Academic Core: A direct approach to teaching fundamental Science and Social Studies concepts

Enclosed is Level A of the Academic Core. This teacher-directed instructional program teaches students important information from four domains—earth sciences, life sciences, physical sciences, and measurement. Each unit’s coversheet is colored coded to indicate the domain for that unit. They are as follows:

- Earth Sciences: Yellow
- Life Sciences: Green
- Physical Science: Blue
- Measurement: Lavender

The program is broken into 11 units. Each unit has 4 to 24 lessons. The lessons are to be presented daily to the whole class and take approximately 20 minutes to teach. The program is sequenced so that information does not overlap and become confusing. Information needed to understand some complex concepts is presented over time in several different units. Units can be used separately as long as students know the basic information taught in earlier units or the earlier units are pre-taught.

If you have questions concerning the program or implementation, contact info@nifdi.org.
# Academic Core Level A

## Table of Contents

### Guide
- Overview of NIFDI Academic Core
- Certificate of Achievement
- Summary of Information Taught in Level A

### Units

<table>
<thead>
<tr>
<th>Unit</th>
<th>Description</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Measurement of Length</td>
<td>7, 8</td>
</tr>
<tr>
<td>2.</td>
<td>Vertebrates</td>
<td>11, 12</td>
</tr>
<tr>
<td>3.</td>
<td>Temperature</td>
<td>4, 5</td>
</tr>
<tr>
<td>4.</td>
<td>Phases of Matter: Solid, Liquid, Gas</td>
<td>3, 4</td>
</tr>
<tr>
<td>5.</td>
<td>Life Cycles</td>
<td>5, 6</td>
</tr>
<tr>
<td>6.</td>
<td>Time: Calendar</td>
<td>13, 14</td>
</tr>
<tr>
<td>7.</td>
<td>Measurement of Length: Conversions</td>
<td>6, 7</td>
</tr>
<tr>
<td>8.</td>
<td>Arthropods</td>
<td>3, 4</td>
</tr>
<tr>
<td>9.</td>
<td>Measurement of Weight</td>
<td>6, 7</td>
</tr>
<tr>
<td>10.</td>
<td>Solar System</td>
<td>6, 7</td>
</tr>
<tr>
<td>11.</td>
<td>Body: Skeleton</td>
<td>23, 24</td>
</tr>
</tbody>
</table>

### Challenges

### Displays
- Unit Displays
- Challenge Displays
Overview of NIFDI Academic Core

Academic Core is a highly structured four-level program (A through D) developed by the National Institute for Direct Instruction (NIFDI) to teach students important science facts and information. The program ensures mastery of sophisticated information and includes a built-in rewards system to motivate and reinforce students. Measurement, time, the solar system, rocks, body systems, and United States geography are just a few of the units included in Academic Core Levels A through D.

Academic Core is intended for students in grades 2 and above. Each level is divided into units. Each unit is focused on one specific topic. There are 4 to 24 lessons in each unit in Level A. The lessons take approximately 20 minutes to teach and should be scheduled daily. Each lesson is designed to be presented to the entire class but can also be presented to small groups.

Academic Core is primarily a verbal program directed by the teacher. The teacher presents lessons from a script and students respond verbally. Once brought to verbal mastery, students respond to questions in writing. Many units include reference charts, maps, or displays. This material is on a PowerPoint display contained on a CD. (For teachers who do not have access to the equipment necessary to use the PowerPoint displays, a separate display booklet is included with the material.) Most units stand alone; however, some units are dependent upon information from earlier ones. This overlap of information requires the teacher to either follow the exact sequence of each level or to make sure the students know the prerequisite information.

Review
Academic Core does not have a built-in review component; however, the information must be continually reviewed if the students are to remember it. An efficient way to accomplish this is with Review Fridays.

Each Friday, review information is presented. The teacher presents the last two lessons of any unit previously taught. For example, if units 1, 2, 4, and 5 have been taught, the teacher may select any one of these four units to review. The review lessons — the final two lessons in the unit — are marked with the following banner:

REGULAR LESSON/MASTERY TEST • FRIDAY REVIEW

All students should be at least 90% accurate on Friday Review lessons. If they are not at mastery, the unit or the material missed should be repeated.
Evaluation
Mastery Tests
The last two lessons of each unit are Mastery Tests. The lessons are a series of questions on the material that was presented during the unit. Students produce written responses to teacher questions and check their work upon completion. Approximate spellings for complex vocabulary or labels are acceptable. At least 90% of students must be at 90% accuracy or above on information before the next unit is started.

Mastery Over Time
Challenge Rounds
Challenge Rounds are assessments of retention over time. Challenge Rounds are different than the end of unit Mastery Tests. Students take Challenge Round tests from any unit presented up to that point. Challenge Rounds may not include the 15 lessons most recently taught. The challenges ask students to both recall specific information and to use information that they have learned to solve problems. Students who pass the tests earn stickers on a certificate of achievement.

Challenge Rounds are scheduled during the year to provide opportunities to celebrate students’ academic achievement in learning difficult information. Challenge Rounds should begin approximately 30 lessons after Academic Core has started and are held the last full week of each month.

Challenge Awards
A student earns a seal on a certificate of achievement every time he/she passes a Challenge Round. Passing five Challenge Rounds earns a certificate. Special recognition such as a medal, letter home, or being honored by the principal should be given after the student earns the second certificate. The number of stickers required for each award level is summarized below.

<table>
<thead>
<tr>
<th>Stickers</th>
<th>Award</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 stickers</td>
<td>Certificate</td>
</tr>
<tr>
<td>10 stickers (cumulative)</td>
<td>Certificate + Special Recognition (Silver medal, letter home, or award assembly.)</td>
</tr>
<tr>
<td>15 stickers (cumulative)</td>
<td>Certificate + Special Recognition (Gold medal, letter home, or award assembly.)</td>
</tr>
</tbody>
</table>

Achievement Excellence Award
Presented to Gary Davis
For Meeting Challenges of Skill and Knowledge

Length

By: ____________________________________________
Date: __________________________
**Pass Criteria for Challenge Rounds**

Each student must perform at 90% accuracy or above to pass a Challenge Round. Any student who fails may retake a Challenge, but must wait at least three full instructional days before retaking it. The passing criterion is still 90%. Students may retake Challenges until they pass.

Examples:
- If Gary fails the Vertebrate Challenge on Monday, the first day he can retake the Vertebrate challenge is Thursday.
- If Maria fails the Temperature Challenge on Thursday, she may not retake it until the following Tuesday.

**Getting Started**

Academic Core should start with a motivating kickoff event. Tell the students a few interesting facts about the information they will learn during the year. Emphasize that the material is difficult and that even many adults do not know all the things that they are going to learn. Show them the certificate of achievement and describe the silver and gold medals or the special recognition that they will earn. Teach students that the harder they work, the smarter they’ll get. Follow this introductory routine for several days.
Achievement Excellence Award

Presented to

_____________________________________________

For Meeting Challenges of Skill and Knowledge

Challenges:

_____   _____   _____   _____   _____

By: ___________________________   Date: ___________________________
SUMMARY of Information Taught in Level A

Unit 1. MEASUREMENT OF LENGTH

Basic conversions:
There are 12 \textbf{inches} in a \textbf{foot}.
There are 3 \textbf{feet} in a \textbf{yard}.
There are 36 \textbf{inches} in a \textbf{yard}.
There are 5,280 \textbf{feet} in a \textbf{mile}.
There are approximately 2 ½ \textbf{centimeters} in an \textbf{inch}.
A \textbf{meter} is about 39 \textbf{inches} long.
There are 100 \textbf{centimeters} in a \textbf{meter}.

Unit 2. VERTEBRATES

If it’s a \textbf{living thing}, it’s either a \textbf{plant} or an \textbf{animal}.
\textbf{Vertebrates} are \textbf{animals} with backbones.
There are 5 classes of animals with backbones.
1. \textbf{Mammals} 2. \textbf{Birds} 3. \textbf{Fish} 4. \textbf{Reptiles} 5. \textbf{Amphibians}

Facts about \textbf{mammals}:
- feed their babies milk
- have a steady body temperature
- have hair

Facts about \textbf{birds}:
- lay eggs
- have a steady body temperature
- have feathers

Facts about \textbf{fish}, \textbf{amphibians} and \textbf{reptiles}:
- don’t have a steady body temperature
- lay eggs
Facts about **fish:**
lay eggs
don’t have a steady body temperature
don’t breathe air—have gills

Facts about **amphibians:**
usually lay eggs
don’t have a steady body temperature
babies live in the water

**Unit 3. TEMPERATURE**

**Temperature** is measured in **degrees.**

We usually use **Fahrenheit.**

Facts about Fahrenheit:
Water freezes at 32 degrees Fahrenheit.
Water boils at 212 degrees Fahrenheit.
Normal room temperature is 70 degrees Fahrenheit.
Normal body temperature is 98.6 degrees Fahrenheit.
The melting temperature of glass is 2,500 degrees Fahrenheit.
The lowest temperature ever recorded on earth was 129 degrees below zero. It was at Vostok, Antartica, July, 1983.

A different scale of measuring temperature is **Celsius.**

Facts about Celsius:
Water freezes at zero degrees Celsius.
Water boils at 100 degrees Celsius.
Normal body temperature is 37 degrees Celsius.
Unit 4. PHASES OF MATTER: SOLID, LIQUID, GAS

All things that you can see or touch are matter.

Facts about matter:
- Matter has 3 phases: solid, liquid and gas.
- The solid phase is the coldest.
- Liquid is the next hottest.
- The gas phase is the hottest.
- Each substance has a melting temperature.
- Each substance has a boiling temperature.

  * **Melting temperature** — changing from a solid to a liquid.
  * **Boiling temperature** — changing from a liquid to a gas.

Facts about the sun:
- The surface is 11,000 degrees Fahrenheit.
  It is so hot that everything is a gas.

Fact about some planets far from the sun:
- It is so cold that everything is a solid.

  * **Nitrogen** melts at 346 degrees below 0.
  Nitrogen boils at 320 degrees below 0.

  * **Copper** melts at 1,981 degrees Fahrenheit.
  Copper boils at 4,172 degrees Fahrenheit.

  * **Glass** melts at 2,500 degrees Fahrenheit.
  Glass boils at a much, much higher temperature.

Facts about heating things:
- When solids are heated, they expand.
- When solids are cooled, they contract.
Unit 5. LIFE CYCLES

All insects are born from eggs.

Baby form — larva
Fly form — maggot
Butterfly larva — caterpillar

Metamorphosis is the change larva undergoes to become an adult insect. Stage between larva and adult — pupa

Amphibians change as they grow. They start out as eggs. The little animals live in water. They have gills. They grow legs and the tail disappears. As adults, they have lungs.

Baby stage of frogs and toads — tadpole

Unit 6. TIME: CALENDAR

There are 12 months in a year. January, February, March, April, May, June, July, August, September, October, November, December

There are 7 days in a week. Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday

There are 365 days in a year.

There are 24 hours in a day. Each day is divided into 2 parts. Each part is 12 hours long. The morning hours are A.M. hours. The afternoon and evening hours are P.M. hours.
There are 60 minutes in an hour.
There are 60 seconds in a minute.
There are 52 weeks in a year.
There are 4 seasons in a year. Winter, Spring, Summer, Fall
There are 100 years in a century.
There are 30 years in a generation.
There are 10 years in a decade.

B.C. years are the years that came before Christ.
A.D. years started after the birth of Christ.

The Great Pyramids of Egypt were built in 2700 B.C.
Columbus discovered America in 1492.
The United States became a nation in 1776.

To figure out how long ago B.C. years were, you add 2,000 years to the B.C. number shown.
To figure out how long ago A.D. years occurred, you subtract the number from 2,000.

Unit 7. MEASUREMENT OF LENGTH: CONVERSION

There are 12 inches in a foot.
There are 36 inches in a yard.
There are 39 inches in a meter.
There are 3 feet in a yard.
There are 5280 feet in a mile.
There are 2.5 centimeters in an inch.
There are 100 centimeters in a meter.
There are 100 meters in a kilometer.
There are 1 6/10 kilometers in a mile. A kilometer is not as long as a mile.

To figure out how many centimeters are in 1 inch, 2 inches, 3 inches, or 4 inches you count by 2 ½. Listen: 2 ½, 5, 7 ½, 10.
Unit 8. ARTHROPODS

Facts about insects:
Insects have 3 main parts: head, thorax, and abdomen.
Insects are cold-blooded.
All insects have 6 legs.
Spiders are not insects.
Insects are members of a large group of animals called arthropods.

Facts about spiders:
Spiders have 2 body parts.
Spiders are arachnids.
Spiders are members of a large group of animals called arthropods.

Facts about arthropods:
All arthropods are cold-blooded.
Arthropods have legs with joints.
Arthropods have an exoskeleton.

Unit 9. MEASUREMENT OF WEIGHT

Basic conversions:
There are 16 ounces in a pound.
There are 2000 pounds in a ton.
There are about 28 grams in an ounce.
There are about 2.2 pounds in one kilogram.
Unit 10. SOLAR SYSTEM

The solar system is made up of the sun, eight planets, and a dwarf planet. The sun is in the middle. All planets revolve around the sun.

Facts about the sun:
- The sun is matter in the gas phase.
- The surface temperature is 11,000 degrees Fahrenheit.
- The inside is much hotter.
- The sun is actually a star.
- The diameter is 100 times the diameter of the earth.

Facts about the planets:
- All planets have solid matter.
- The closer the planets are to the sun, the more heat and light they receive.
- The path the planets follow as they go around the sun is called an orbit.

The four planets closest to the sun are Mercury, Venus, Earth and Mars.

**Mercury**
- Closest planet to the sun
- 36 million miles from the sun
- The hottest planet
- Temperature id 800 degrees Fahrenheit
- Diameter is 3,000 miles

**Venus**
- 67 million miles from the sun
- Called the evening or morning star
- Temperature is 600 degrees Fahrenheit
- Diameter is almost 8,000 miles
Earth
the third planet from the sun
93 million miles from the sun
takes 365 days to go around the sun one time
diameter is 8,000 miles
can support living things
atmosphere contains oxygen
has a moon

Mars
142 million miles from the sun
takes 2 years to go orbit the sun
temperature is 27 degrees below 0 Fahrenheit
diameter is 4,000 miles

The other four planets are Jupiter, Saturn, Uranus, and Neptune.
Jupiter
largest of the planets
is 5 times as far from the sun as Earth
orbits the sun in 12 years
diameter is 88,000 miles
has at least 56 moons

Saturn
has beautiful rings
the rings are made of rocks
takes 30 years to orbit the sun
diameter is 71,000 miles
has over 60 moons

Uranus
four times as large as Earth
2 billion miles from the sun
takes 84 years to orbit the sun
has 27 moons
Neptune
  takes 165 years to orbit the sun

The dwarf planet is Pluto.

Pluto
  takes 248 years to orbit the sun

Unit 11. BODY: SKELETON

Cranium — skull bone
Femur — biggest bone in the upper leg
Spine — backbone
Ribs — you have 24 ribs . . . 12 on each side
Clavicle — collarbone
Pelvis — hipbone
Phalanges — finger and toes
  you have 56 phalanges . . . 14 for each hand and foot
Humerus — upper arm
Patella — knee cap
Ulna — forearm bone . . . comes out of the elbow
Vertebrae — bones of the spine
  a baby has 33 bones . . . an adult has 26 bones.
Radius — forearm bone . . . can feel by your thumb
Sternum — goes down the middle of the rib cage
Tarsals — seven bones in each ankle
Scapula — shoulder blade
Tibia — lower leg . . . outside of shinbone
Mandible — jawbone
Carpals — eight bones in each wrist
Metabones — metacarpals . . . hand metatarsals . . . foot