Chart
- Hypothesis, observation, and conclusion worksheets
- Online articles
- Adapted Binders containing definitions and examples made with *Writing with Symbols 2000*
- Smart Board
- Smart Board projections of plants, different organisms, aquatic habitats
- Big Mack and other AAC communication devices
- Velcro board for water, organism, and plant vocabulary
- Aquarium, terrarium, grass, potting soil, light, and water
- Camera
- Crayons, pencils, and pens
- Chemical testing kits
- Nets
- Water collection containers
- Thermometer
- Data sheets (chemical testing, organism identification, plant identification)

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