Atom concept: a complex and multiple-steps discovery

As you've learned in the past few years, all matter (like the apple shown above) is made of particles called atoms. These atoms are in turn made of even smaller particles called protons, neutrons and electrons.

How have scientists come to understand these particles we cannot see? How has this understanding changed and evolved over time? In a way, the scientists who have unraveled the properties of the atom have been like detectives solving parts of a mystery — with new mysteries arising out of every discovery.

Your Project
You will work as a class to research the scientists and experiments that have led to our current understanding of the atom and its properties. You will work in a group assigned to one of eight tasks. Within each group you will research, and report on, the following-

1. Biography: When did this scientist live? What was his or her education and background? How did the views of the scientific community influence their views and work?
2. Discovery: What discovery is this scientist noted for? Thompson, Rutherford are each noted for a landmark experiment — what was it and what did it prove?
3. Timeline: How did this discovery change our view of the atom or its properties? How did it influence future research?

Each group will prepare a 5-10 minutes presentation to the class with the results of their research. You may use posters, a video projector (for mp3's or videos downloaded off the internet) or any other visual you choose.

You must divide the tasks so that all group members have a specific role in the research and the presentation. Active participation by all members of the group is required.

Each group will prepare a single poster to contribute to a class timeline of the discovery of the atom. Each poster in the timeline will note the date or period of the discovery, the major character and the advancement in our understanding of the atom that is associated with your assigned task. Together, these posters should present a history of the atom.

Resources available to all groups:

The following resources should get you started. Questions in each area are provided as guides.

A timeline of the atom: http://atomictimeline.net/
http://northspringer.tripod.com/HistoryofAtom/index.html

A note on sources: All sources must be verified before use. You will hand in on the day of the presentation a list of sources (at least two sources) and include a bibliography. These will be checked by your teacher.

The eight different tasks:

1. **Early history of the atom (Greek Era): "atomism"**

What are the different theories that existed through time? What were the views of the Greek philosophers? Do a quick biography of the most important figures.

https://en.wikipedia.org/wiki/Atomism

2. **Dalton**

Can you comment John Dalton's theories using our knowledge nowadays? How did he arrive at his conclusions? How Dalton's view was different from what was happening before?
http://web.lemoyne.edu/~giunta/dalton.html

3. **Thomson and the discovery of the electron**

What experiments did Thomson conduct? What was he investigating? What hypothesis did Thomson develop based on his experiments? What was Thomson's model of the atom? Why were Thomson's results controversial? What further research was needed? How has our understanding of the electron changed since Thomson?
https://history.aip.org/history/exhibits/electron/
https://en.wikipedia.org/wiki/Plum_pudding_model
https://en.wikipedia.org/wiki/Oil_drop_experiment

4. **Rutherford and the planetary model**

Describe the gold foil experiment. What did Rutherford expect to see? Why did the results surprise Rutherford? How did this experiment change the view of the atom developed by Thompson?
https://micro.magnet.fsu.edu/electromag/java/rutherford/

5. **Bohr and the energy levels**

What's new about Bohr's model?
https://www.nobelprize.org/prizes/physics/1922/bohr/biographical/
https://faraday.physics.utoronto.ca/GeneralInterest/Harrison/BohrModel/BohrModel.html

6. **Schrödinger & Heisenberg and the cloud model**

How this theory is different from the others? What other work of these scientists influenced their view on the atom? Do a quick biography of both these scientists.
https://mathshistory.st-andrews.ac.uk/Biographies/Schrodinger/

7. **Chadwick and the discovery of the neutron**

Did Chadwick postulate the existence of the neutron? What was his task? How did he proceed?
https://timelineoftheatom.blogspot.com/p/james-chadwick-1932.html
http://dev.physicslab.org/Document.aspx?doctype=3&filename=AtomicNuclear_ChadwickNeutron.xml

8. **Where are the women?**

Why is there no woman in this list of scientists? Have some women participated in the atom's history in any kind? Who and how?
http://atomictimeline.net/

Grading for this assessment:

Presentation	**50 points**	**Group grade**
Biography	10	Clear and thorough
Research	15	All questions answered
Timeline	15	Both questions answered
Participation	10	All members participate equally and correctly
Organization	5	Presentation is planned and well coordinated
Poster	**30 points**	**Group grade**
Aspect	25	Timeline poster complete
Sources	5	At least two sources
Individual	**20 points**	**Oral skills and investment**

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Date	Scientist	Theory	Illustration