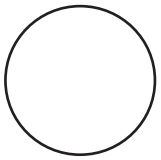
The 2001 Project

Students hand-letter the project title
This can be customized to incorporate student initials, etc.

Teacher's Edition

Student Name

If the Earth were this big...



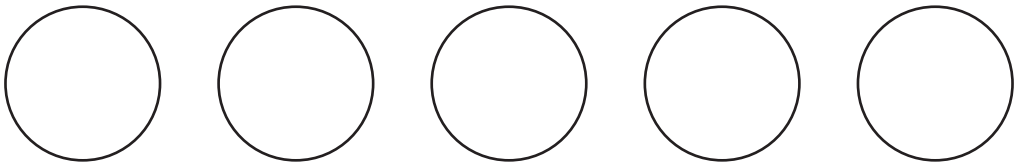
...then the Moon would be this big:

How ***far away*** would the Moon be from the Earth, if they were this small?

Actual diameter of the Earth: Slightly under 8,000 miles. In above diagram: Slightly under .8 inch. The moon: Actual diameter, 2159 miles; above, .2159 inch.
At the sizes shown here, the moon would be about 23.9 inches away from the Earth.

Activities on pages 2 to 3 can be done before viewing the film. Purpose: to familiarize students with the nature of the moon.
Also suggested: Display / work with a lunar map or globe.

Phases of the Moon



Have students fill in and label phases.

Suggested graphic:
Current or next month's phases of the moon.
Students able to see the moon
can personally observe the phases.

Facts about a crescent moon:

The thinner it is, the closer to the sun it appears, and the closer to sunset or sunrise that it will set or rise.

If students or instructor can find an example: Sometimes, comic book artists draw a moon with the horns pointing downward ***at night***. Impossible! This would mean the sun is close to the crescent moon, and ***above*** it. In other words, daylight!

A man is arrested. He is a suspect in a crime.
He says, "I was out in the countryside walking, when the crime was committed. I was walking at midnight. I looked up, and saw a thin crescent moon straight above me."
What could you say about the man?

Based on "Facts about a crescent moon," he's lying or mistaken—at the very least, about the moon.

Facts about a full moon:

The more full the moon is, the farther away from the sun it appears.
A full moon rises close to sunset.
A full moon sets close to sunrise.

A man is arrested. He is a suspect in a crime.
He says, "I was out in the countryside walking, when the crime was committed. I was walking at midnight. The full moon rose over a hill at midnight."
What could you say about the man?

Based on "Facts about a full moon," he's lying or mistaken—at the very least, about the moon.

Movie: Show title credits. Pause.

Our movie for this project:

(Nice and big)

2001: A Space Odyssey

(Let students get creative with lettering)

Movie: The Study Guide questions from this point up through page 5 can be done before further viewing the movie. While adults would consider this "spoiling" the movie, it will prepare the young student to be alert for key points.

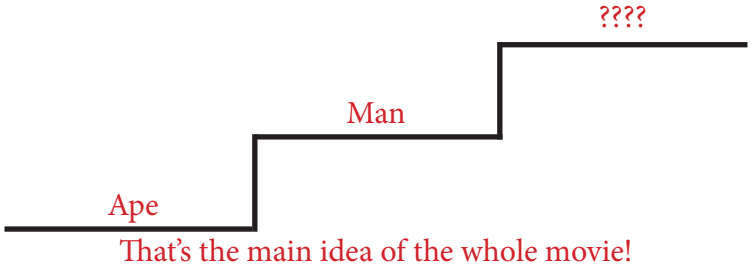
The Dawn of Man

"Dawn" here means beginning. 4,000,000 years ago.

The idea that life develops over time is called evolution.

Be careful when you talk about evolution. Some people become very angry about it. Why?

The three "steps" in this movie are:



That's the main idea of the whole movie!

The apes in this movie are starving. They are in danger of becoming extinct.

The apes are starving because they are stupid.

The leopard is smart. The leopard will survive, because he/she kills for food.

The animals that keep eating the apes' food are called tapirs.

When the apes first fight over the water hole, who wins?
The ***loudest*** ones.

What do the apes think of night, and darkness?
They are subdued, sullen, and afraid.

Why are modern people less afraid of the dark?

They found ways to create light. Candles, oil lamps, electricity.

The apes wake up to see something strange. Draw what they see.

The monolith.

The aliens teach one ape
how to survive. How to avoid starving.

You can actually see the ape thinking!

The apes again fight over the water hole.
Who wins?

The ***smart*** ones.

The bone turns into a space satellite! What does that mean?

The film is saying, "Many years (four million!) have passed."
In what other ways do movies tell us, "Time passes"?
-- Clock hands spinning
-- Calendar pages flying away

Dr. Heywood R. Floyd is riding aboard the Orion.
Draw the Orion.

Suggested graphic:
The Orion spacecraft.

One possible method here and elsewhere:
Place the photo here, and (if your software allows)
make it transparent enough that it can be easily traced, while
being still visible.

Such images are not included with this Project, as they are intellectual property.
You should be able to locate images for your personal use.

Other possible technique: Present images for students to observe and copy.

Tracing might work better for younger children.

Dr. Floyd's pen is floating away! A flight attendant puts it in his pocket. How does she avoid floating away?

Grip shoes. (Magnetic? Velcro?)

The Orion has wings because
when it began its flight, it was in Earth's atmosphere.

Dr. Floyd's travels from Earth
aboard the Orion
to the Space Station.

Draw the Space Station.

When scientists proposed plans to reach the moon, one proposal included building a space station, which would make regular trips to the moon easier. This idea was not used to initially reach the moon in real life.

People on the Space Station don't float around. Why not?

Centrifugal force.
Explain and discuss.

One aspect of the Space Station's physics:
People inside can walk inside the ring as if they experience gravity.
But it's ***not gravity;*** it's centrifugal force. Compare to:
- Spinning carnival rides (a good video would be effective)
- The Mission Space ride at Disney World
- Space colonies envisioned by Gerard K. O'Neill
- Advanced topic: ***Acceleration*** will also ***simulate*** gravity.

Dr. Floyd talks to some people. He says he's going to Clavius.
One man is surprised.
He says he heard people could not go to Clavius because of

an epidemic.

Dr. Floyd is going to Clavius.
What is Clavius?

A crater on the moon.
In the movie, it is a city near that crater.
(Some people, hearing "Clavius," think he's going to the planet Clavius, despite all the images of the moon. That might provide a good laugh for your students.)
If you can work with a lunar map or globe prior to watching the film, have the students "discover" craters Clavius and Tycho, so they recognize them when mentioned.

What does Dr. Floyd's daughter want for her birthday?

A bushbaby.

Draw a picture of the thing Dr. Floyd's daughter wants for her birthday.

What invention, common today, was not anticipated by the makers of this film?

The portable, compact cell phone. The essential concept was used in the Dick Tracy comic strip, as early as the 1940s.

What is Dr. Floyd talking about, at the meeting?

Some secret on the moon.

From the Space Station, Dr. Floyd takes the Aries to the moon. Draw the Aries.

Why is the control room of the Aries is red?

It is easier to adjust one's eyes to the darkness outside.
The control rooms of submarines are also red.

https://wonderfulengineering.com/this-is-why-they-use-red-lights-inside-submarines/:
"the presence of red light helps in the adjustment of vision. Not only submarines, but airport control towers, planetarium, and some movie theaters also use red light so that it is easier for the viewer's eyes to adjust from light to dark. The submarine crew needs to acclimate the eyes before going topside for the night watch. This vision adjustment is the primary reason for using the red lights."

Dr. Floyd and other scientists have a meeting.
What does Dr. Floyd emphasize?

They must keep something secret.

Dr. Floyd and two other scientists take the
Moon Bus from Clavius to Tycho, which is

where the secret is.

Riding the Moon Bus, Dr. Floyd and the two other scientists talk about the secret.
What do they say about it?

It has a magnetic field. That's how it was detected.
They had to dig it up.
It was buried. "Deliberately buried." ("Deliberately" means....?)
It was buried deeply.
The scientists don't know what it is.
It was buried 4,000,000 years ago. ***(Connection:*** That's when the monolith appeared to the apes!)

Draw the Moon Bus.

Six men examine the secret. They hear a terrible sound. What is that sound?

(This is not revealed until later in the movie. But knowing this now, you will understand the next part better.)
It's a radio signal.
The men hear it on their radios.
It happened when the sun touched the "secret" for the first time.
The radio signal was sent to Jupiter.
Why was it sent to Jupiter?
What's out there that would receive the signal?

Jupiter Mission. 18 months later.
Why are they going to Jupiter?

To see where the radio signal was sent.

Draw the Discovery One.

Part of the Discovery One spins. Why?

To provide artificial gravity. The same reason the Space Station spun.

How many men are aboard the Discovery One?

Five.
Two are awake: Frank and Dave.
Three are in hibernation.

When Frank and Dave watch the BBC TV news show, how far from Earth are they?

80,000,000 miles.

Frank's parents wish him Happy Birthday. Why does he not talk to them?

They are so far away from Earth, that real-time conversation is not practical. See next question/answer. Discuss in detail. Tie this in with the BBC News man's statement that gaps between questions and answers were "edited out."

At that distance, how long does it take for a radio signal from Earth, to reach them?

7 minutes.

Hal says there's a problem with

The antenna.

EVA means

Extra-vehicular activity. (Going outside the ship.)

Draw one of the pods. (How many are aboard the Discovery One?)

Why are Dave and Frank worried about Hal?

Hal might have made a mistake.

What does Hal blame the problem on?

"Human error."

What are "Explosive Bolts"?

Bolts in a hatch (or door) that blow the hatch off, for quick exit in emergency. (Foreshadowing)

How does Hal "listen in" on Dave and Frank?

He reads their lips.

What worries Frank and Dave the most about Hal?

Hal controls the ship.
He might not want to be disconnected.

In outer space, there is no air. That means there is no sound.

An explosion in space would be silent.

If Dave opens the pod door in space, what would happen?
The air would rush out, like an explosion.

What does Dave plan to do to HAL?

Disconnect Hal's higher logic functions.

There is an historic basis for HAL to sing "Daisy." A computer was programmed in the early 1960s to mimic human speech, and to sing "Daisy." An audio of this can be found on the Internet.

Optional discussion: Distinguish between HAL's higher logical functioning, and his routine maintenance of the ship. Compare to the reasoning functions, and automatic regulation of the human body. Compare to Alzheimer's, or other brain damage.

"Daisy Bell" was composed by Harry Dacre in 1892.

Suggested: Read (and explain) these lyrics before viewing the scene where Dave disconnects HAL.

	Rhyming scheme
Daisy, Daisy,	A
Give me your answer, do!	B
I'm half crazy,	A
All for the love of you!	B
It won't be a stylish marriage,	C
I can't afford a carriage,	C
But you'll look sweet	D
Upon the seat	D
Of a bicycle built for two!	B

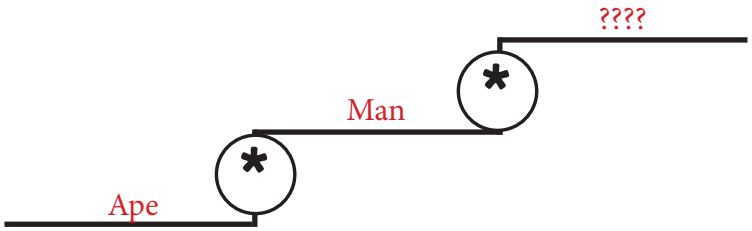
If children you're working with like to: Sing this song.

From 1892

What happens to Dave?

1. The aliens take him on a big trip.
One ***possible*** way to look at this (it is ***not*** the only interpretation):
If you were to put an ape in the passenger seat of an ATV, and drive him down the streets of a big city at night, the ape wouldn't understand what he's seeing.
Similarly, Dave is being shown many wonders of the universe, but he doesn't have the adequate knowledge or cognitive powers to understand what he's seeing.
2. The aliens "bump him up" to the next level of evolution.

The whole point of the movie:



The asterisk above * indicates a ***change*** in the movie. What does the movie do, that is the same, during those two ***changes?***

The movie's theme music is played.

At the end of the movie, how would you describe Dave?

What do you think Dave will be like, when he "grows up?"