

Instructional Design Project

Charelle Lovett

EDTC 6020: Principles of Instructional Design

East Carolina University

Overview

Seventh-grade math teachers across the state have the task to teach proportional relationships across varying mediums – graphs, tables, equations, and equivalent fractions. They must connect proportional reasoning to the meaning of percent (a ratio whose parts are out of 100). Once that connection is made, learners in a seventh-grade math classroom will work toward meeting the goal: students will use proportional relationships to solve percent problems involving money.

As a seventh-grade math teacher at Heritage Middle School, a school in the Wake County Public School System, I wanted to use this project to improve my ability to teach percent problems involving money. The specific objectives I included were:

1. Given examples and non-examples, students will accurately describe the differences between tax, tip, mark-up, commission, and discount.
2. Students will correctly solve percent problems involving money using equations and proportions 85% of the time.
3. Students will create a themed retail store and write and solve ten different word problems, based on the items sold in the store, solving for tax, tip, discount, mark-up, and commission.

The 28 students receiving the instruction are of differing socioeconomic backgrounds living in either Wake Forest's affluent Heritage neighborhood or lower income housing surrounding downtown. Students range in ages from 11 to 14 and have varying abilities with mathematical concepts. Using money to teach percent is the last section of the percent unit that I need to explain before students take their percent summative assessment. The instruction will take place in my classroom over a five-day, 50-minute class period.

Needs Analysis

Adolescents are curious beings, and with our current state's curriculum they have been trained to explain their thinking with sound reasoning and logic. It is part of my job to

understand and analyze the material before teaching in order to know the types of questions students may ask before they ask them. Questions students ask regardless of what they are learning are “When will I ever use this?” and “Why do I need to know this?” Finding an answer to satisfy their need to question outside of the response “The material is in the curriculum that I am required to teach,” can sometimes be a challenge. One aspect of teaching seventh grade is the amount of real-world connections I can make to what my students are learning in the classroom. The concept of percent with money is no exception. Students are able to connect to what they experience on a daily basis, such as making a purchase or eating out with family. Also, I am able to add life experience to the classroom conversation because I work a second job in retail.

Students will apply prior knowledge of percent and equations in order to be successful. Percent with money is part of a larger proportional reasoning unit. In the first half of the unit, students worked to find percent of a number, as well as worked backwards when given a portion and the percent to find the whole amount. They did this by using a picture (tape diagram or double number line), setting up a proportion (two ratios equal to one another), and solving an equation. This ability adds on to what they were taught in sixth grade about the abstract concept, along with the skill to move between fraction, decimal, and percent. Students are also expanding their comfort with writing and solving equations – skills we focused on during the first twelve weeks of school. Before moving to applying percent to money, I gave the pre-assessment below to determine if students could move between a percent and decimal and if they could solve for percent of a number. I also asked a question applying the vocabulary of the second half of the unit. Students need to understand the terms used in order to know the next step to take when setting up and solving a problem.

Percent with Money Pre-Assessment

1. What is 33% as a decimal?
2. What is 25% of 120?
3. What is 125% of 120?
4. Kenny ate 8 pickles out of a jar. This was 20% of all pickles in the jar. How many pickles were in the jar?
5. I walk into a store and buy a shirt at a discounted price. Am I going to pay more or less than the original price?

Learner Context Analysis

Robert Mager, author of instructional design texts, recommends a list of fourteen items to learn more about a target audience. Some of his recommendations include age, maturity level, motivation, attitude toward the subject, and pre-requisite and entry-level skills already learned. I have been working with my students since the beginning of July due to the school's year round schedule. Prior to the first day of school, I made contact with the sixth-grade teachers to learn more about the upcoming group. They provided grades, benchmark scores, End of Grade test scores, and personal input to paint a vivid picture of individual students and the group as a whole. On the first day of school, I gave my students the math survey below asking them to be as honest as possible. I wanted them to know their responses would not affect how I viewed them as a person or student, but I wanted to know their attitude toward mathematics.

Math Beginning of the Year Survey

1. I believe I can do math. YES / NO / MAYBE
2. I like (maybe even love) math. YES / NO / MAYBE
3. I will pass the math EOG this year. YES / NO / MAYBE
4. I will make at least one year's growth in math. YES / NO / MAYBE
5. In one word, describe school: _____.
6. Write three words that describe you as a person: _____, _____ and _____.
7. What do you like to do when you are not in school?
8. Do you think you are smart? Why or why not?
9. Who was the best teacher you ever had? Why?
10. What is the most important thing that I can do as a teacher to help you succeed in our class?

Most students were not surprising with their brutal honesty regarding their distaste of the subject. I predicted their responses would be what they were because the group preformed below average on the previous year's benchmarks and End-of-Grade tests. They wrote candidly about their likes outside of school, and they asked me questions about my interests at the end of the survey. The common thread among their responses was the feeling of failure due to the lack of understanding of the subject. Teachers who fell in the best teacher category had a common thread as well: patience. He or she did not look down on the students because they struggled, but patiently worked with them until they understood. These responses helped me to understand some were afraid to try because every time they did they failed, while others were on the brink of giving up. I had to show them that although my expectations were high, I was in their corner.

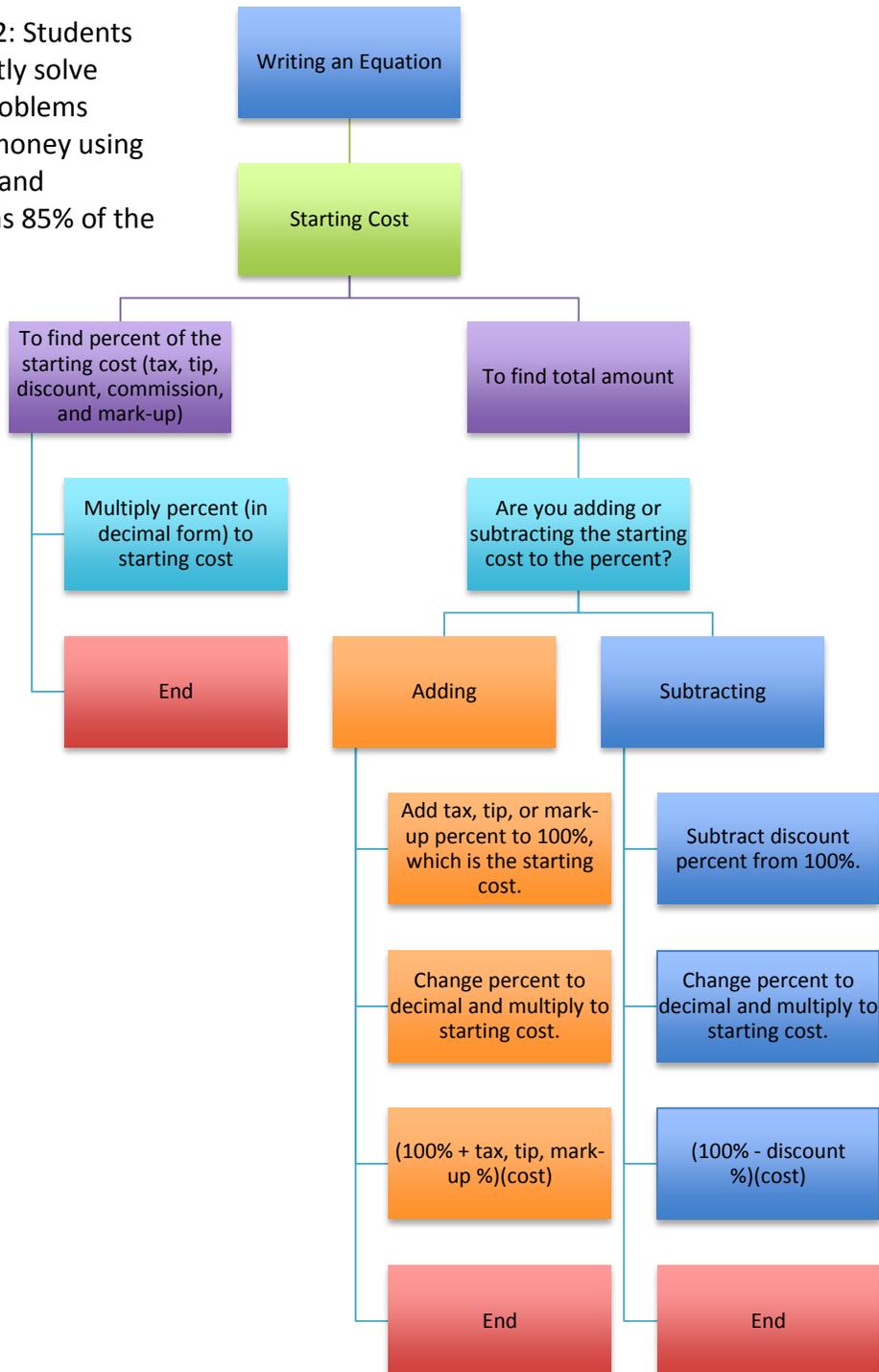
Out of the 28 students, six have an Individualized Education Program (IEP) and receive support through the in-class resource teacher in the classroom and a curriculum assistance elective class. Seven students not identified with a specific learning disability receive content support in an accelerated learning program elective class. One student receives English as a Second Language (ESL) support since he moved to the area from Puerto Rico at the start of the school year.

Task Analysis

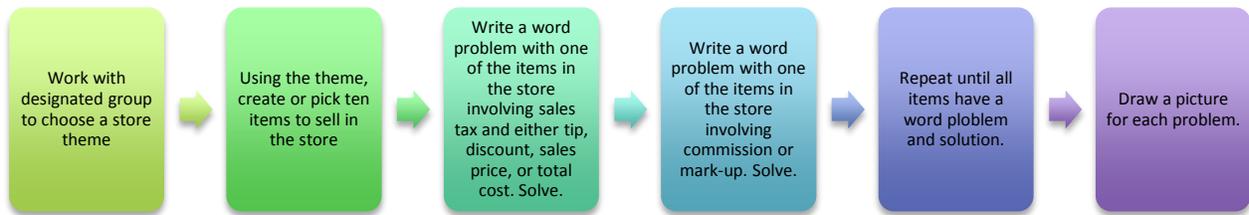
There are three objectives I included to satisfy the goal. I conducted a task analysis on the second and third objectives because they are procedural objectives to ensure I did not leave out any steps. I created the flowchart below for both objectives in order to see the process from start to finish. I contacted a subject matter expert at my school who has taught seventh-grade math for almost 20 years; who reviewed the steps and provided feedback about order, explanation, and

detail, as well as missing or unnecessary information. With the feedback she provided, I reviewed the analyses once more to ensure I was satisfied with the end result.

Objective 2: Students will correctly solve percent problems involving money using equations and proportions 85% of the time.



Objective 3: Students will create a themed retail store and write and solve ten different word problems, based on the items sold in the store, solving for sales tax, tip, discount, mark-up, commission, sales price, and total cost.



Instructional Strategy/Plan

After conducting the three analyses, I decided to implement a directed learning environment with structured teaching and specific practice inside and outside the classroom. The learner and context analyses gave me information about my students' math deficits and adversity to the subject. They approach math with caution, and direct instruction will allow for the content to be broken down in a structured fashion and taught in segments. Time constraints were also a factor for the type of learning environment because the school system sets the schedule of what material is taught, when it is taught, and for what length of time. The school system allotted two days for money and percent instruction. In order to teach the portion of the unit with fidelity and allow students the time for ample practice, students will need five days with the material before moving to reviewing and assessing the entire proportional reasoning unit.

The pre-assessment showed all students could change a percent to a decimal, six students could not find the percent of a number, and eight students could not answer question number four that had them find the whole amount. Only two students told me I was going to pay more for the shirt if the price was discounted. Vocabulary is important for success with the material; therefore, categorizing the vocabulary and then providing examples on the same form will allow students to have their notes in one place. The foldable, folded note taking form, will be provided

to the students on the first day of instruction. The guided notes will display on the SMARTboard, while students take notes in the foldable.

Percent and Money Foldable

<p>Discount Markdown amount you save</p> <p>30% off coupon → save 0.30 for every 1.00 you spend</p>	<p><u>To find:</u> % (in decimal form) times \$</p>	<p><u>To find:</u> % (in decimal form) times \$</p>	<p>Tax (Sales Tax) amount you pay extra</p>
			<p>Mark-Up whole sale (store buy it for) added cost for profit</p>
			<p>Commission money a sales person makes</p>
			<p>Tip/Gratuity money given customarily to a person in the service industry for a service (10%-20%)</p>
<p>Sales Price what you pay after an item is discounted</p> <p>25% off → sales price is 100% - 25% = 75%</p>	<p><u>To find:</u></p> <p>1. subtract % from 100%</p> <p>2. % (in decimal form) times \$</p>	<p><u>To find:</u></p> <p>1. add % to 100%</p> <p>2. % (in decimal form) times \$</p>	<p>Total Cost Selling Price or Retail what you pay after tax, tip, or markup is added on</p> <p>7% tax → total cost is 100% + 7% = 107%</p>

Students will access the foldable in their spiral notebook when solving specific questions pertaining to the vocabulary found in the guided notes. Homework practice will be given after each session to exercise the skills learned in class. For both homework and class work exercises, students will solve each problem using an equation and percent proportion to affirm their understanding of the material. To review the material before starting on the third objective,

students will participate in a game called Flamingo Run. They will spread themselves out around the room and start at one of the twelve problems posted on the wall. Once they answer the question, they will move to the card that has the answer, and read and answer the question that is on the second card. They will continue moving around the room until they are back where they started. No two cards have the same answer, so this is a way to self-check whether they got the question correct. The final objective is for students in small groups of three to create a retail store and write and solve ten different percent word problems based on the items sold in the store.

Instruction

On the first day of instruction, I started the class with a discussion about the vocabulary in the upcoming lesson. We discussed the similarities and differences between tax, tip, mark-up, commission, and discount. We categorized the terms by determining whether we were to subtract or add the original amount to the percent given or just find the percent of the original amount. Students were given the foldable, and we proceeded to go through each section of the foldable and discussed the definitions. For each term, I acted out purchasing or selling an item with different students. My students are interested in name-brand clothing, shoes, and accessories. I used their interests to relate what the cash register is doing when they purchase those items at a store. I gave different scenarios and asked which term I was representing. Some had to use their foldable to answer the posed question, but it reiterated to them they had a place to find the answer. Once students understood the vocabulary definitions, I provided examples of each type of problem using a proportion and equation to solve. On the first day we worked on examples mirroring the left side of the foldable. On the second day of instruction, we continued with examples that mirrored the right side of the foldable. Students did not hesitate to ask questions about setting up their equation or proportion to check their understanding.

At the start of the instruction on the third day, students quickly checked their homework from the night before, which was a mixture of problems. My in-class resource teacher and I circulated the room to assess how students did on the homework. A total of nine students, four with no homework and five who struggled, worked as a small group in the back of the room with me while the other students answered the twelve questions around the room. As the larger group finished with the Flamingo Run, they started on the current night's homework while I continued to give examples to the smaller group in the back of the room.

Students were generally excited at the start of class on the fourth day while I explained the retail store assignment. I put them into eight groups of three and one group of four, and they busily started on the assignment. The in-class resource teacher and I served as a resource for groups, as well as timekeepers. After ten minutes of brainstorming store and merchandise ideas, I told the groups they needed to come to a decision about what they would sell. Six of the groups divided the work load amongst the group members. The other three groups worked together to write each question. All of the groups either checked in with me or the resource teacher to verify they either worded or solved the problem correctly. Groups continued working on their word problems for remainder of class and half the next class period. For the second half of the class, I took turns displaying problems from each group on the board. I distributed individual white boards and markers, and the class had to answer the questions on their boards using either an equation or proportion. This was the final activity before their assessment during the next class.

Assessment/Evaluation

The instruction served two purposes: to teach my students about relating proportional reasoning to percent with money, and to gauge my abilities as an instructional designer. To evaluate the effectiveness of the instruction, I gave the students a fourteen-question assessment

on the material we had covered. The assessment consisted of multiple choice, short answer, and matching questions. No students missed all the questions, which communicated that they all learned something new with the given instruction.

The formative evaluation of the instruction took place before and during the instruction. Smith and Ragan write there are stages to proper formative instruction from the design process to continued evaluation of learners after the instruction. I used the needs, learner, and context analyses to tailor the instruction to meet my students' needs. I met with the subject matter expert and two other seventh-grade math teachers in the building to design the instruction for the students. We found questions with money and percent on the End-of-Grade test were in equation form even though the school system placed the material with the proportional reasoning unit. Students needed to recognize the equation and make the connection of how it all related. The designed instruction, though teacher directed, allowed for students to make the connection.

During instruction, I formatively assessed the children through classroom participation, observation, and communication with the resource teacher. I made sure to call on students who did not actively participate in the classroom discussion. While working on guided examples, I called students to the board to solve problems or explain their thinking at their seats. I would then ask the class if they agreed or disagreed to check for their understanding. Based on their performance on the second day of instruction and the homework questions, I pulled a small group together to work out their confusion. My ESL student struggled because of the vocabulary. I gave him the same type of problems, but removed the unnecessary information to determine if he understood the math steps, which he did. He has the ability to use a Spanish English dictionary in class, which I suggested he use when answering the word problems. Creating the retail store gave insight to applying what they learned to a single assignment. While moving

from group to group, I realized I was not clear about the order of discount and tip when combined with sales tax. I did stop the students from working, and I explained the order. I also wrote it on the board for them to reference.

The summative assessment came in the form of a fourteen-question quiz. The quiz gave four matching questions to test their vocabulary knowledge, and remaining questions on solving percent with money. Students were instructed to solve questions 5 - 13 using either an equation or a percent. Three students stuck with either using one way or the other exclusively. The other 25 students used different methods to answer each question.

Money and Percent Quiz

___ 1. To deduct an amount from the usual price of something.	a) Tax
___ 2. A sum of money given to someone as a reward for their services.	b) Mark-up
___ 3. An amount of money paid to an agent for a commercial transaction	c) Tip
___ 4. The difference between the amount earned and the amount spent in buying, operating, and producing something.	d) Profit
	e) Discount
	f) Commission

5. Ms. Lovett paid \$26.50 at Target for school supplies, which included a 6% sales tax. What was the subtotal of the merchandise (before the tax was added)?
6. A jewelry store has a ring that retails for \$2,000 on sale for 20% off. What is the sale price of the ring?
7. Cameron wants to buy a shirt that regularly sells for \$25 but is on sale for 15% off. How much will he save on the shirt?
8. Mike bought a new shirt that cost \$30. If he has to pay a 5% sales tax, how much will he pay in taxes?
9. Best Deal sells used iPods for 30% off the original price. If a new iPod normally cost \$150, how much is the sale price at Best Deal?
10. Jerry bought two airline tickets for \$235. He has to pay an 8% sales tax on the tickets. What is the total cost of the tickets?

11. A jacket is on sale for 15% off. If the jacket normally cost \$125, what is the discount on the jacket?
12. Ben is buying a stereo that cost \$890 at Target. If the tax rate in Ben's state is 4%, how much tax will he have to pay on the stereo?
13. A vacuum cleaner cost \$85 at Target. With a sales tax rate of 6%, how much will you pay for the vacuum cleaner in all?
14. Which expression will find the total amount for a \$40 dinner with a 17.5% tip?
a) $40(1 + 17.5)$ b) $40(100 + 17.5)$ c) $40(100 + 0.175)$ d) $40(1 + 0.175)$

Out of the 28 students, 11 got all questions correct, one student missed one, and four students missed two questions. Sixteen out of 28 students made an 85% or higher on the quiz. Three students missed five to seven questions who were not part of the small group session. The six other students who missed five to seven questions were part of the small group session on the third day. Overall, I was pleased with the results but saw areas of improvement, such as making sure that all students highlight the important vocabulary when reading the questions. Several missed questions 10, 12, and 13 because they were either finding the percent of the number and not the entire amount or vice versa. The most missed question was number five where they had to work backwards to solve the problem. Those who set up an equation got the question correct, and those who tried to solve using a proportion missed the question.

When I returned the graded quizzes to the students, and we discussed the common errors, I asked them which activity was effective in helping them learn the material. Almost of all of them said the retail store. They all agreed they were able to combine their interests of outlandish products with the task of writing word problems. Several students said the foldable was helpful when answering the practice questions either in the classroom or at home. No one mentioned the Flamingo Run game, so I asked if anyone thought it was beneficial. Many shrugged their

shoulders and said they liked the fact they were out of their seats moving around the room, but again stated their favorite activity was the retail store.

Going through the process of designing instruction allowed me to fully analyze not only the students I teach but effective strategies to meet my set goal and three objectives. Looking to the future, I will have to focus on setting up and solving an equation earlier in the proportional reasoning unit, therefore students will be more comfortable with solving equations when we reach this section of the unit. My students gave positive and negative feedback about the instructional activities that I will use to revise the instruction the next time I teach percent and money.

References

Brown, A., & Green, T. D. (2011). *The essentials of instructional design: Connecting fundamental principles with process and practice*. (2nd ed.). Boston, MA: Pearson Education.

Marzano, R.J., Pickering, D. J., & Pollock, J.E. (2001). *Classroom instruction that works: Research-based strategies for increasing student achievement*. Alexandria, VA: Association for Supervision and Curriculum Development.