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Paideia Seminar Lesson Plan

Text: Euclid, *Book One* (first 23 Definitions)

Grade/Subject: MS / Math

Ideas, Values: Definition, Geometry, Line, Mathematics, Point

Date of Origin: 2/15/2018

Pre-Seminar Content

Launch Activity:

Ask participants to work with a partner to write down a list of as many ways they see geometry used in their lives. Tell them to feel free to make a sketch or two to illustrate the items in their lists.

Inspectional Read:

Distribute the text to all participants. Based on the title and appearance of the text, discuss as a whole group what they think the text will be about. Take turns reading the text aloud (each student taking a definition) while all students highlight unfamiliar terms (not including the definitions themselves: *point*, *line*, *plane*, etc.)

Background Information:

Share as appropriate: Euclid (~ 300 BC), sometimes given the name Euclid of Alexandria to distinguish him from Euclides of Megara, was a Greek mathematician, often referred to as the "father of geometry". He was active in Alexandria during the reign of Ptolemy I (323–283 BC). His *Elements* is one of the most influential works in the history of mathematics, serving as the main textbook for teaching mathematics (especially geometry) from the time of its publication until the late 19th or early 20th century. In the *Elements*, Euclid deduced the principles of what is now called Euclidean geometry from a small set of axioms.

Vocabulary:

Work through the entire text as a whole group, noting the unfamiliar terms that students identified during the *Inspectional Read*. List the terms on the (interactive) white board and assign small groups of students to define the non-math terms. Share out the definitions while all students annotate their individual copies of the text.

Analytical Read:

Have students read the text one more time aloud in pairs, taking turns reading the definitions. Then have the students annotate their texts by placing an exclamation point beside three definitions they find especially important and a question mark beside one or two definitions they find particularly puzzling.

Pre-Seminar Process:

- ✓ **Define and State the purpose for the seminar.**

“A Paideia seminar is a collaborative, intellectual dialogue about a text, facilitated with open ended questions.

“The main purpose of seminar is to arrive at a fuller understanding of the textual ideas and values, of ourselves, and of each other.

- ✓ **Describe the responsibilities of facilitator and participants.**

“I am primarily responsible for asking challenging, open-ended questions, and I will take a variety of notes to keep up with the talk turns and flow of ideas. I will help move the discussion along in a productive direction by asking follow-up questions based on my notes. “I am asking you to think, listen and speak candidly about your thoughts, reactions and ideas. You can help each other do this by using each other’s names.

“You do not need to raise your hands in order to speak, rather, the discussion is collaborative in that you try to stay focused on the main speaker and wait your turn to talk.

“You should try to both agree and disagree in a courteous, thoughtful manner. For example, you might say, ‘I disagree with Joanna because...,’ focusing on the ideas involved not the individuals.

- ✓ **Have participants set a Personal Goal.**

“Now, please reflect on how you normally participate in a discussion as a group. What goal can you set for yourself that will help the flow and meaning of the seminar? “Please consider the list of personal participation goals – either on the Speaking and Listening Checklist or on the board.”

- ✓ **To speak at least three times**
- ✓ **To refer to the text**
- ✓ **To ask a question**

- ✓ **To speak out of uncertainty**
- ✓ **To build on others' comments**

“Is there one that is relevant for you? Please choose one goal from the list or that you feel is best and commit to achieving it during the discussion we are about to have... write down (or circle) your personal goal.”

- ✓ **Agree on a Group Goal.**

For this seminar, I will suggest our group goal (select display for all to see).

Seminar Questions:

- ✓ **Opening (Identify main ideas from the text):**

- ❖ Of the 23 definitions in our text, which do you think is most significant? (round-robin response)
- ❖ Why did you choose the one you did as most significant? (spontaneous discussion)

- ✓ **Core (Analyze textual details):**

- ❖ Which of the 23 definitions is it hardest to conceptualize? What makes that concept so difficult?
- ❖ Is there a logic to the order of the definitions in Book One of Euclid? If so, how would you describe it?
- ❖ Would you change the order of the definitions to make them more effective? If so, how?
- ❖ In definition 13, what does Euclid mean when he posits that “A *boundary* is that which is an extremity of anything”?
- ❖ How is Geometry like (or unlike) a language? What does the Language of Geometry help us understand?

- ✓ **Closing (Personalize and apply the ideas):**

- ❖ If you were going to create an “Illustrated Euclid,” which of the 23 definitions would you want to illustrate? Why?

Post-Seminar Process:

“Thank you for your focused and thoughtful participation in our seminar”.

- ✓ **Have participants do a written self-assessment of their personal goal.**

“As part of the post-seminar process, I would first like to ask you to take a few minutes to reflect on your relative success in meeting the personal process goal you set prior to beginning the discussion. Please review the goal you set for yourself and reflect in writing to what extent you met the goal. In addition, note why you think you performed as you did”. (Pause for reflection.)

- ✓ **Do a group assessment of the social and intellectual goals of the seminar.**

“Now I would like us to talk together about how we did in relation to the group goal we set for ourselves (insert your group goal). On a scale of one to five, five being perfect, how would you say we did? Why?” (Pause for discussion.)

“Now, would someone be willing to (volunteer) to share your personal self-assessment and reflection?”

- ✓ **Note reminders for the next seminar.**

Post Seminar Content:

- ✓ **Transition to Writing:**

Have participants chose one definition at random and sketch an illustration of that term in the margins of the text. Then have them share their sketches with a partner.

- ✓ **Writing Task:**

How can we express our understanding of Euclid’s Geometry in visual terms? After reading and discussing the first 23 Definitions of Euclid, divide into teams of two-three student-artists each and create illustrations of Euclid’s definitions (one to each team). Prepare multiple drafts of your illustration, starting with round sketches and progressing through finished ink drawings.

✓ **Brainstorm:**

Assign participants to teams of two (at the most, three) students each and assign them a definition to illustrate, focusing on the more complex definitions near the end of the text. Have each team prepare a preliminary sketch of their ideas for illustration.

✓ **Structure the Writing:**

Have the teams share the preliminary sketches on the board (in the order of the definitions) and discuss as a whole group how to make the drawings more consistent in style and content.

✓ **First Draft:**

Have the teams prepare a “first draft” sketch of their proposed illustrations.

✓ **Collaborative Revision:**

Then have the teams share their first sketches with two other teams and take recommendations for how they can make their drawings more complete and/or clear.

✓ **Edit:**

Have the teams prepare a second draft in pencil based on feedback from the collaborative revision stage and go through a second round of sharing and discussing, so that each team can correct and/or add to their drawings. Have each team prepare a final ink illustration for publication.

✓ **Publish:**

Create an “Illustrated Euclid” by scanning the drawings and interspersing them with the definitions. Publish on the class website as well as in print form: one copy for each student and several copies for use as teaching tools for use with future classes.

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***Text is attached if open sourced.**

***Text is cited if it needs to be procured.**

EUCLID

DEFINITIONS, POSTULATES, COMMON NOTIONS

Book One

1. A *point* is that which has no part.
2. A *line* is breadthless length.
3. The extremities of a line are points.
4. A *straight line* is a line which lies evenly with the points on itself.
5. A *surface* is that which has length and breadth only.
6. The extremities of a surface are lines.
7. A *plane surface* is a surface which lies evenly with the straight lines on itself.
8. A *plane angle* is the inclination to one another of two lines in a plane which meet one another and do not lie in a straight line.
9. And when the lines containing the angle are straight, the angle is called *rectilineal*.
10. When a straight line set up on a straight line makes the adjacent angles equal to one another, each of the equal angles is *right* and the straight line standing on the other is called a *perpendicular* to that on which it stands.
11. An *obtuse angle* is an angle greater than a right angle.
12. An *acute angle* is an angle less than a right angle.
13. A *boundary* is that which is an extremity of anything.
14. A *figure* is that which is contained by any boundary or boundaries.

15. A *circle* is a plane figure contained by one line such that all the straight lines falling upon it from one point among those lying within the figure are equal to one another;
16. And the point is called the *centre* of the circle.
17. A *diameter* of the circle is any straight line drawn through the centre and terminated in both directions by the circumference of the circle, and such a straight line also bisects the circle.
18. A *semicircle* is the figure contained by the diameter and the circumference cut off by it. And the centre of the semicircle is the same as that of the circle.
19. *Rectilinear figures* are those which are contained by straight lines, *trilateral* figures being those contained by three, *quadrilateral* those contained by four, and *multilateral* those contained by more than four straight lines.
20. Of trilateral figures, an *equilateral triangle* is that which has its three sides equal, an *isosceles triangle* that which has two of its sides alone equal, and a *scalene triangle* that which has its three sides unequal.
21. Further, of trilateral figures, a *right-angled triangle* is that which has a right angle, an *obtuse-angled triangle* that which has an obtuse angle, and an *acute-angled triangle* that which has its three angles acute.
22. Of quadrilateral figures, a *square* is that which is both equilateral and right-angled; an *oblong* that which is right-angled but not equilateral; a *rhombus* that which is equilateral but not right-angled; and a *rhomboid* that which has its opposite sides and angles equal to one another but is neither equilateral nor right-angled. And let quadrilaterals other than these be called *trapezia*.
23. *Parallel* straight lines are straight lines which, being in the same plane and being produced indefinitely in both directions, do not meet one another in either direction.

*This excerpt from "The Definitions" can be found on pages 1-2 in Volume 11 of *Great Books of the Western World* (1952). Chicago: Encyclopedia Britannica.

