

## Taxation in Modern and Ancient Societies: Integrating Math and Social Studies

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### Introduction

One of my sixth graders recently said, “Wait...we have taxes in Delaware?” with a confused expression as we were discussing some of Delaware’s public goods and services. Many of my students believe that since Delaware doesn’t collect sales tax, we don’t have taxation here. The students’ ideas of taxation are abstract and lack a solid foundation. With this unit, I want to make the concepts of taxation clear for my students so that they can make informed decisions when making purchases that involve taxes and for when they eventually have to pay their own taxes. Taxation has personal and historical implications. The current focus of educational reform is to make students “college and career ready,” but shouldn’t we also be preparing our students to participate in the civic process?

### Rationale

Margaret Branson in *The Importance of Promoting Civic Education* wrote, “One of the most important things we know about civic education is that Americans profess it to be an essential-- if not *the* essential-- purpose of education.”<sup>1</sup> In my school district, as well as far too many others, the truth is that civic education is not at the forefront. With standardized testing focused on math and English, the social studies and science curriculums have become secondary in importance. In my conversations with elementary teachers, I learned that most of the instructional time in the elementary classroom has been devoted to math and English instruction. This makes sense as the incentives for teaching these subjects are high as school and teacher ratings are based upon the standardized test scores of students in these areas. At my school in particular, the supports for social studies and science have been redirected to the math and English departments. As a result, the social studies and science departments face larger class sizes, a broader range of student abilities, and fewer resources inside and outside of the classroom. For these reasons, I created a unit that integrates civics and mathematics.

My school, like schools all over the country, serves a diverse population of students. Skyline Middle School serves students from Pike Creek and Wilmington in northern Delaware, where I teach four sections of sixth-grade social studies. The students come from diverse backgrounds and cultural groups, including African American, Asian American, Caucasian, Hispanic, and low income. This diversity poses challenges in planning and implementing lessons to meet the needs of each child. It is, therefore,

imperative that my lessons are student-centered and employ a variety of teaching strategies as each class period is sixty minutes in length.

In my school district, we are required to follow the Delaware Recommended Curriculum. For social studies, units have been created for most of the Delaware content standards to ensure the rigor of the classroom discussions, activities, and assessments in achieving the standard. There is currently no unit for the civics standard I am required to teach. The standard states, “Students will understand that governments have the power to make and enforce laws and regulations, levy taxes, conduct foreign policy, and make war.” The essential question for this standard is, “Why does a government have certain powers?” For my unit of study, I will focus on why governments are given the power to tax their citizens. I want the students to understand that taxes are collected to fund public goods and services and certain programs. They should also know that the citizens agree to give up some of their personal finances to ensure that their society is orderly. The students have numerous misconceptions when discussing taxation. Some believe taxes are a punishment, others think you don’t have to pay taxes, and some are under the impression that since Delaware does not have sales tax, the state doesn’t have any taxes.

This unit thematically combines math and social studies standards. Presenting historical connections in mathematics adds excitement and highlights important events and people.<sup>2</sup> The foundation for this unit of study is taxation in the United States and in the Babylonian Empire. The students will learn the reasons why the federal and state governments in the United States collect taxes. They will also learn why taxes were collected in the ancient Babylonian Empire. This unit is of critical importance as many of our daily activities revolve around calculations that are based on decimals and percentages. For example, many times when the news media presents statistical information it is in the form of a percentage. Another daily application of percent is when we make purchases; sales tax and discounts are calculated using percentages and decimals. Finally, the money we pay for said purchases is based on the concept of decimals. Our students need to be equipped with the skills to navigate through their everyday life with an understanding of operations using decimals and percentages.<sup>3</sup> The content standards related to Common Core State Standards for the math instruction of this unit is CSS.Math.Content.6.RP.A.3c Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.

## **Integrating History and Math**

### Historical Overview

History can add significance and relevance to mathematics instruction and learning. Western mathematics can trace its roots back to ancient Mesopotamia, ancient Greece, the Middle East, India, and Western Europe. Looking at mathematics within a historical

context can aid in our understanding of the development of mathematics. According to James Bidwell, in his article “Humanize Your Classroom with the History of Mathematics,” there are three methods for incorporating history into mathematics. The simplest method is to just make a display in the classroom of historical people and events related to mathematics. The students could be told a little about the historical person or event and then given time at home to research it further. The second method is to add a mini lecture on historical mathematical practices or figures. The article stated that the mini lecture does not have to be related to the concepts being taught in the math class. I believe the opposite; I think the teacher should only interject the historical information and mini lessons when it is related to the mathematical concept or standard being taught. The last method is to make historically accurate mathematical developments a mainstay of the mathematics curriculum.<sup>4</sup>

With time constraints and standardized tests, I think the most logical way to incorporate math and history is to use an interdisciplinary approach. The math and social studies teachers could find connections across the disciplines to capitalize the integrations between the two disciplines. For example, in my social studies curriculum I teach about Mesopotamian Empires and the math curriculum requires knowledge of fractions. The Mesopotamians had one of the first known systems of fractions. I also teach about the purposes and powers of government, including taxation. In math, the students could learn the basic computations with percents and decimals. Connections could be made as the students solve complex taxation problems in math and learn the historical relevance in social studies.

Mathematics plays a tremendous role in civilizations throughout human history. According to Nathan Altshiller Court in *Mathematics in the History of Civilization*, the development of math can be traced back to some very simple questions, “How many? This question is the origin of arithmetic and is responsible for much of its progress. But this question cannot claim all of the credit. It must share the credit with another, a later arrival on the scene of civilization, but which is even more far reaching. This question is: How much?”<sup>5</sup> To answer the questions, addition and subtraction were developed out of necessity. For example, when going into battle, an effective leader would use addition and subtraction to compare the size of his army to the size of the enemy’s army. Additionally, as bartering developed, the wise trader had to have a means to compare the size and amount of one good in comparison to another trader’s goods.<sup>6</sup>

The people of the Babylonian Empire of Mesopotamia and other ancient societies developed their mathematical knowledge through the development of their daily activities. An agricultural society, like the Babylonian Empire, was concerned with the quantities of crops and livestock and the sizes of plots of land. As the villages developed, a more organized system of leadership was necessary which eventually led to complex governments developing to meet the needs of their growing population. Governments began a system of taxation to fund themselves and provide for the needs of the people.

The tax collector and government officials needed a means to quantify the tax and keep records of payments.<sup>7</sup> The depth of mathematical knowledge of the Babylonian Empire is much deeper than historians originally thought. The basic idea of place value may have originated in Mesopotamia. There are tablets that show evidence of math computations using fractions. Some of the computations even have basic algebraic characteristics.<sup>8</sup>

### Taxes in the Babylonian Empire

Most early governments of the Mesopotamian empires were based around a divine king acting on the behalf of the gods. The connection the kings held to the gods gave them greater power as the people wanted to please the gods. Compliance to the king was based on the people's moral desire to be obedient to the will of the gods.<sup>9</sup> Hammurabi, the well-known king who reigned over the Babylonian Empire from 1792-1750 B.C.E., was a little different; he did not want to be a divine king. Instead, he wanted to be known as a just and fair ruler. The law code of Hammurabi is most remembered for helping him to achieve this goal.

Hammurabi carried out the typical duties of an ancient king including the maintenance and construction of irrigation canals, building temples and public structures, and ensuring that religious rituals were upheld. Hammurabi was highly concerned with the expansion of his empire which led to periods of war followed by periods of peace and then years of war and peace again. He worked to expand his empire to include parts of the Euphrates River where the land on the riverbanks was most fertile. This grab for land caused ongoing conflicts with the kingdom of Larsa, located downstream from Hammurabi's Empire. Larsa was subject to dwindling water flow from the Euphrates River as citizens of the Babylonian Empire redirected the water to their canals to water their crops. Hammurabi even used this technique in battle; he would have his men build dams upstream from a neighboring city that he was planning on conquering. Sometimes he would order the dammed water to be released when the water level became high enough to flood the enemy city when released. Other times, he would just hold the water and stop the flow to the city downstream to reduce their water availability which would reduce their crop yield and leave the citizens famished.<sup>10</sup>

Their geographic location, central to many other developing civilizations, allowed for many markets to form. The Babylonian Empire conducted trade with societies all over the world, largely due to their geographic location. Many business practices that are still carried out today were developed during this time period. They had a system for loaning farming supplies, mortgages of land and homes, and partnerships between artisans and farmers that even included contracts to keep both parties responsible. Value was placed on grain, date wine, dates, flour, oil, barley, and silver. Business transactions were recorded on clay tablets using a wedge-shaped stylus. Upon completion, the tablets were baked and thus became permanent. Rates of interest were either negotiated between lender and borrower or set by Hammurabi's law code. The study of the ancient clay

tablets has revealed evidence of some of the earliest interest payments and loans.<sup>11</sup> With a sophisticated economy, the distribution of Babylonian goods and services became more widespread and allowed members of society to develop their skills in the areas of art and science.<sup>12</sup>

Tax collection in the Babylonian Empire was a major function of the government. Taxes were levied as goods moved through different regions along trade routes. Civil servants traveled across the empire to collect taxes. Regions that refused to pay would be subject to military actions. Citizens paid taxes for the maintenance of irrigation systems, for land use, and construction of government building projects like temples and palaces. Merchants played an important role in society; they conducted trades internationally. Additionally, they played the role of “bankers” as they made loans and took deposits. Farmers could receive advances of farming materials for a fee in the form of land and supplies after a successful harvest. The merchant would also store the harvested crops for farmers for a fee.<sup>13</sup> During this time period, taxes were levied on most goods. The Babylonians paid their taxes through service or goods such as livestock and crops. Taxes were levied on both traders and travelers. Taxes in the form of physical labor were also levied; the male head of household had to perform the physical tax payments such as farming, maintenance of canals, military service, and foreign battles. Sometimes wealthier men would send slaves or pay another to perform their service obligation.<sup>14</sup>

### Taxes Today

Today, taxes are collected to fund government activities and programs. The expenditures include interest payments and program spending. Interest payments are the result of government borrowing, usually in the form of bonds, securities, and bills. Individuals or other governments can buy bonds and securities from governments. The benefit to buying bonds and securities is the interest payments that are paid to the bondholder over an agreed upon length of time.<sup>15</sup> Program spending includes transfer payments and direct government production. Transfer payments involve the shifting of money from one sector of society to another. A transfer payment does not involve goods or services, it is simply a transfer of funds. Examples of transfer payments in the United States include welfare, social security, and subsidies. Government production is comprised of public consumption and public investment. Unlike transfer payments, government production involves the government providing a service either directly through a government agency or with the hiring of a private agency. Government production includes the public goods and services consumed by taxpayers without a direct payment, they are entitled to these public goods or services due to their citizenship of a country. Another function of government production is public investment. Public investment usually involves the government’s investment in public projects to improve the infrastructure of cities and states.<sup>16</sup>

To fund these expenditures, tax revenue must be collected. Taxes are levied in a variety of ways including income, sales, payroll, wealth, and environmental taxes. Individuals and businesses pay income tax as a portion of their earnings. Income taxes come in the form of progressive taxes or flat-rate taxes. The tax rate under a progressive tax increases as the amount of income increases. In contrast, a flat-rate tax is a constant rate regardless of the level of income. Sales taxes are collected upon the sale of a good or service; when an individual makes a purchase the tax is added in addition to the final cost. Payroll tax is related to the wages earned by a worker. The tax burden is typically shared between the employee and employer. Wealth taxes are levied on the accumulated wealth of an individual. They include all assets an individual accumulated over their lifetime. Environmental taxes are used to encourage environmentally-friendly actions and provide a disincentive for actions that are environmentally damaging.<sup>17</sup> In the past, reading about taxation has not been enough for my students to fully understand the impact of it. So for this unit the students will compute tax amounts.

## The Mathematics

I hope to develop my students' fluency in using decimals and percents so they will have a means to manage their money and understand governmental policies related to taxation. Mathematical knowledge related to percents will become a large part of my students' adult life. Consumers need to be aware of interest rates, tax rates, discounts, tips, and survey results and statistics. Developing a solid base knowledge of percents and decimals in middle school will allow the students to gain an even more comprehensive understanding of those concepts. Many times students learn and implement an algorithm to solve problems and get the answer, but they don't understand the principles behind the algorithm and lack the number sense to be able to make sense of tax and percent change. My ultimate goal in this math unit is for the students to be able to mentally compute and estimate the solution to problems based on percent change.<sup>18</sup>

## Income Tax

Income tax has been collected from employees' paychecks in the United States since 1943. There are only seven states that do not levy a state-wide income tax. In Delaware, employers are required to collect income tax from their employees and keep records of the names and addresses of the employees and contractors who they do business with. The amount of federal income tax withheld from an employee's paycheck is based on their earnings, marital status, and number of allowances they claimed. To determine the employee's income tax rate, the payroll clerk uses the wage and bracket withholding tables from the Internal Revenue Service. For my students, I will give them the income tax rate. For older or more advanced students, they could be challenged to calculate the tax rates. To calculate income tax the students will use the following formula:  $T = B \times R$ . In this equation "T" represents the amount of tax, "B" is the base or the gross pay, and "R" is the tax rate in the form of a decimal. The students will be required to first change

the tax rate that is expressed in the form of a percent to its corresponding decimal. Next they will multiply it by the employee's gross pay. This step will give the students the amount of tax paid. Finally, to find the take-home pay with income tax deducted, the students will need to subtract the amount of tax paid from the gross pay.<sup>19</sup>

## Sales Tax

Sales tax is usually charged per unit of merchandise and not necessary for the entire purchase amount. Items like food and other necessities are not taxed in most states. Calculating sales tax requires basic multiplication and addition. For the most part, businesses calculate the tax amount for the customer at the register on the website at the point of sale. To calculate sales tax the students will use the same formula as was used for calculating income tax:  $T = B \times R$ . In this equation "T" represents the amount of tax, "B" is the base or the price of the item being taxed, and "R" is the tax rate in the form of a decimal. The students will be required to first change the sales tax rate that is expressed in the form of a percent to its corresponding decimal and then multiply it by the price of the item. This step will give the students the tax amount. Next, to find the total cost of the item with tax included, the students will need to add the price of the item to the tax amount.<sup>20</sup>

## Property Tax

Property tax is levied in cities, counties, school districts, and states. Property taxes can be collected annually, semiannually, or quarterly. Properties are assessed to determine their market value and the property tax amount is calculated based on the assessed value. Property tax is added to a homeowner's monthly mortgage payment and held in an escrow account by the mortgage company until the tax payment is due. To calculate property tax the students will first multiply market value of the property by the assessed rate. Then they will determine the number of hundreds in the assessed value by dividing the assessed value by 100. Finally, the students will need to multiply the number of hundreds by the tax rate per \$100 to determine the amount of tax due.<sup>21</sup>

## Tax and Percent

Percent is commonly taught in middle school and early high school mathematics courses. It forms a basis of multiplicative structures. Despite its extensive instruction, students still struggle in conceptualizing and using percent. It is critical that the students see percent as a label but understand that it is not a label of measurement like inches or feet. It can't be dropped during the problem solving process and then tacked on at the end. Percent means per one hundred. A percent is another way of writing a value that could be expressed as a decimal or fraction. For example, 20% of 100 is 20 and represents 20/100 or .20.

In the article, “A Privileged Proportion<sup>22</sup>,” an explanation as to the reasons for student difficulties in this area is expressed. They concluded that part of the problem is that the definition of percent changes roles as it is used in mathematics and our language does not fully describe those differences. The authors further explain that traditional tasks fall into four categories including conversions, exercises, shading tasks, and problems. For this unit the students will be working through all four of the categories. First they will be converting fractions into decimals such as changing 5% to its decimal form of .05. Exercises involve finding a missing value. For example, in the introductory level problems in this unit the students will be using an equation to find the rate, base, or tax amount for exercises structured in various ways. Shading tasks require the students to visually display a percentage of an area or object by shading them in. For this unit, the students will be required to restate the problem using a visual representation. Finally, problems require the problem solver to sort out the information and data to find the solution. In this unit the students will work in groups to solve problems that are based on the tax burdens of different families including sales tax, income tax, and property tax.<sup>23</sup>

### **Teaching Strategies**

Middle school math is a transition as the students move from concrete to abstract concepts. It is important that math instruction moves the students from the concrete to the abstract by meeting students at their current level of knowledge and then scaffolding them to a higher level with more abstract concepts. A carefully created sequence of instructional activities at increasing difficulty levels can lead to greater student achievement.<sup>24</sup>

### **Assessment**

Giving a pretest before the unit will allow me to gauge student understanding of the mathematical concepts before teaching the unit. Since I teach social studies and not math, my classes include students at all different levels of mathematical knowledge. Math courses my students are taking include pre-algebra, general math, honors math, and a pull-out resource room math class. I will put the students into small groups based on the results of the pretest. I will have one student with a high level of proficiency, two with an average level of proficiency, and one who is at the lowest level of proficiency. The pretest questions will include: explain what a percentage is, explain what a decimal is, and explain the process for changing a decimal to a percent. I will use the results of the pretest to inform my teaching. If necessary, I will conduct a mini lesson on decimals and percents. After the unit is completed, I will give the post-assessment. The post-assessment will have the exact same questions as the pre-assessment. I will use the results of the assessment to determine the student growth toward meeting the objective.<sup>25</sup>

### **Problem Solving**



With no experience in teaching mathematics, the development and selection of appropriate problems is critical in the success of this unit. To assist in the selection process I referred to *Teaching Mathematics through Problem Solving: Grades 6-12* written by the National Council of Teachers of Mathematics. The book warns that the design of problem-solving lessons, units, and activities is challenging and must be done thoughtfully. The book includes a series of questions to assist teachers in selecting appropriate materials. The questions are: “Will working on the tasks foster students’ understanding of important mathematical ideas and techniques? Will the selected tasks be engaging and problematic, yet accessible, for many students in the target classes? Will work on the tasks help students develop their mathematical thinking—their ability and disposition to explore, to conjecture, to prove, to represent, and to communicate their understanding? Will the collection of tasks in a curriculum build coherent understanding and connections among important mathematical topics?”<sup>26</sup> Through the careful selection of mathematical problems, I created an engaging unit to bridge the concepts of civics and mathematics in a way that immerses the learners in content and process.

As an outline for problem-solving throughout the unit, I used G. Polya’s book, *How to Solve It*, to teach the students a four-step process for solving problems. In the book there is a “list” that explains the four-steps for solving a problem as well as guiding questions for each step of the way. The first step is “understanding the problem.” This step requires the problem solver to thoroughly investigate the problem that they are attempting to solve. They should determine what is unknown, what the facts are, and determine if there is enough information to satisfy the condition. The second step is “devise a plan.” This step in the process requires the problem solver to devise a solid plan of action for coming to a solution to the problem. If the problem is unfamiliar or too complex to be solved, the problem solver should be encouraged to think of similar problems that they can rework to fit the new problem. The last step is “looking back.” The problem solver should recheck the problem and then determine alternative methods for solving the problem. They should also think about ways their solution to the problem could help them to solve other similar problems. Problem solvers should look back at the thought processes behind their work to see what could be applied to a different problem. Although I am only teaching one unit of the problem solving technique, I’m hoping that with repetition and practice in math and other classes my students will begin to naturally use the “How to Solve It” process when they are solving problems throughout their daily lives.<sup>27</sup>

For example, a problem the students will be solving is, “Isabella got a puppy for her birthday. To care for the new puppy, Isabella went to the pet store to buy treats, dog shampoo, and a leash. The treats were \$2.50, the shampoo was \$4.25, and the leash was \$10.99. The sales tax rate is 7%. Isabella gave the cashier \$20.00, how much change did she receive?” The students will use the problem-solving process to solve this problem. The first step is to understand the problem. This problem requires the students to determine the value of a basket of goods, calculate the total tax and total amount charged, and then subtract to find the change Isabella received from the cashier. When devising a

plan the students should express their anticipated technique for solving the problem. For this problem the first step would be to add up the three items to find the item total. This would be \$2.50 plus \$4.25 and \$10.99. The next step would be to change the tax rate from a percent to a decimal. Then the problem solver would multiply the item total by the tax rate expressed as a decimal. This would give them the dollar amount of the sales tax that can be added to the item total. The final step would be subtracting the item total with the tax dollar amount from the amount that Isabella gave the cashier. The problem solver would find that Isabella received \$1.02 in change from the cashier. The last step in the process is to look back at the problem to find alternative methods for solving it and to check for accuracy.

### Hands-on Activities

The use of hands-on activities can help move the students from the concrete to the abstract. As students are first introduced to the mathematical concepts of this unit, I will use visuals to aid in their understanding. For example, I want to give the students a “paycheck” and then they will show on a pie chart the representation of the portion taxed and then show the take home pay. See Figure 1 for a simple example of a pie chart showing the tax amount and take home pay. Showing the problem visually will allow the students to gain a greater understanding of the impact of taxation. They will also be able to check their work using their visuals. Sometimes students add the income tax amount instead of subtracting it so the visual will help them to see this relationship. There will be a section on the graphic organizer for problem solving that will require the students to create a visual representation of the problem.<sup>28</sup>

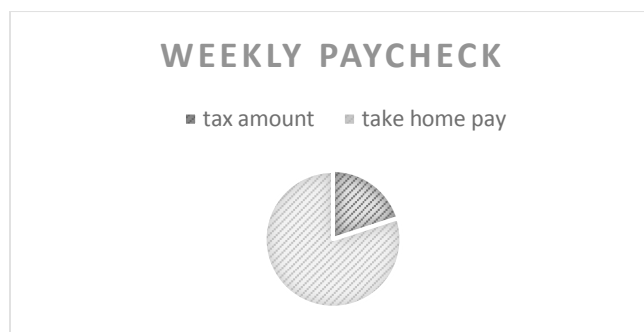


Figure 1

### Jigsaw

A strategy to get the students working together is the jigsaw cooperative learning model. With this strategy, the students have the opportunity to become an expert in one aspect of the lesson and share what they learn with their classmates. Each student is responsible for a piece of the “puzzle.” The first step in the process is dividing the information that

needs to be covered into logical sections. All sections should have a similar structure and difficulty level because the students need to feel as though each part is important. The next step is to divide the students into groups of the same number of sections. For this unit, the jigsaw activity will include five sections of content and five students in a group; this way each section has representation. Each student is assigned his or her part and given time to independently read and/or do research. For this reading, section one is sales tax, the second is excise tax, the third is income tax and progressive taxes, the fourth covers social security tax and Medicare tax, and the fifth is property tax and estate tax. When students are finished gathering information on their section, the groups will be restructured so that “expert” groups are formed. The teacher will organize the students in groups according to the section they studied to discuss the information, clarifying any questions or concerns they may have. Then the students will devise a plan for sharing the information with their classmates. The students should be given time to practice their presentation with their expert group to ensure its accuracy. The final step is when the original group meets again and each student presents his or her section. Each student is responsible for teaching a portion of the information to the group. Throughout the activity, the teacher acts as a facilitator, periodically checking in on students to keep them focused and to answer questions.<sup>29</sup>

### Close Reading

To meet the Common Core State Standards, my school district is working to add more close readings to the units currently taught in English and social studies. Close reading is a technique used to teach students to carefully study a piece of writing by reading it several times, each time looking for a different bit of information. The process begins with a hook; usually the teacher asks the class a question or gives some background information. Then the teacher explains the close reading technique to the class. The students complete the first reading of the text independently and fill in a graphic organizer related to vocabulary and their understanding of the content. The second reading is done aloud by the teacher. While the teacher reads, the students are directed to listen and look for the central ideas of the text. Next, the students answer a series of text-dependent questions with a partner. To check for accuracy, the teacher conducts a whole-class discussion of the questions and passage.<sup>30</sup>

### Exit Ticket

An exit ticket is a teaching strategy used to assess the students’ understanding of a concept, determine if the students can transfer the lesson objectives to a new situation, emphasize the key points of the lesson, or extend the lesson’s content. Exit tickets are usually brief and collected at the end of the class period. They are most typically used as a formative assessment, helping the instructor to determine a course of action for the learning activities that are in the near future.<sup>31</sup>

## Activities

### Pretest

Before beginning the unit I will give a short pretest. The pretest questions will include: explain what a percentage is, explain the process for changing a decimal to a percent, and explain how to calculate a tax amount using the equation  $T = B \times R$ . I will use the results of the pretest to inform my teaching and grouping of students for the unit. See Appendix 1: Pretest for an example.

### Lesson 1: Gathering Information- Taxation Today and in the Ancient World

#### *Anticipation Guide*

To assess prior knowledge and get the students thinking, I will use the following anticipation guide. The students will read four statements that will be covered later in the lesson and decide if they are true or false. I will tell the students that they will revisit this information at the end of the period to make any necessary changes. The statements are as follows, “Government at all levels can impose sales tax,” “An excise tax applies to all products,” “Income tax is the tax you pay on money you receive from various sources,” and “Social Security is the basic retirement program run by the banking system.”

#### *Jigsaw Reading of “Taxation”*

Next I will have the students jigsaw read the article “Taxation” from an iCivics lesson plan called “Taxation.”<sup>32</sup> The students will be divided into five groups, each representing a section of the article. The article should be divided up by sections; the first is sales tax, the second is excise tax, the third is income tax and progressive taxes, the fourth covers social security tax and Medicare tax, and the fifth is property tax and estate tax. As the students read and share the information they will take notes in a graphic organizer. See Appendix 2: Jigsaw Reading Graphic Organizer for an example.

#### *Close Reading of “Mesopotamia”*

To make a historical connection and to extend the students’ understanding of taxes, I will have them do a close reading of an article on taxes in Mesopotamia from the website Ben Franklin Tax Help.<sup>33</sup> The article, “Mesopotamia,” has a Flesch-Kincaid reading level of 8.4. To hook the students before beginning the close reading, I will ask the students to describe what they think taxes were like in the ancient world. I anticipate the students discussing a barter system related to agriculture due to content covered in the units that precede this one. Then I will explain to the students that they will be using the close reading technique to learn more about taxes in Mesopotamia. I will tell them that they will be working together and independently to carefully analyze the text. I will tell the

students that they will be reading the text several times and each time they will be focusing on different aspects of it. Then I will instruct the students to independently read the text and fill in a graphic organizer to ascertain the words and concepts that are unfamiliar to the students. See Appendix 3: Close Reading Graphic Organizer for an example. After the students have independently read the text, I will give them a few minutes to share their graphic organizer with a partner. This way the students may find similar terms and concepts that they find difficult or a student may be able to answer a question of the other student. Then I will have the students share their remaining questions through a full class discussion.

Next, I will read the passage aloud. Before reading I'll tell the students to listen for the central idea of the text. After reading the passage, I will give the students time to compare what they identified in the passage as the central idea to what their classmates identified. The students should explain that the central idea is the early writing system of Mesopotamia and its uses. Then I will have the students record their answer on the top of their worksheet. See Appendix 4: Close Reading for an example. Then I will ask the follow-up question: What distinct details explain the central idea of this piece? The details conveying the central idea can be found in the second sentence of the first paragraph and the first sentence of the second paragraph. If the students have difficulty in finding the central idea or details conveying the central idea, I will redirect them to the text and allow the students to reread the section.

The final step in the close reading includes a series of text-dependent questions. As a model, I will complete the first question as a full class and then allow the students to complete a couple more questions with a partner. I will model the following process as I work through the first question with the students. First the students should re-read the section of the text and take notes that will help them to respond to the question. Next they will discuss the question in a small group. Finally, the students will write what they think is the best answer to each question. The first question is, "What does the author mean in the sentence, "Records of taxes, tithes, and tributes pre-date even the most ancient of stories and religion."?" The author is explaining how tax records existed even before religious writings and written stories. The second question is, "What does the word "universal" mean in this selection?" The word universal means it was the same. No matter what language the people were speaking, the written language was the same for everyone. The next question is, "How did the people of Lagash keep record of the taxes people paid?" Tax records were kept on pieces of soft clay that were later baked. People used the pieces of clay as receipts. The last text-dependent question is, "What do you infer the tax rate would be when a crisis or war was not going on? What led you to that conclusion?" During times of peace and stability the tax rate would probably be below 10% or only on a few goods, not all goods. See Appendix 4: Close Reading for an example.

*Closure/Check for Understanding*

To check for understanding I will ask the students, “Why do governments need the power to collect taxes? Explain your answer with an example.” I will score their answers using a two-point rubric. To score two points their response must give valid reasoning with an accurate and relevant example of a reason why governments have the power to collect taxes. For a score of one point the student response gives valid reasoning with an inaccurate, irrelevant, or no example of a reason why governments have the power to collect taxes. An example of an appropriate answer is, “Governments need the power to collect taxes in order to fund government programs. For example, taxes are collected to pay for the maintenance of the highways.” This question will be answered independently in the form of an exit ticket and the exit ticket for the following question is Appendix 5: Exit Ticket- Taxes in Mesopotamia.

## Lesson 2: Application- Calculating Tax

### *Calculating Tax Today- “A Taxing Situation”*

Since I teach mixed abilities classes I wanted to ensure that all of the students are on level ground before beginning the mathematics portion of the unit. For remediation I will be using the lesson “A Taxing Situation” from *Focus: Grades 3-5 Economics* by the National Council on Economic Education.<sup>34</sup> This lesson is intended for fourth grade but I will be using it with my sixth graders as a review for some students and an introduction for the others. The lesson has two parts, the first is a discussion and narrative about public and private goods and the second is a series of problems related to property tax, sales tax, and income tax. Since the students have already been introduced to the different types of taxes through the jigsaw reading of the article “Taxation” from iCivics, I will only use the problems from the lesson to provide the basis for the more difficult problems later on in the unit. I will be using the property, sales, and income tax cards from activity 4.3. Each of the cards have a simple tax calculation that can be solved using a variation of the equation  $T = R \times B$ , where “T” is the tax, “R” is the tax rate, and “B” is the base or item being taxed. I plan to work through a few of the problems as a full class and then allow the students to work with a partner to solve several more. To check student work, I will have the students explain how they solved the problems using the ELMO.

### *Looking at Tax Burdens- “Where Does the Money Come From?”*

Utilizing the problems included in the *Focus Economics: Middle School Economics* lesson “Where Does the Money Come From,” the students will work in small groups of three to four to solve problems related to federal taxation in the United States.<sup>35</sup> Each group will be assigned a family and will have a series of word problems that requires them to calculate the family members’ taxes based on the information provided on the problem card. The students will be calculating property tax, income tax, and payroll tax. The students will utilize a graphic organizer that I created based on Polya’s problem

solving technique to show their interpretation of the problem, plan of action, solution, and reflection.<sup>36</sup> They will share their graphic organizer with the class using the ELMO. This way we can discuss how different families have different tax burdens. See Appendix 6: Problem Solving Steps for an example.

*Closure/Culminating Activity with a Historical Connection*

To make a historical connection I will use the book Mesopotamia: Creating and Solving Word Problems. One section in particular describes the specialization of the Mesopotamians and their land use. The word problem posed on the section of text focuses on calculating a percent of a number to determine how many people are farmers. As a culminating activity, I will have the students work in pairs to create their own word problems that include a combination of rate, base, and tax. They will be given an excerpt of text relating to a Mesopotamian Empire's tax collection data. The students will work in pairs to write equations, using the problem from Bonnie Leech's book as an example.

Posttest

Upon completion of the unit I will give the posttest. The posttest contains the same questions as the pretest: explain what a percentage is, explain the process for changing a decimal to a percent, and explain how to calculate a tax amount using the equation  $T = R \times B$ . I will use the results of the posttest to determine student proficiency of the unit objectives. See Appendix 7: Posttest for an example.

**Appendices**

Appendix 1: Pretest

Name _____	Date _____
<b>Taxation in Modern and Ancient Societies: Pretest</b>	
1. Explain what a percentage is.	
2. Explain the process for changing a decimal to a percent.	

3. Explain how to calculate a tax amount using the equation  $T = R \times B$

Appendix 2: Jigsaw Reading Graphic Organizer

Name _____ Date _____	
<b>Jigsaw Reading Graphic Organizer</b>	
Section	Notes
Sales tax	
Excise tax	
Income tax progressive taxes	
Social security tax Medicare tax	
Property tax Or estate tax	

Appendix 3: Close Reading Graphic Organizer

<b>Taxes in Ancient Mesopotamia   Reading Graphic Organizer</b>
<b>First Reading of the Text</b>



The words in the text that I do not understand are...	
Some questions or thoughts I have about the text are...	

Appendix 4: Close Reading

Name _____ Date _____	
<b>Close Reading: Taxes in Mesopotamia</b>	
<b>Second Reading of the Text</b>	
<b>DIRECTIONS:</b> Follow along as your teacher reads the text aloud. Highlight the central idea.	
What is the central idea of the text?	
_____	
_____	
_____	
<b>Third Reading of the Text</b>	
<b>DIRECTIONS:</b> Use the following process to answer the test-dependent questions.	
<ul style="list-style-type: none"> <li>a) Re-read the section of the text in the left column.</li> <li>b) Take notes to help you respond to the question.</li> <li>c) Discuss the question in a group of 2-3.</li> <li>d) Write what you think is the best answer to each question.</li> </ul>	
1. What does the author mean in the sentence, "Records of taxes, tithes, and tributes pre-date even the most ancient of stories and religion."?	

<p>2. What does the word “universal” mean in this selection?</p>	
<p>3. How did the people of Lagash keep record of the taxes people paid?</p>	
<p>4. What do you infer the tax rate would be when a crisis or war was not going on?</p>	

Appendix 5: Exit Ticket- Taxes in Mesopotamia

<p>Name _____ Date _____</p>
<p><b>Exit Ticket: Taxes in Mesopotamia</b></p>
<p>DIRECTIONS: Answer the following question using complete sentences.</p>
<p>Why do governments need the power to collect taxes? Explain your answer with an example.</p>
<hr/>
<hr/>
<hr/>
<hr/>
<p>Rubric</p>
<p>2 – This response gives valid reasoning with an accurate and relevant example of a reason why governments have the power to collect taxes.</p>
<p>1 – This response gives valid reasoning with an inaccurate, irrelevant, or no example of a reason why governments have the power to collect taxes.</p>

Appendix 6: Problem Solving Steps

<b>Steps for Problem Solving</b>		
<b>1</b>	<b>Understand the Problem</b>	<ul style="list-style-type: none"> <li>• Restate the problem.</li> <li>• What do you need to “figure out?”</li> <li>• Draw a visual to illustrate the problem.</li> </ul>
<b>2</b>	<b>Devise a Plan</b>	<ul style="list-style-type: none"> <li>• Do you have a plan for solving this problem?</li> <li>• What is your plan of action?</li> <li>• If this problem is unfamiliar, does it remind you of any problems you solved in the past?</li> <li>• Can you simplify the problem to understand it better?</li> <li>• Have you thoroughly taken into consideration all of the parts of the problem?</li> </ul>
<b>3</b>	<b>Carry Out Your Plan</b>	<ul style="list-style-type: none"> <li>• As you solve the problem, record all of the steps you take to come to a solution.</li> <li>• Check your work.</li> <li>• Can you prove that your solution is correct?</li> </ul>
<b>4</b>	<b>Looking Back</b>	<ul style="list-style-type: none"> <li>• Could the problem be solved in a different way?</li> <li>• How could this problem help you to devise a plan for solving other problems?</li> </ul>

Appendix 7: Posttest for an example

Name _____	Date _____
<b>Taxation in Modern and Ancient Societies: Posttest</b>	
1. Explain what a percentage is.	

2. Explain the process for changing a decimal to a percent.
  
3. Explain how to calculate a tax amount using the equation  $T = R \times B$ .

### Resources for Teachers

Delaware Content Standards and Clarifications Documents	Delaware Department of Education <a href="http://www.doe.k12.de.us/infosuites/staff/ci/content_areas/socialstudies.shtml">http://www.doe.k12.de.us/infosuites/staff/ci/content_areas/socialstudies.shtml</a>
Teaching Civics	Rationale for teaching civics- <a href="http://www.civicmissionofschools.org/educators">http://www.civicmissionofschools.org/educators</a> Lesson plans and resources for teaching civics- <a href="http://www.icivics.org/">http://www.icivics.org/</a> Lesson plans, videos, and books for teaching civics- <a href="http://new.civiced.org/">http://new.civiced.org/</a>
Problem Solving	Teaching problem solving- Advice for teachers <a href="http://www.cmc-math.org/members/infinity/polya.html">http://www.cmc-math.org/members/infinity/polya.html</a>
Taxes	Delaware Tax Information: <a href="http://taxfoundation.org/state-tax-climate/delaware">http://taxfoundation.org/state-tax-climate/delaware</a> Comparison of Tax Rates in US: <a href="http://taxfoundation.org/article/facts-figures-2013-how-does-your-state-compare">http://taxfoundation.org/article/facts-figures-2013-how-does-your-state-compare</a>

## Endnotes

- <sup>1</sup> Margret Branson, *The Importance of Promoting Civic Education*, Center for Civic Education. Last modified January 31, 2003. Accessed July 14, 2013, 2.
- <sup>2</sup> James K. Bidwell, 1993. "Humanize Your Classroom with the History of Mathematics" *Mathematics Teacher*. 86 (6): 461-64.
- <sup>3</sup> Charles David Miller and Vern E. Heeren. *Mathematical ideas*. 6th ed. Glenview, Ill.: Scott, Foresman/Little Brown Higher Education, 1990. Print, 309-17.
- <sup>4</sup> Bidwell, 461-64.
- <sup>5</sup> Nathan Court. 2006. "Mathematics in the History of Civilization". *Mathematics Teaching in the Middle School*. 12 (3): 142-148
- <sup>6</sup> Shirk, James Abram Garfield. 1938. "Contributions of Commerce to Mathematics". *Educational Leader*. 1 (4), 203-06.
- <sup>7</sup> Court, Nathan, 142-148.
- <sup>8</sup> Shirk, James Abram Garfield, 203-06.
- <sup>9</sup> Stephen Bertman, *Handbook to life in ancient Mesopotamia*. New York: Facts on File, 2003, 67-9.
- <sup>10</sup> Encyclopædia Britannica Online, s. v. "Hammurabi," accessed October 28, 2013, <http://www.britannica.com/EBchecked/topic/253697/Hammurabi>.
- <sup>11</sup> Ibid., 203-06.
- <sup>12</sup> Ibid., 206.
- <sup>13</sup> Bertman, Stephen, 67-9.
- <sup>14</sup> Donald White. "4/2/2002, Taxes in the Ancient World - Almanac, Vol. 48, No. 28." 4.
- <sup>15</sup> Jim Stanford and Tony Biddle. *Economics for everyone: a short guide to the economics of capitalism*, 239-42.
- <sup>16</sup> Ibid., 240-41.
- <sup>17</sup> Ibid., Jim, 242.
- <sup>18</sup> Ron Zambo, 2008. "Percents Can Make Sense". *Mathematics Teaching in the Middle School*. 13 (7): 418-422.
- <sup>19</sup> Sharon Burton and Nelda Shelton. *Business math using Excel*. Mason, Ohio: Thomson/South-Western, 2005, 225-51.
- <sup>20</sup> Ibid., 322.
- <sup>21</sup> Ibid, 235-38.
- <sup>22</sup> Melanie Parker and Gaea Leinhardt. "Percent: A Privileged Proportion." *Review of Educational Research* 65.4 (1995): 421. Print.
- <sup>24</sup> "A Bargain Price for Teaching about Percentage". 2013. *Mathematics Teaching in the Middle School*. 19 (2): 108-115.
- <sup>25</sup> Elizabeth S Sweeney and Robert J. Quinn. 2000. "Concentration: Connecting Fractions, Decimals, and Percents" *Mathematics Teaching in the Middle School*. 5 (5): 324-28.
- <sup>26</sup> Harold L Schoen. *Teaching mathematics through problem solving: grades 6-12*, 55-6.

- <sup>27</sup> George Polya. *How to solve it*. 2nd ed. New York: Penguin, 1990. Print, 33-6.
- <sup>28</sup> Sweeney, Elizabeth S., and Robert J. Quinn, 324-28.
- <sup>29</sup> Elliot Aronson. *The Jigsaw Classroom*. Beverly Hills: Sage Publications, 1978, 62.
- <sup>30</sup> Maureen McLaughlin. *The common core: teaching students in grades 6-12 to meet the reading standards*, 53.
- <sup>31</sup> "Exit Ticket." The Teacher Toolkit.  
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- <sup>32</sup> "iCivics | Free Lesson Plans and Games for Learning Civics." iCivics | Free Lesson Plans and Games for Learning Civics. N.p., n.d. Web. 8 Dec. 2013.  
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- <sup>33</sup> "Ben Franklin Tax Help." *Ben Franklin Tax Help*. N.p., n.d. Web. 9 Dec. 2013.  
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- <sup>34</sup> Flowers, Barbara J.. *Focus, grades 3-5 economics*. New York, NY: National Council on Economic Education, 2005. Print, 43-56.
- <sup>35</sup> Suiter, Mary C.. *Middle school economics*. New York: Economics America, National Council on Economic Education, 1996. Print, 79-87.
- <sup>36</sup> Pólya, George, 33-6.

### **Annotated Bibliography**

"A Bargain Price for Teaching about Percentage". 2013. *Mathematics Teaching in the Middle School*. 19 (2): 108-115.

This article discussed methodologies for teaching percent.

Aronson, Elliot. *The Jigsaw Classroom*. Beverly Hills: Sage Publications, 1978  
Aronson explains the strengths of using the jigsaw teaching strategy with students.

"Ben Franklin Tax Help." Ben Franklin Tax Help. <http://bftaxhelp.wordpress.com/about-property-taxes/history-of-property-taxes/ancient-mesopotamia/> (accessed December 9, 2013).

This website includes an article on tax collection in Mesopotamia that I used in developing a close reading.

Bertman, Stephen. *Handbook to life in ancient Mesopotamia*. New York: Facts on File, 2003.

This book provided background information on the importance of merchants and bankers in Mesopotamian society.

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This article provided a rationale for teaching history in math classes.

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Branson expresses the importance of civic instruction at all levels of education in this article.

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This article provided important information for calculating different types of taxes.

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This article explains the origins of math.

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This guide included information about taxation in Delaware.

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Flowers, Barbara J.. *Focus, grades 3-5 economics*. New York, NY: National Council on Economic Education, 2005.

This book of economics lessons includes a lesson called "A Taxing Situation" that was used in the mathematics development portion of this unit.

Leech, Bonnie Coulter. *Mesopotamia: creating and solving word problems*. New York: Rosen Pub. Group's PowerKids Press, 2007.

This resource integrates information about Mesopotamia with mathematic word problems.

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This publication provided a basis for the close reading included in this unit.
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*Mathematical Ideas* was the textbook I used during my teacher education in mathematics. It provided background information in the area of problem solving using percents.
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*Economics for Everyone* is a concise guide to almost everything related to our economy. I used this book to understand more about taxation in the United States.
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This book includes high-quality economics lessons.
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<http://www.upenn.edu/almanac/v48/n28/AncientTaxes.html> (accessed October 21,



2013).

This article explained how and why taxes were collected in Mesopotamia and other ancient civilizations.

"iCivics | Free Lesson Plans and Games for Learning Civics." iCivics | Free Lesson Plans and Games for Learning Civics. <http://www.icivics.org/> (accessed December 8, 2013). This is a wonderful resource for civics instruction. It includes lesson plans, resources for students and teachers, and links to other institutions related to civic education.

Zambo, Ron. 2008. "Percents Can Make Sense". *Mathematics Teaching in the Middle School*. 13 (7): 418-422.

This article describes the way percents should be explained to students.

Curriculum Unit  
Title

Taxation in Modern and Ancient Societies: Integrating Math and Social Studies

Author

April Higgins

**KEY LEARNING, ENDURING UNDERSTANDING, ETC.**

**Delaware Social Studies Civics Standard 1a:** Students will understand that governments have the power to make and enforce laws and regulations, **levy taxes**, conduct foreign policy, and make war.

**CCSS.Math.Content.6.RP.A.3c** Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.

**Enduring Understanding:** Governments require their citizens to pay taxes to achieve financial security.

**ESSENTIAL QUESTION(S) for the UNIT**

- Why do governments have the power to levy taxes?
- How are tax amounts calculated?

**CONCEPT A**

Taxation Today

**CONCEPT B**

Taxation in Mesopotamia

**CONCEPT C**

Calculating Tax Amounts

**ESSENTIAL QUESTIONS A**

**ESSENTIAL QUESTIONS B**

**ESSENTIAL QUESTIONS C**

Why do governments levy taxes?  
How are taxes levied?

Why did the governments of Mesopotamia collect taxes?  
How were taxes levied in Mesopotamia?

How are tax amounts calculated?

**VOCABULARY A**

**VOCABULARY B**

**VOCABULARY C**

income tax      levy  
sales tax  
payroll tax

surplus  
specialization  
tribute

rate              decimal  
base              percent  
tax amount

**ADDITIONAL INFORMATION/MATERIAL/TEXT/FILM/RESOURCES**

Delaware Content Standards and Clarifications Documents	Delaware Department of Education- <a href="http://www.doe.k12.de.us/infosuites/staff/ci/content_areas/socialstudies.shtml">http://www.doe.k12.de.us/infosuites/staff/ci/content_areas/socialstudies.shtml</a>
Teaching Civics	Rationale for teaching civics- <a href="http://www.civicmissionofschools.org/educators">http://www.civicmissionofschools.org/educators</a> Lesson plans and resources for teaching civics- <a href="http://www.icivics.org/">http://www.icivics.org/</a> <a href="http://new.civiced.org/">Lesson plans, videos, and books for teaching civics-http://new.civiced.org/</a>