Learning Content Proposal

Summary

The game we are designing is a Day of the Dead themed game. The goal of the game is to teach the user how to interpret, add, subtract, multiply, and divide fractions. The game is called Division of the Dead. The game is set in the kitchen of Evangelina, the skeleton. While she was alive Evangelina was a famous chemist, and developed a genetically modified form of corn that greatly reduced world hunger. She even won the World Food Prize in 2000. Now Evangelina has passed away into the underworld, but she is excited to return to her family on the Day of the Dead.

It is up to the user to help Evangelina prepare a series of dishes that she wishes to bring back to her family. In order to prepare these dishes the user must use and build on their knowledge of factions in order to help measure out the right amount of ingredients. If you need help Evangelina's friendly dog Pedro will give you hints. Each level gets progressively more difficult, but ultimately if you are able to help prepare all the dishes, Evangelina will have a wonderful visit with her family.

Target User Attributes

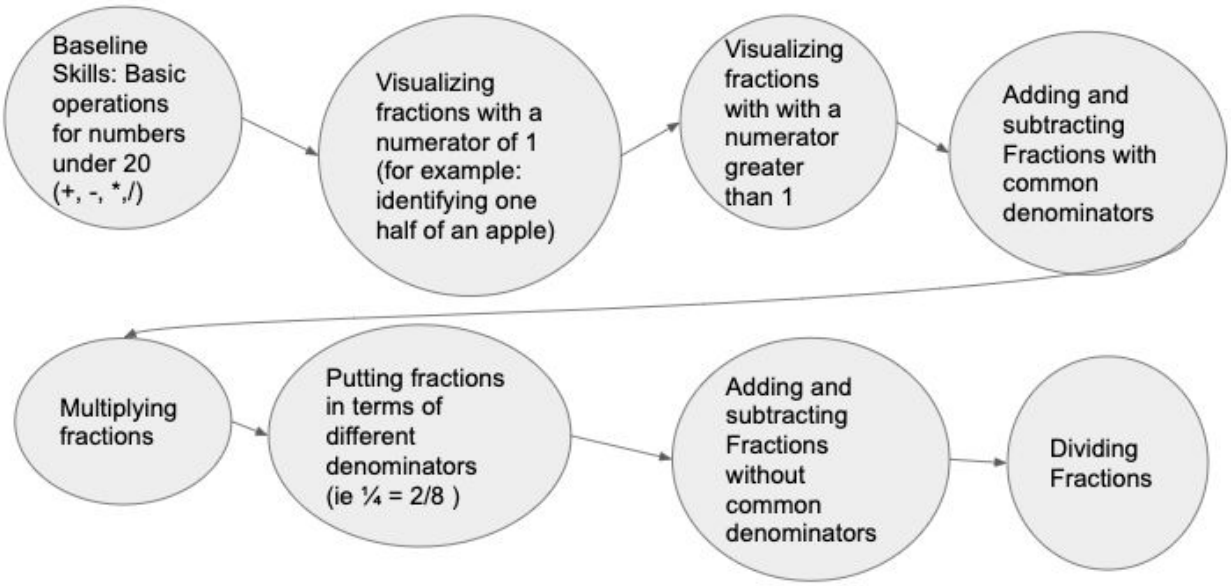
Our user is a female or gender-minority 3th - 6th grader (ages 8 to 12) of Mexican descent. They can perform basic arithmetic operations including addition, subtraction, multiplication, and division on numbers lower than 20. This game is specifically target to them because it is framed with culturally accurate elements from Day of The Dead. While there are many games centered around mainstream US holidays like Halloween or Christmas, there are few centered around holidays from other cultures. We aim to help fix this discrepancy with this game.

Additionally, our game is directed at our target audience because the main character addressing the player, is a mexican female scientist and leader, who in life and death has always sought to better the world and her community. We hope the game's main character inspires users to find an interest in STEM, and to better their communities.

Skills Describe what skills you are going to teach your user.

This game will teach late elementary and early middle school fraction skills. This includes how to interpret fractions (visually and conceptually), add and subtract fractions that have the same denominator, multiply fractions, add and subtract fractions that have different denominators, and how to divide fractions.

Learning Trajectory Diagram



Describe your sources and methodology for creating your learning trajectory.

We designed this learning trajectory and our game to engage a player and hopefully help them enter a state of flow and a loss of self consciousness. To achieve this we try to keep the user in a Zone of Proximal Development. We've assumed for this game the ZDP will be somewhere within the National Common Core Standards for children of our target age. We keep the user in the zone of proximal development by offering them scaffolding as necessary. In this game scaffolding comes in the form of hints from Evangelina and Pedro, as well as pictures of the ingredients to help the user visualize fractional parts. The hints (the scaffolding) is removed as the user improves. Once a player fully understands one skill we up the level of challenge by moving onto the next more difficult skill. In this way we offer a dynamic and attainable challenge, which is one of the key elements to keeping a user engaged and in a state of flow.

Finally, our curriculum is designed, much like the Common Core, to be a spiral curriculum. The way in which users learn to visualize fractions comes back later as we give images to help them visualize fraction operations. The addition of fractions with the same numerator comes back again as part of the skill set needed to add fractions with different denominators. In this spiral curriculum we reinforce what has already been learned by the user and build on it with a new concept. In this way our game is also a constructivist approach to learning fractions as it asks users to construct their understanding of fractions from a combination of their previous knowledge as well as their experience.

Our Sources for the learning trajectory methodology were primarily from in class materials. The following are our sources for the grade-level of our material as well as the inspiration for our game:

https://www.edweek.org/ew/collections/common-core-math-report-2014/fractions-by-grade-level.html

https://dayofthedead.holiday/

https://www.cimmyt.org/news/super-woman-evangelina-villegas-developed-transformative-quality-protein-maize/

https://growingupbilingual.com/2014/recipes/10-traditional-day-dead-recipes-celebrating-dia-de-los-muertos/

Additional Game Design

First summarize the game type, placing it into a genre. What is a well-known game that most closely resembles your game? And what are the major differences between yours and that game?

Our game is a simulation educational game. Our game is in some ways similar to Overcooked. It is also a cooking simulation that emphasises various challenges through the pretense of preparing a dish. In both games the player interacts with another character. However in our game that character is automated, whereas in Overcooked it can be another real player. Our games are different in that our game does not support a multiplayer option. Additionally, our game places greater emphasis on math skills specifically fractions, whereas Overcooked places emphasis on logic, movement, and collaboration skills.

Describe your game, taking care to describe the different elements such as premise, rules, etc.

Division of The Dead opens on Evangelina's kitchen. It is a small kitchen with a stove, and a pantry. Evangelina and her dog Pedro greet us. Evangelina introduces herself saying, "Hola amiga! So glad you could join me. My name is Evangelina. Back in the world of the living I was a famous chemist. I helped make a special type of corn that today helps feed millions of people. But today we have a different challenge we're gonna be making food to bring back to mi familia on Dia de Los Muertos! Will you help me, amiga?" The player is given an option to click yes and then the game continues.

Before every level Evangelina will give more context behind Dia de Los Muertos and describe the food she is about to make. Recipes will include traditional dishes of the holiday, including Pan de Muerto, vanilla atole, marigold tortillas, and tamales. With each food she wants to make she will also describe a challenge such as helping her measure ingredients, double a recipe or add more of certain spices. These challenges reflect the faction skills we hope our users will learn, such as identification, addition, subtraction, multiplication, and division.

Players are given two tries to correctly answer a question. When they fail to answer correctly the second time Pedro tells the the correct solution and explains how to solve the problem. Evangelina continues giving them similar problems until they understand. Players must get 10 questions of increasing difficulty right each level before being allowed to progress to the next level.

After each correct problem solution players are given congratulations by Evangelina. After each level they are also given congratulations and Evangelina shows them the food they have created. And tells them how close they are to being able to go visit her family. Once the players have made it through every level, Evangelina and Pedro will be overjoyed. They will invite the player to come visit Evangelina's family. The game will close on a happy picture of Evangelina enjoying the food we've prepared with her family.

Describe how your choices of elements above will result in the keys to successful game design, such as increasing difficulty, engaging players' attention, as well as resulting in learning.

Our game has an increasing difficulty, specifically a spiral curriculum. Each level is laid out similarly, so once a player learns the rules of the game in earlier levels they can apply those same rules to more difficult levels. Concepts introduced earlier in the game like identifying fractions and adding fractions with similar denominators are highly relevant to future skills. In this way we are constantly building on our game's difficulty while giving the user enough foundation to ensure that each new level is within their ZPD. This way our user will be engaged in the game while not feeling overwhelmed.

We engage the player's attention partially through an appropriate difficulty level. We also engage our player's attention by storifying the game. We introduce Evangelina's life story as well as the the story behind Dia de Los Muertos in general. This storifying gives the player more context for their tasks and can lead to them feeling more invested in the game's outcome. Storifying has also been identified as a culturally-relevant form of teaching that makes lessons more accessible to students from a wide range of backgrounds.

Finally, the combination of these two core elements, increasing difficulty as well as the game's cohesive narrative should help facilitate learning. The increasing difficulty reflects well known teaching styles, that have been shown to be effective in introducing and reinforcing concepts. And the difficulty increases at a rate where the player should always be addressing moderate challenges, which have been shown to be the level of challenge at which people most effectively learn. Additionally, the story elements offer another engaging factor of the game. A combination of the story elements with appropriate challenge will keep a player engaged

enough to work through multiple level and hopefully achieve long term understanding of fraction operations.

Describe how different "player types" will find something that engages them.
The Explorer Is unlikely to be very engaged by our game because it lacks exploratory potential, and all of the levels, except for the final one, take place in the same setting.
The Achiever plays for varying levels of achievement and is incentivized by levels, which our level-by-level game satisfies.
The Collector likes to acquire items and rewards and create sets. They have the opportunity to do so in our game, as they are rewarded with a decorative skull trophy upon completion of each level.
The Storyteller Is unlikely to be very engaged by our game because it does not allow them to create their own story. The game itself, does however tell a story, so that may slightly engage the storyteller
The Craftsman desires building, crafting, and puzzling things out, and our game satisfies this desire by allowing players to piece together different ingredients and figure out how much of each ingredient to add to engineer the end result. Crafting new recipes will not help the player advance levels but it is allowed by the game. Overall they will be partially engaged because they can craft new recipes, but the game is not designed for this capability.
The Artist is driven by creating things, and our cooking-based game allows the artist to combine different ingredients to create a final result. Like the craftsman they are not well rewarded because their creativity does not allow them to advance levels however they can experiment with different combinations of ingredients.
The Performer, The Joker, and The Director will find nothing to engage them in this game. It does not have an preformative qualities and lacks the audience necessary to engage these player types.

Describe how your game makes the user progress through the different elements in the learning trajectory you produced. How do you teach different elements and how do you gradually increase the difficulty and/or complexity as users progress through the levels?

Our game is divided into levels with each one representing one circle of our learning trajectory. Players can only move on to the next level after completing the previous one. In this way we keep players on track with a standard learning trajectory. We also hope that by matching levels to the individual learning objectives we identified in the learning trajectory, that as the difficulty increases it will always do so while remaining at a level where it poses a medium challenge to the player, where they are challenged but not overwhelmed.

In the first level Evangelina asks for help picking out ingredients, and through this teaches the player to identify basic fractions. The player is given a view of the ingredients. The ingredients are already divided by lines into fractions. Evangelina will ask the player to click on the right fractional part of the ingredients, for example, “Can you find me half a bag of sugar?” If the player correctly clicks on the fractional part they will advance to more complicated fractions,

for example, “Can you find me ⅛ of a chocolate bar?” If the player gets the fractions wrong, Pedro will gently tell them their mistake and give them more similar level questions to practice. In this way we offer a bit of scaffolding to assist players who are struggling. Once they’ve clearly mastered basic fraction identification they will progress to level two. They receive a level one decorative skull trophy.

In level two the player will learn how to add and subtract fractions with like denominators. Evangelina will ask for ingredients to add to her Atole de Vainilla (a popular beverage for Dia de Los Muertos). She will ask questions like, “I want to add a quarter cup of sugar and then another quarter cup of sugar, how many quarter cups of sugar do I want to add?” The player will type the response. If it is right Evangelina will congratulate them and then move on to the next question. If they are wrong Evangelina will give them another try before Pedro will offer a solution if they get it wrong a second time. At this level we don’t care if the fraction is simplified, but if it is not, Evangelina will also tell them the simplified form of the fraction. By not requiring simplified fractions but still enforcing what a simplified fraction is we hope to gradually point to what skills players will need to have in future levels. Once a player demonstrates understanding of this level’s skills we will progress to level three.

In level three players will learn to multiply fractions. Evangelina is making her Pan del Muerto, but she wants to double the recipe and change the ratio of spices in the bread. She will ask the player questions like, “If the original recipe had ⅓ cup of flour and I want to double it, how much flour do I need?” Like the previous levels Evangelina will offer solutions if the player gets it wrong twice, and once the player demonstrates mastery the player will progress levels.

In the fourth level the player will learn to add and subtract fractions with different denominators. It will look like the second level except that fractions have different denominators, and now Evangelina is working on her Marigold Tortillas. In this way this level is very reflective of our spiral curriculum. At this level players will be required to simplify to completely correctly answer a question. Evangelina will tell them if their answer is wrong because it is not simplified. This is another way in which we help build off of skills learned in previous levels.

Finally, the player will progress to the fifth and final level. This level is structured like every other level but here we emphasis division, as Evangelina tries to make a smaller recipe of tamales. Evangelina offers congratulations or solutions based on the players answers as in previous levels. Once the level is completed Evangelina is overjoyed and invited the player for the reward of joining her and her family for a celebration. By this point through scaffolding, a spiral curriculum, and appropriately challenging levels our player should have a full understanding of basic fraction operations.

Explain how you took into account the limitations in skills of the user to influence your game design.

We took into account the limitations of the user in several ways. We try to limit text, while making the objectives of the game visibly obvious. We make objectives visually obvious by limiting the interactive elements on the screen and by Evangelina giving hints with visual elements when possible. We also make sure that text always stays on the screen until users click next, so that users can read at their own pace. In these ways we try to make the game

available for english language learners and users who struggle with reading at grade level. Additionally, although we will not implement it in our final project, in a full version of our game we would have a text to speech feature, to help those who struggle to read and the visually impaired.

We also took into account the ability of our users by making sure there are no constantly animated elements in the background of the game. Moving elements can be distracting to users, particularly those with ADHD and dyslexia. By eliminating them we give the user a greater ability to focus on the task at hand, and make the game more accessible to users with learning disabilities.

Finally we also have eliminated any time constraints. We also set up the game in a way in which only rewards players for succeeding, and does not penalize them for losing. In doing this we aim to make our game accessible to users with anxiety and users who have a fear of failure that limits their learning ability. Overall we hope users who struggle with this game because of various different limitations may be able to enjoy this game and not feel discouraged.

Explain how you designed for students of various backgrounds. What cultural elements did you remove because they are "mainstream" culture that may alienate some students? What elements did you add to make students of different backgrounds relate to the game more? (Note: I will not accept the argument that your game is culturally agnostic. We all live in a culture, and you need to put in the work to identify what cultural elements you have included)

Originally, we considered making this game Halloween themed. However we decided against this design because although Halloween is a common holiday in the US, it can be alienating for many students. Some students are not allowed to participate because of their religion whereas others are simply from other cultures where an understanding of the traditions of Halloween are not common knowledge.

Instead we decided to make our game Day of The Dead themed. In doing this we hope to reach a large population of Mexican students, for whom games are rarely specifically designed. We also added features explaining the importance of Day of The Dead and it's traditions so that for players who do not celebrate Day of The Dead they can learn about the holiday and enhance their cultural awareness.

Additionally, our main character is based on a real historical figure, a scientist who is both female and Mexican. In this way we hope to connect to students of Latin American descent through history as well as culture. Additionally, our main character is unique in that she provides much need representation of women of color in STEM that is missing in many video games, as well as books and TV shows. Having a strong female character in a STEM related game helps provide a positive role model for students who identify with her and helps show other students who may not identify with her that women of color have had lasting effects on science and technology even if their accomplishments are often not discussed.

At the end of the document, pivot to presenting what you will implement by the end of the quarter. This must include at least three "levels" of your game. One needs to be an

introductory level. Two others need to be fairly consecutive more advanced levels that show the progression of difficulty between two adjacent levels. You also must use the Java game engine unless you have prior permission to do otherwise. The projects implemented in other technologies were by and large simplistic last year, so I am very unlikely to allow Unity.

Minimum Viable Product:
Propose what you will implement by the end of the quarter. What levels will you implement? (describe the three levels and where they fall on your learning trajectory) What will the interface be? Make sure your description is detailed enough so that I can evaluate the challenge for this class. This is our "contract" that, if you implement it in a high-quality way, means you have completed a project sufficient for this course.

Short Game Description
Division of the Dead is a cooking game where users make traditional recipes for a Day of the Dead celebration. The user's job is to choose different amounts of ingredients to add to each dish, based on fraction arithmetic questions. If you pick the right amounts, your dish is ready, and you can continue to the next level! When you complete the last level, you'll get to enjoy the Day of the Dead celebration and all of the food you made with Evangelina and her family.

MVP Specs
Our MVP will consist of three levels. The first one will be level one, and the second two are levels 4 and 5. They are each part 2,5, and 6 of our learning trajectory, respectively. Each of these levels will take place in Evangelina's kitchen, which will look like a basic kitchen with traditional Day of The Dead decorations. Below we have written detailed descriptions of each level of our MVP.

- Level 1: Identifying fractions, part two of our Learning Trajectory (above the baseline skills): Evangelina introduces the game. She first explains the basic context of Day of The Dead. The user clicks next once she has finished explaining. Next Evangelina explains her personal history and her goal to visit her family on The Day of The Dead. The user once again clicks next. Then she asks for the user's help in preparing dishes for her family. Once again the user clicks next and the game begins with level one.

  Evangelina gives a brief description and visual demonstration of how to navigate this level of the game by typing the correct letter for the users answer. The user is given a view of the ingredients, divided into portions and labeled with letters 'A' 'B' 'C' and sometimes 'D'. Evangelina will ask the player to enter the letter on the keyboard corresponding to the letter on the correct piece. For example, "Can you find me half a bag of sugar?" If the player correctly selects the fractional part Evangelina will congratulate them and they will advance to the next question. If they get it wrong once they are asked to try again. If the player gets the question wrong twice, Evangelina will prompt them with the correct answer and an explanation. She will then ask them a question of similar difficulty. Once the player has demonstrated mastery of

understanding fractions ranging from ½ to ⅛, by answering questions correctly pertaining to each sized fraction, they may advance to the next level.

- Level 4: Multiplying Fractions, part five of our Learning Trajectory: Evangelina explains that she is making her Pan del Muerto, but she wants to double the recipe and change the ratio of spices in the bread. She will ask the player questions like, “If the original recipe had ⅓ cup of flour and I want to double it, how much flour do I need?” The player is then prompted with a textbox to type their answer in. Like the first level, if the player gets the question wrong twice, Evangelina will prompt them with the correct answer and an explanation. She will then ask them a question of similar difficulty. The player advances once they have gotten six consecutive questions of increasing difficulty right.

- Level 5: Manipulating the Denominator of a Fraction, part six of our Learning Trajectory: Players will learn to change the denominator of a fraction using the multiplication techniques they acquired in Level 4. Evangelina will ask questions,like, “The recipe calls for 4/8 of a cup of flour, but I only can measure things in terms of 1/2s. How many 1/2s is equivalent (equal) to 4/8?” The player is then prompted to type the answer in a textbook. The answer choices are limited because the user is prompted to fill in spaces with a single number like _ /2.The player receives hints in the same way they did in the previous levels. They advance to the next level once they have answered six consecutive questions of increasing difficulty correctly.