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MAT 674 Differentiated Instruction

Interdisciplinary Lesson Plan - Assignment 4.2a

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Abstract

This paper includes a differentiated Interdisciplinary lesson plan, integrating content standards from three different disciplines. It describes a lesson that uses grouping patterns to reinforce the standards during three parts of instruction: Teach, Practice, and Apply. Heterogeneous and homogeneous groups are used, along with a peer panel instructional design. Additionally, two differentiation strategies, as suggested by Linda Ventriglia, and four differentiation strategies for English Language Learners have been incorporated.
Key Elements

The following key elements are included in this interdisciplinary lesson plan and can be found by the color in which they are highlighted.

- Two content standards for Mathematics
- Two content standards from other disciplines: Science & English Language Arts
- Flexible Groupings (Homogeneous & Heterogeneous)
- Peer Panel Instructional Design
- Three curricular elements of Teach, Practice, and Apply
- Two differentiation strategies from Chapter 5
- Four differentiation strategies for English Language Learners

Instructional Overview

Students will learn how to recognize Direct Variation. They will learn how to graph, write, and use direct variation equations by identifying and/or calculating the slope of the linear graph. They will also learn how to determine if a given point lies on the line. Students will also see the value of this concept, as it applies to real world scenarios. When group projects are presented to the class, students will practice using their speaking and listening skills. An assessment will first take place to determine students’ readiness levels. The three elements of instruction I will implement and modify are Teach, Practice, and Apply (Ventriglia, 2013, p. 18).

Part 1: Identify Content Standards

Grade 8 Mathematics Content Standards Algebra 6.0: Students graph a linear equation and compute the x- and y-intercepts (e.g., graph $2x + 6y = 4$). They are also able to sketch the
region define by linear inequalities (e.g., they sketch the region defined by \(2x + 6y < 4\)) and

Grade 8 Mathematics Content Standards Algebra 7.0: Students verify that a point lies on a line, given an equation of the line (California Department of Education, 1999).

Grade 8 Science Content Standard 9d: Recognize the slope of the linear graph as the constant in the relationship \(y = kx\) and apply this principle in interpreting graphs constructed from data (California Department of Education, 1998).

Grade 8 English-Language Arts Content Standard 1.2: Paraphrase speaker’s purpose and point of view and ask relevant questions concerning the speaker’s content, delivery, and purpose (California Department of Education, 1997).

Part 2: Assess Student Readiness

Students will be given a pre-assessment, in the form of a short quiz, that consists of five problems: Identifying if an equation represents direction variation, graphing a direct variation equation, writing a direct variation equation based on a given graph, determining if a point lies on the line, and defining and explaining the use, in a short answer format, of direct variation. The pre-assessment will allow me to gauge students’ understanding and knowledge on this subject matter. Additionally, the data will tell me how to make instructional decisions based on student needs, how to implement flexible grouping patterns, and how to identify the students who are ready for advance instruction and those who need additional support. “Once this is determined [what students know about a topic], the teacher can decide how best to present the content to different readiness levels” (Ventriglia, 2013, p.20).
Part 3: Teach

I will use whole-group instruction so that I can directly “Teach” the entire class. To engage student interest, I will show a PowerPoint presentation. First, students will see a picture of Earth and a picture of Neptune. Moving to the next slide, I will tell students that an object on Earth that weighs 150 pounds on Earth would weigh 165 pounds on Neptune. They will see the same object on both planets, however, weighing different amounts. This will lead me into a discussion about direct variation.

Next, students will take some time and review some vocabulary terms by taking part in a vocabulary exercise. First, with their table partner, students will discuss the three Tier II interdisciplinary words they had learned, in the beginning of the unit of study: Slope, variation, and variable. In their journals, students will complete a task involving two, Tier III Subject, specific terms: Direct variation and constant of variation. Vocabulary development will be part of every math lesson I teach in order for students to make sense of the technical terms and to make connections between concepts and interdisciplinary words. “Vocabulary learning has been deemed particularly critical in math because this content area has more concepts per word, per sentence, per paragraph than any other content area” (Harmon, 2005; cited in Ventriglia, 2013 p. 27). English Language Learners (ELLs) will have a translated vocabulary sheet which will be given at the beginning of every unit of study. This way, the guide is available to them, whenever they need to reference it. I will also differentiate the seating for my English Language Learners by intentionally placing them next to a student who preferably speaks the same native language, is competent in math, and is patient and understanding. This way, ELLs have an instant resource they can turn to if they have a question or need clarification. This also allows ELLs to feel safe
and comfortable and more inclined to communicate, by knowing a peer is there and willing to help.

Students will be given a graphic organizer that is divided into two parts. The first part will list some engagement questions. Students will use their textbooks to skim section 5.7 Recognize Direct Variation in order to answer the questions. “The Strategy of Skimming before reading content information is a powerful advance text organizer. Research has shown that skimming a selection before reading it, actually improves the comprehension of the text” (Ventriglia, 2013, p. 77). Next, we will read the section, in its entirety, as a class. By this point, students will have a better understanding of direct variation.

Next, students will work on the second part of their graphic organizer, which is broken into four sections. I will provide direct and instruction and students will take notes on the concept, in the space provided. They will also include a mathematical example in each section, which I will model on the Interactive SmartBoard. During this time, I will teach Grade 8 Science Content Standard 9d: Recognize the slope of the linear graph as the constant in the relationship y = kx and apply this principle in interpreting graphs constructed from data (California Department of Education, 1998). I will show that while the values of x and y can change, the slope of the slope, k, will remain constant in the relationship.

After direct instruction, I will assess students’ understanding by conducting a “Now You Try” activity. I will project a few problems for students to answer on the back of their graphic organizer. As they are solving their problems, I will roam the room and conduct a quick check for understanding. I will differentiate instruction for the English Language Learners (ELLs) by asking questions that are targeted at their English proficiency levels. For example, I will ask my
English learners who are at the *Preproduction* stage to point to the slope of the line or ask them to show the constant of variation. Students at the *Early Production* level will be asked if an equation represents direct variation. I may ask a student who is at the *Intermediate Fluency* level why an equation does not represent direct variation. Subsequently, an *Advanced* ELL will be asked how he or she will graph a particular direct variation equation. “One way of differentiating instruction is to adjust the levels of questions across subject areas to English language proficiency levels” (Ventriglia, 2013, p. 94). I will also differentiate questions to other learners in the class by taking into account their learning preference. This will help me gauge students’ readiness levels, by how they respond. The results of this formative assessment will guide how I create homogeneous groupings, for the next part of instruction.

**Part 4: Practice**

Students will be placed in homogeneous, small groups so that I can target instruction at students’ readiness level, allowing them access to the core curriculum and the opportunity to “Practice” so that they can master content standards. I will use the *Problem Solving* strategy where each group will be assigned a problem to solve. Students who are advanced will have problems that are more complex and require them to analyze, evaluate, and synthesize. I will chunk down the problem for students who are less proficient or for my ELLs. For example, we will dissect the problem into pieces, labeling what we know, and determining what we need to find out. We will draw pictures, use manipulatives, or use the guess and check strategy. I will differentiate instruction and bridge the information to students at their proficiency levels so that they can achieve success and attain the learning objective. “This [Strategy of Bridging] is the process the teacher uses to differentiate content to fit the students’ levels of comprehension so they can eventually master grade level standards” (Ventriglia, 2012, p. 57). Students will be
asked, in their homogenous groups, to formulate a list of questions, about what they have learned, that they would like to ask their peer experts. I will collect the questions, giving me a chance to review and send back with feedback, if necessary.

**Part 5: Apply**

Students will be placed in heterogeneous flexible groups for the “Apply” part of the lesson. Groups can choose an item off the choice board, such as design a real world, direct variation problem, create a write-up on the importance of direct variation, take a video of something, in real life, that shows direct variation, become “teacher of the day” and teach the concept, draw tables or graphs with images showing direct variation based on a problem, or create a song or rap about direct variation, taking into account the constant of variation. These choices take into account Howard Garden’s Theory of Multiple Intelligences. Students can choose what product they will create based on their strengths and intelligences (Ventriglia, 2013).

Upon completion of the group product, students will present their group work to the class. Each student will be given a “Summary Sheet” with blank boxes. Students will provide a summary of each group’s work, highlighting the group’s main point and purpose. After each group presents, students will have a chance to ask questions or provide feedback to the presenters.  

*Grade 8 English-Language Arts Content Standard 1.2*: Paraphrase speaker’s purpose and point of view and ask relevant questions concerning the speaker’s content, delivery, and purpose (California Department of Education, 1997). This exercise will provide students with multiple exposures to the mathematics content learned by actively listening and speaking
and will give students the opportunity to practice the English-Language Arts Standard 1.2, as well.

**Part 6: Closure**

As a culminating activity and to allow students to learn further by asking and sharing about the subject matter, I will use **peer panel instructional design** (Ventriglia, 2013). While observing students’ work, during class, and reviewing the final products, I will select students to serve as panel members. Students will return to their homogeneous grouping, and I will pass back their list of questions. Students will be given some time to read any comments I may have made and to practice reading their questions, while in their groups. During this time, I will meet with the panel members and provide any insight on questions they might find too complex. This way, panel members will have a few minutes to collaborate and put together some notes so that they can properly address the question without feeling intimidated or frustrated, and because I want this experience to be a positive one for all. “Peer panels give students the opportunity to stretch their thinking by formulating questions at different levels of complexity” (Ventriglia, 2013, p. 112). Additionally, students can continue to practice the eighth grade **English-Language Arts Content Standard 1.2** by asking relevant questions about the content, which is an important skill to acquire in the 21st Century classroom.
References


