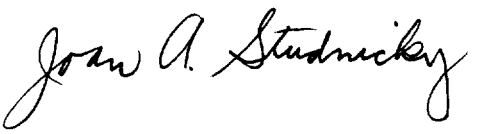
Astronomy: A Themantic Unit

An Honors Thesis (HONRS 499)

by

Tina D. Cobb

Dr. Joan Studnicky



Ball State University

Muncie, Indiana

June 1993

Expected graduation date December 1993

Purpose of Thesis

Education occurs constantly, and not always in a classroom. I want my students to realize that learning does not end when they leave my classroom. I wrote lesson plans with the common theme of astronomy to show my students that astronomy is not limited to science. Not all lessons were specifically about astronomy, but they contained symbols or visual references which remind students of the integration of astronomy into every aspect of the curriculum. I want my students to realize that any area of interest they have should not be compartmentalized or limited. I want them to see that all aspects of life are interrelated with many commonalities and that they can use their knowledge to draw correlations and relationships between things.

I wrote my lesson plans for different ages in elementary school so that they can be adapted or expanded to fit any age group. These lessons can easily be adapted for special education classes or for students with special needs so that they do not miss out on anything. I tried to make as many hands on lessons as possible to get children to be active learning participants. I also included extensions to lessons or activities children could do alone, both to increase learning opportunities and to allow the teacher flexibility in planning.

ART LESSON

The center point of our discussion will be Van Gogh's Starry Night.

Vincent Van Gogh

BIRTH: March 30, 1853 in Grootzundert, Holland.
DEATH: July 29, 1890 in Auver-sur-Oise, France of a self-inflicted gun wound.

BIOGRAPHICAL INFORMATION: Vincent was the oldest child of Theodorus Van Gogh, a preacher in the Reformed Church. His mother was Anna Cornelia, whose family were bookbinders. Vincent had two younger brothers and three younger sisters. He was closest to his brother Theo. Vincent worked in the art galleries of his uncle in Holland, England, and France for 7 years.

Vincent became very religious after being rejected by his landlady's daughter, who was promised to another. He went to England to become a minister; however, after four years of trying and failing, he dedicated his life to art. Theo provided Vincent with money to pay for his supplies. Vincent was so passionate about painting that he would go without food in order to have money for painting supplies. It was after several years of neglect that his body began to fail and he was hospitalized several times. Vincent's mind faltered and he began to have fits of madness. It was in one of these fits that he cut off part of his left earlobe and sent it to a prostitute. In 1889 he admitted himself to a mental asylum and in 1890 he shot himself and died.

MEDIUM: Vincent did study pictures with pen and ink to create visible texture before reproducing these pictures in oil paints.

MAJOR WORKS OF ART: His most famous works include: The Self-Portrait, Starry Night, The Artist's Bedroom at Arles, and Portrait of Dr. Gachet.

SUBJECT MATTER AND CONTENT: Vincent painted landscapes, still lifes, everyday scenes, portraits, and a multitude of self-portraits.

STYLE/PERIOD: Vincent's style coincided with Post-Impressionism. Some of the characteristics of Post-Impressionism include: intense, brilliant colors; loose brushwork, with some heavy layers of paint; and a swirling composition. Other Post-Impressionists include Paul Cezanne, Paul Gauguin, and Georges Seurat.

ANALYZING ARTWORK: Students will analyze the qualities of Van Gogh's Starry Night and point out to their small group where they see such qualities. Then the students will play "Van Gogh", which is similar to Bingo.

Materials:

1. laminated gamecards
2. overhead marking pens or dry erase pens
3. various Van Gogh Visuals
4. post-it notes numbered as high as the number of visuals being used

The teacher, or another student, begins by holding up a visual of one of Van Gogh's works which has a post-it note attached to it. The post-it note has a number written on it so the visuals can be identified by number. The student studies the picture and compares qualities of the picture with the qualities listed on his gameboard. If he finds one that matches, he writes the picture's number on that space on his card. The teacher continues showing visuals until someone yells, "Van Gogh". When the student has four corners covered or four across they yell, "Van Gogh". The student must then defend why he covered the space on his card for each specific visual. The answers should be considered correct as long as the child can show how they arrived at their explanation.

LANGUAGE ARTS AND WRITING LESSON

OBJECTIVES:

Students will brainstorm ideas to pick topics on which to research and report.

Students will decide what questions they want answered and what sources they will use to answer those questions.

Students will develop a list of job descriptions and job responsibilities.

Students will write and edit work.

ANTICIPATORY SET:

We have been discussing lots of different areas of astronomy and you have become very knowledgeable. Now we are going to share our knowledge with others. We are going to make a class newspaper.

TEACH:

First we need to brainstorm. What people do you know who work for a newspaper? What are the names of their jobs? Write on board: editor, reporter, photographer, researchers, print designers, vendors, delivery people, assistant editors, and proofreaders.

What are the responsibilities each of these people have?

Editor- Will be the teacher. The editor is the one who checks everyone else's work before the paper is printed.

Reporter- The people who write the story.

Photographer- Takes pictures of interviews and subject materials.

Researchers- They do all of the background work and look things up to check facts or information. They work closely with the reporters.

Have the number of jobs equal to the number of children. The teacher is the editor, but there can be assistant editors who are students. Draw names from the hat and allow students to pick jobs. If they don't get the exact job they want they may find another student who is willing to trade.

As a class we have to decide what will be in our astronomy newspaper. I want each of you to think of two questions that you would like to see answered. Teacher writes questions on the board or overhead.

Now we have to decide which questions to answer. Can we answer them all? Do some questions have answers that we all know? If we all know the answer it might not be news. We need to decide what questions to answer and if we can group them together so our researchers and reporters can work with them. Use more group discussion to finalize and get a more definite idea of topics that will be covered and what questions may be answered.

Does everyone know what to do for their job? How do we get started? What do we do first?

PRACTICE:

Before we begin, let's take a look at this question. Pick a question to which the class knows the answer. Go through every job and give an overview how the process works to research and answer the question, report the story, how to get photos, how to discuss with editors, and set up the design layout of the article to prepare for printing. Ask the class if they have suggestions on what to do or add. Pick another question and

ask the students what they would do first. Have them write it down. The teacher should circulate and read to see if the students can organize what to do before setting them loose on their specific job.

Before setting you loose I think we need to decide how we will know if this newspaper was done well. We need to write down qualities that we want this paper to have. Be specific. These qualities that you write down are how we will know if we were successful and met our goal.

EVALUATION:

Have students fill out a survey of their views on the newspaper in general.

Example questions:
Were the stories informative?
Were the stories clear?
Did the photos go with the stories accurately?
Was the spelling correct?
Did the stories make sense?
Were the stories interesting?
Was the correct punctuation used?

Have students write down or use an audiotape to record what job they had, what the job responsibilities were, and how they carried out those job responsibilities, giving specific examples.

MATH LESSON

I chose skip counting as my topic to use as a link to introducing the concept of multiplication.

OBJECTIVES:

The students will make number sets that skip count by 2's, 3's and 5's.

The students will make record cards of skip counting that will become multiplication cards later as an integral link between addition and multiplication.

ANTICIPATORY SET:

We're going to work on a special kind of counting called skip counting. Do you know what skipping is? Who can explain skipping or what it means to skip?

TEACH:

Skipping is like hopping, both feet are never on the ground at the same time. I can put my feet heel to toe, heel to toe while walking, but not while skipping. With numbers, I can count, but I won't count every number.

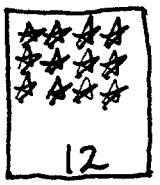
Today we'll be working with these. Hold up number cards, blank cards, and stars. **Everyone needs to get one of these and then line up.** Hold up the number cards, numbered 1-25, or as many students as there are. **I want the numbers in order, smallest on the left and largest on the right. With these numbers we are going to skip count by 2's. That means if I count, "One, two, one two..." that all of the ones sit down and all of the twos stay standing. Let's do that now.** Count aloud and have students sit or stand as indicated. **The numbers we have left are what we can skip count by two. Let's say them together, "Two, four, six, eight, ten, twelve, fourteen, sixteen, eighteen, twenty, twenty-two, twenty-four."**

If I want to skip count by 4's I count, "One, two, three, four, one, two , three, four...". Everyone with one, two, or three sits down and the fours remain standing. I want everyone to think to himself or herself and decide if your number will sit down or will stay standing. Give the students about 30 seconds to think and decide. **Okay, let's try it. Everyone line up and count. Once everyone has moved then we will skip count together. Let's count, "Four, eight, twelve, sixteen, twenty, twenty-four." What would be the next number in our skip counting pattern by fours?** 28.

Now watch me please. We're going to record our skip counting on these cards. I'll show you with the 4's we just counted. The first number standing is four, so we put four stars in a row and write the number 4 at the bottom like this:

Our next number was eight. We started with four and added four, so that's eight. That goes like this:

The next number was twelve. That's 4 + 4 + 4. How do you think I will show that number on the card?



PRACTICE:

I want you to tell me how to make cards for skip counting by twos like we did first. On a piece of paper at your desk you'll write them down and we'll all go through it together.

Sample question: **What was our first number when we were skip counting by 2's? Why? What was the second number? How do you know? How do I make a record card for the number four?**

Take these paper rockets and write down on them the numbers that skip count by two. I want the last number of our counting to be 24. Then put them in order on your desk for me to see.

APPLY:

Students will make rocket counters for skip counting by 2's, 3's, and 5's.

Students will make record cards for 2's, 3's, and 5's which will be saved to introduce multiplication.

EVALUATION:

Can the students explain how skip counting works? Can they use the rockets and the record cards? Can they back up their explanations? Have them record the answers to those questions on a piece of paper and put it in their student portfolio.

What is skip counting?

How do you skip count?

Give examples and draw pictures to explain.

FUTURE LESSONS:

The record cards can be used to teach multiplication, as repeated addition. The cards will already be set up in rows to visually demonstrate that 12 is three rows of four, or 3 x 4.

MUSIC LESSON

I am teaching this song first because it only has 3 chords, 3 different notes, is $\frac{4}{4}$ time and in the key of F.

OBJECTIVES:

For the students to be able to identify the type of notes in the song (half note, quarter note, and eighth note) and tell the difference between these notes.

Using those notes and a $\frac{4}{4}$ measure, have the student write a rhythm pattern.

Have the students find the correct chords on the autoharp (F, C7, and B flat) and strum the correct chords following the teacher cues.

Have students make music following certain guidelines involving time signature, key, and type of note. This music will be turned in to the teacher and will be played for the class by individuals or by groups of students.

ANTICIPATORY SET:

How many of you are part German? Today we will be working with a German Folk Song called "O Beautiful Banner."

TEACH:

Example leading questions: **What is a banner? What are some things that might be on a banner? Is our country's flag a banner? What is on our flag?**

Listen to the words of the song and tell me what is on their banner. Teacher sings and plays the song on the piano. **What is on their banner that we have been talking about in class?** Stars. **Are the stars in this song real stars or symbols?** Symbols. **How do you know?** They're talking about stars on a flag, not stars in the sky. **Now we're going to talk about other symbols. What are these?** Hold up half note, quarter note, and eighth note. **What about this?** Hold up $\frac{4}{4}$. **What about these?** Hold up clef sign and measure bars. **Who can come up and place these in the correct position on the staff?** Have one per student and make sure to have two eighth notes so that it adds up to four beats in the measure.

Example: 

Can we all count this measure together? One, two, three, four and. If the students arrange it in a difficult way, work through it and have the students suggest different ways to count it. Only rearrange it if the students suggest it. If the measure is rearranged, try to rearrange it several times to reinforce that the notes carry the same value and that there are four counts in the measure no matter how it is rearranged. Then move it back to the original position and have the students count it and clap it.

Now we're going to sing the song together. I'll play the melody on the piano for you and then we'll add in the chords. Play the melody and sing several times, then add the chords, then see if they can sing the melody while I play only the chords- F, C7, and B flat. Once they have the melody then break them up into groups with autoharps- the F group, the C7 group, and the B flat group. Go through the song cueing the groups when to play their chord and having them sing along. Rotate students through so that everyone has a turn.

PRACTICE:

Break up into groups of two. One partner writes a measure in $\frac{4}{4}$ time and the other partner plays it with rhythm sticks. Students may use half notes, quarter notes, and eighth notes in various combinations. Students will write the rhythm down on individual cards and then will put several individual cards together to make a larger rhythm. The students can then form larger groups challenging other groups to play their rhythm and practicing the other group's rhythm.

APPLY:

The students will write and perform ten measure of music in $\frac{4}{4}$ time using half notes, quarter notes, eighth notes, and the key of F. The students may work alone or in groups. The instruments the students use may be the piano (using one note), autoharp (using one chord), or the rhythm sticks or handdrum. The students will perform for the class and turn in their individual written work.

EVALUATION:

The evaluation will be on the correct use of time signature, key and type of notes used in the ten measures of music. Students may revise and perform their work again for grade improvement. Students may ask the teacher or other students to check their progress before turning in their work.

FUTURE LESSONS:

Use "Morning Is Come" as another song to reinforce note values of half note, quarter note, and eighth note. "Morning Is Come" is in the key of G, so there is one sharp, while "O Beautiful Banner" is in the key of F, having one flat. "Morning Is Come" is in $\frac{3}{4}$, so it would be good to use to evaluate students' understandings of measure and time signatures. The concept of a round could also be introduced as "Morning Is Come" is a four part round.

Next, use "Slumber, Slumber" to introduce the dotted half note. "Slumber, Slumber" has the same chords as "O Beautiful Banner", so it would be next in a logical progression. The autoharp could be used and music reading could be introduced. The students would already be familiar with the chord positions, so they could look at the music and read the chords at the top of the music, following the words.

FOLLOWING THE ASTRONOMY THEME:

STAR SONGS:

Cradle Song
Dakota Hymn
O Beautiful Banner
Slumber, Slumber
Stars Of The Summer Night
The Star-Spangled Banner
Turn Ye To Me
Valleys Green, You Are My Joy

SUN SONGS:

A-Roving
As The Sun Goes Down
Ev'ry Night When The Sun Goes Down
He's Got The Whole World In His Hands
In Summer, The Sunshine Is Brightest
Taps
Tree Songs
Valleys Green, You Are My Joy

MOON SONGS:

As The Sun Goes Down
He's Got The Whole World In His Hands
Stars Of The Summer Night
The Silver Moon Is Shining

EARTH SONGS:

Dakota Hymn

MULTICULTURAL THEME:

AMERICAN INDIAN: Dakota Hymn

CROATIAN: Tree Song

GERMAN: O Beautiful Banner
Valleys Green, You Are My Joy

SCOTTISH: Turn Ye To Me

SICILIAN: The Silver Moon Is Shining

SOUTH AFRICAN (AFRIKANER): As The Sun Goes Down

SWEDISH: In Summer The Sunshine Is Brightest

TYPES OF SONGS:

BLUES: Ev'ry Night When The Sun Goes In

CHANTY: A-Roving

FOLK SONG: O Beautiful Banner

LULLABY: Cradle Song

SPIRITUAL: He's Got The Whole World In His Hands

READING LESSON

OBJECTIVES:

The students will read How Raven Brought Light to People, retold by Ann Dixon.

The students will identify and write down the plot, the characters, and the reasons for the characters' actions.

ACTIVATE SCHEMA:

Look at the cover of this book and tell me what you see. The title will be covered by a piece of paper, so all the students can see will be: trees; water; mountains; a bird(raven); and a box. **Tell me what types of birds you know that are black.** Blackbirds, crows, ravens, etc. **Why do you think the bird might be carrying off the box? Let's read and find out.**

READ:

The teacher reads the book to the students, pointing out places where the text agrees with the pictures. The teacher asks the students what they think will happen next before reading the following page or letting them see the picture.

American Indians and Eskimos often use myths to explain why things happen. The raven is a favorite animal to use because the Indians feel he is cunning and a trickster with magical powers. What animals do we think might have magical powers? Are there any animals that we need to be careful of because of their "magic" powers?

What does a story need to make it a story? How is a story different than a sentence? Stories have sentences in them, but they also have paragraphs. Stories use sentences to tell the reader something, so they are written in a specific order. Stories might contain more details than a sentence, such as a setting. Stories can have a plot and a climactic ending. The reader can feel like a part of the story, being an active participant. Readers can guess what comes next. Stories have characters.

What is the beginning of this story? The beginning is what happens first in the story. A chief had three boxes containing the sun, the moon, and the stars.

Who are the main characters in the story? Who is the story about? The chief, the chief's daughter, and the raven.

What is the plot of the story? What happens in the story? Raven turns himself into the baby of the chief's daughter and demands to play with the boxes. Every time he plays with one of the boxes he opens the lid and throws up into the sky whatever was inside the box. When the last box was opened he turned himself back into the raven and flew out the smokehole. The soot from the smokehole turned the raven black and he has been black ever since.

Have the students read the story to themselves once before matching up with story partners and having the two students read aloud together. After practicing reading the story together with their story partners, have the students read to their partners alone. The teacher circulates throughout the room to check on progress.

WRITE:

For the student portfolio the students should write "Who did what and why" stating who the characters were, what the characters did, and why the characters did what they did.

FUTURE LESSONS:

Have a unit on myths from various cultures and have students write their own myths .

Read a scientific book about stars, the sun, and the moon. Have students compare the styles of writing, the information presented, and the purpose for presenting something as fiction or non-fiction.

Have the students draw pictures of an event and write a story to explain the picture. Have the pictures and the stories available for students to read. See if the students can read the text and find the matching picture. This could then be directed into a unit on descriptive writing.

SCIENCE LESSON

PURPOSE/RATIONALE: I want the students to be exposed to the elements of nature that surround them and to have at least a basic understanding of why things work the way they do, so that the students can feel more connected and a part of the greater universe in which we live. I will expose them, throughout the year, to such experiences as why the moon shines, why the stars shine, what gravity is, the other planets in our galaxy, and how we are all similar/different.

OBJECTIVES:

For the students to discover that objects are seen when they give off their own light or when they reflect light from the sun.

For the students to discover that the moon does not give off its own light. The moon's light is reflected light from the sun.

ENGAGEMENT ACTIVITY:

The teacher will place an object on the table in the front of the classroom after turning out the lights. **What did I put on the table?**

Example dialogue:
Students: I don't know. I can't see it.
Teacher: Why can't you see it?
Students: The lights are off. There's no light. It's too dark.
Teacher: What would you need to be able to see the object on the table?
Students: Lights.
Teacher: Now that I've turned on the lights, do you see the object because it is reflecting light or because it is giving off its own light?
Students have mixed responses.
Teacher: How is this light different from the light you see when you look at the ball?
Students: The overhead lights glow. The ball doesn't glow. The overhead lights are brighter than the ball.
Teacher: Now that I've turned out the lights, what are two reasons why you may not see any lights in the room?
Students: Nothing is giving off light. Nothing is shining.
Teacher: Why do you think the moon shines?
Students have mixed responses.

EXPLORATION/ LABORATORY EXERCISE:

Materials and Equipment: (per group)
1 small foil ball, about 1 inch in diameter, with attached string
1 larger styrofoam ball, about 3 inches in diameter, with attached string
1 box with tight fitting lid (shoe box)
1 flashlight
1 roll masking tape
1 pair scissors (or other sharp instrument for making eyehole)

Student Worksheets, Data Tables, Etc. (Attached to back)

Laboratory Safety Precautions:

Have the students be careful with the sharp object that will be used to make the eyehole.

EXPLORATION ACTIVITY:

Today we'll be searching for answers to the questions I was asking. The students will be divided into groups of four to work with the "moon in the box". The "moon in the box" is created by suspending a small foil ball from the lid of a box. The ball should be attached with a string to hang about one inch from the lid and be located about 1/3 of the box length away from the end of the box. At the opposite end of the box a hole should be made in which to place the end of a flashlight. The rough edges around the flashlight are then sealed with masking tape. A small eyehole should be made at the end of the box under the flashlight. Then the lid should be placed on the box so the ball is suspended inside the box and the box should be tightly sealed. The students will make the boxes in their groups, one box per group. The groups will then record answers to the questions listed on a worksheet.

Then the box will be modified by the students so that an earth will also be placed inside the box. The students will open their box and put in a second ball, a styrofoam ball three inches in diameter, which is suspended two inches down from the lid and is located about 1/3 of the box length away from the end of the box through which the flashlight is placed. The lid is placed upon the box and the edges are resealed. The old eyehole is sealed and a new eyehole is cut through the side of the box in between the two hanging balls. As a group the students will answer a second set of questions.

EXPLANATION/ DISCUSSION:

As a large group (class) we will discuss the results each group obtained. The questions will be written on the chalkboard, and members from every group will write their findings on the chalkboard near the corresponding question. Students will present their findings. The teacher will emphasize key points in the students' findings. The key points were listed above as the objectives.

ELABORATION ACTIVITY:

Space travel may soon become more commonplace than it is today. Some day we may live on other planets as well as live on Earth. If you lived on another planet, would you be able to see Earth? The students could look up models of our galaxy and see how the planets line up, when Earth will be visible, and when Earth will be blocked out by another planet.

EVALUATION/ ASSESSMENT:

The students will each build a model of another planet, the sun, and the moon. They could pick a planet that is smaller/larger than the earth, or a planet that has more than one moon. The student will identify what each part of the model is (sun, moon, planet), which items give off light and why, and which items reflect light and why.

"Why Does The Moon Shine?"

Flashlight Off

What do you see when you look through the eyehole when the flashlight is off? Why?

Flashlight On

What do you see when the flashlight is on? Why?

Do you see the ball because it reflects light or because it gives off light of its own?

What two kinds of light do you see?

1.

2.

What is the source of each kind of light?

Look out the window

Why are you able to see some objects?

What is the source of light on the objects?

Do the objects seen outside the window give off light of their own or reflect light?

What does the sun give off?

Why does the moon shine?

"Why Does The Moon Shine?"

If the small ball is the moon, what does the flashlight represent?

Turn on the flashlight and look through the new eyehole. What does the large ball represent?

Look at the ball representing the earth and tell which side is day and which side is night. Draw a picture of what you see and tell how you know which side is day and which side is night.

On which side would you be if you could see the moon?

Why does the moon shine?

REFERENCES

Amato, Carol J., Breakthroughs In Science: Astronomy, New York, SMITHMARK Publishers, 1992.

Atkinson, Stuart, The Book Of Space Facts And Records, New York, Derrydale Books, 1990.

Bingham, Celeste, and Sage, Suzanne, Super Strategies: Whole Language Activities In Children's Literature, Minneapolis, T.S. Denison & Company, 1988.

Blackaby, Susan, One World: Multicultural Projects And Activities, Troll Associates, 1992.

Dixon, Ann, How Raven Brought Light To People, New York, MacMillan Publishing Company, 1992.

Evans, Joy, and Moore, Jo Ellen, How To Make Centers Across The Curriculum, Carthage, Good Apple, Inc., 1990.

Falstein, Mark, and McAlpine, Susan, Leading The Way: Stories About Black Americans, Elizabethtown, The Continental Press, Inc., 1988.

Hackett, Patricia, and Lindeman, Carolynn A., The Musical Classroom: Backgrounds, Models, And Skills For Elementary Teaching, Englewood Cliffs, Prentice Hall, Inc., 1988.

Metcalf, Doris Hunter, Portraits In Black: Exploring The Achievements Of Black Americans, Carthage, Good Apple, Inc., 1990.

Milliken, Linda, Springboards & Starters: Multi-Curricular, Dana Point, Edupress, 1993.

Milliken, Linda, Springboards & Starters: Seasonal And Holiday, Dana Point, Edupress, 1993.

Milord, Susan, Hands Around The World: 365 Creative Ways To Build Cultural Awareness & Global Respect, Charlotte, Williamson Publishing, 1992.

Sing Together: A Girl Scout Songbook, New York, Girl Scouts Of The United States Of America, 1973.

Treimer, Margaret, Planets & Space, Huntington Beach, Creative Teaching Press, Inc., 1987.

VanCleave, Janice, Astronomy For Every Kid, New York, John Wiley & Sons, Inc., 1991.

Van Gogh: A Postcard Book, Philadelphia, Running Press, 1988.

Wright, David, and Wright, Jill, The Facts On File Children's Atlas, New York, Facts On File, Inc., 1987.