Chapter 17
Using *Dungeons and Dragons* to Integrate Curricula in an Elementary Classroom

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How can an elementary teacher integrate a set math program with social studies, literature, and writing? In this chapter, I will trace the development of a yearlong project undertaken with my third-grade math students that addresses this challenge. I planned for the students to design and play a game that would reinforce the concepts covered over the course of the year, integrating social studies, writing, and literature curricula with their math lessons. Both skill and content goals across the curriculum informed lessons and activities. While I maintained overall control over the direction of the project, students were intimately involved in planning and executing the design, and we often altered plans to accommodate new, creative ideas and suggestions provided by the students. I will discuss the background and rationale behind this project, goals and learning objectives for the students, lessons and activities created, and learning outcomes and experiences of the students.

17.1 Background and Rationale

The impetus for the *Dungeons and Dragons* project came from my work with a third grade math class in a developmental private elementary school dedicated to the philosophies of John Dewey and Jean Piaget. This school uses the math program *Everyday Mathematics,* a cyclical program that introduces students to a topic that they will delve into more deeply either later in the year or in a later grade. The program can sometimes feel a bit disjointed for students and teachers, as introduces a new concept each day. Creating an ongoing project for the students would help foster conceptual continuity, reinforce the material, and provide students with a record of their work.

The math group with which I worked offered a series of challenges familiar to many educators. Several students were struggling in reading, writing, and math. Other students had difficulty paying attention, completing assignments and

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tasks, following classroom procedures, and working independently. These issues compounded with the requirements of the math program, which presents a new concept and lesson every day. Because of the wide variety of needs I faced in the classroom, I felt that the students needed a more engaging approach to the material. They greeted the idea of creating and playing a game with great enthusiasm, and the experiences and outcomes that I witnessed testified to the success of this project.

Originally, the project was much more limited in scope. I envisioned creating a game that would allow students to engage meaningfully with the math concepts covered and provide them with a tool for ongoing review and assessment. These original objectives are addressed below. However, when the students expressed an interest in creating a game similar to *Dungeons and Dragons*, I realized that one project could incorporate several different objectives across the curriculum. Pulling from these objectives and developing others that would be met by the game determined my approach.

I have often used games in classes and in tutoring to reinforce concepts taught through traditional methods, including directed instruction, small group work, and written assessments. I have developed games that target the specific needs of students and have used pre-packaged educational games that focus on specific skills. In previous years, I worked with students to adapt games in class. In one history course, I asked college students to modify the word-association game *Apples to Apples*. They were each assigned a series of themes and were asked to create different examples from the class materials for each. After discussing their results, they combined their work and played the game. The students all retained and engaged with the material, and they had a lot of fun. The game served as a review of the course concepts for the students and provided me with a flexible assessment tool for progress. I could evaluate the materials the students had created and the way in which they interacted with the game to gauge their comprehension and application of class themes.

I have also worked with high school students in designing a board game as part of a special studies course in game theory, history, and design. Because of my research interests, the students approached me to ask if they could work with me to design a board game as a student-initiated, teacher-guided independent study. I developed a reading list with the students on game theory and design. After reading, we analyzed the components, rules, and play of various board games and discussed which games we thought were the strongest. The students then designed their own game, incorporating their previous analyses and ideas into their own game. Although the game did not incorporate material from other classes, the students learned to work cooperatively to plan, research, and delegate. They learned to evaluate game design and think critically about their own creative work. This experience demonstrated that student-directed game design could have several positive educational outcomes that were not directly related to the material of the game.

The growing research and experience of others working in education, psychology, anthropology, and game design has inspired my decision to use games and game design to teach. Following such theorists as Lev Vygotsky and Jean

Piaget, several educational specialists have argued that play provides the foundation for later success in school. Fantasy play in particular offers many developmental benefits. These include assimilation and associative thinking, problem solving, interaction with others, and empathetic development (Crawford, 1996; Donaldson, 1984; Driscoll, 1994; Satterly, 1987; Vygotsky, 1978; Wertsch and Sohmer, 1995; Wood, 1998). Fantasy play also presents opportunities to expose students to a wide variety of preparatory educational experiences, such as introduction to and application of literacy, numeracy, and logic (Macintyre, 2001). For older students, researchers have focused on the role that games can play in facilitating retention, engagement, and interest (Randel et al., 1992). Combined with traditional educational methods, such as lecture and assessment, games provide an additional means to support and apply concepts. Students introduced to material through games and simulations report a higher level of retention and enthusiasm for subjects than those who were introduced to a subject through traditional lecture-style courses (Randel et al., 1992).

Other research shows how game design and the use of technology can also have a positive impact on the ways in which students interact with information. This research primarily focuses on the development of video games and the use of technology by students. However, some of the conclusions drawn by researchers and practices used by video game developers have broader application to game design in general. Game designer Lloyd Reiber and his laboratory demonstrated that video game design creates a climate that encourages a love of learning and an interest in the material (Reiber, 2001). Reiber maintains that game design teaches students the "power of interdisciplinary problem finding, problem solving, collaboration, communication, persuasion, [and] argument." (Reiber, 2001). Students are more involved and therefore more mentally engaged with the material during game creation, develop important interpersonal skills and problem-solving strategies, and enhance their chance of retention. While the students in my math class did not design a video game, the experiences they had and the outcomes achieved closely paralleled the findings that Reiber described in his work.

The decision to adapt *Dungeons and Dragons* for math came from the students. At the start of the school year, I suggested to the students that we create a game for our math group that we could play all year, which would integrate what they were learning in other subject areas into math. At the end of the year, they would receive a copy of the game, which would be both a record of their work and a tool for review. We discussed our options: creating a board game, a card game, a jeopardy-style game show, and modifying one of the games that came with the *Everyday Mathematics* program. I then encouraged students to go home and think about the games they enjoyed, and we would come to a decision after discussing everyone's thoughts. Watching the students on the playground throughout the week, I was struck by how many of them enjoyed playing their own interpretation of *Dungeons and Dragons*. Some of the students had older *Dungeons and Dragons* manuals from their parents or older siblings and shared these materials with others on the playground. The game usually followed a loose resemblance to the actual rules: students had a "dungeon master" who would direct the narrative and several

players who would participate in the story by asking questions about actions they could take. The dungeon master would answer "yes" or "no" and continue the story accordingly. On the playground, students also played *Dungeons and Dragons* as an on-going chase or fantasy game, frequently involving humans and zombies. The students clearly understood *Dungeons and Dragons* as fantasy-based storytelling game under the direction of a narrator.

I asked students then if they would be interested in developing a version if *Dungeons and Dragons* for our yearlong project. Most of the students were enthusiastic, so I suggested that we would start with a sample game and then see what we could adapt, change, or borrow from the original to create our own *Dungeons and Dragons*. I used an introductory version of the game that would be suitable for young players who were not familiar with it. Wizards of the Coast produces a version of *Dungeons and Dragons* with a recommended age range of six and up entitled "Heroes of Hesiod," available for free on their website (Morris, 2010). Susan Morris, the author, created this game for teachers, librarians, and others who wished to introduce the game to young players. The website emphasizes the educational benefits of the game. Players apply mathematical skills, reading comprehension strategies, creative thinking, and problem solving skills to the game (Morris, 2010). The "Heroes of Hesiod" adventure provides a map and pre-made heroes and monsters, therefore bypassing most of the initial preparation. This made it easier for the students to play quickly and get a sense of the overall structure. The students decided which elements of the game they would like to change after they finished their first game. It became immediately evident that *Dungeons and Dragons* offered wonderful opportunities to integrate math, social studies, literature, and writing curricula into the project. After I developed the project objectives, we began to design our own version of *Dungeons and Dragons*. The assignments and projects evolved organically from the students' ideas and interests during design of the game. I did not create set lesson plans, but developed lessons and activities with the students, directed by the objectives I had set. It seemed natural to use Reggio Emilia approach, which emphasizes the development and implementation of self-guided curricula. In this process, the teacher develops activities based on student interest, asks questions to further understanding, and engages in activities alongside the children (Cadwell, 2002; Lewin-Benham, 2005). The students designed this project, and I provided materials and activities that incorporated student suggestions and the objectives I had outlined before beginning the project.

17.2 Objectives

I created specific learning objectives for each of the content areas the game design would address and attempted to integrate these objectives into every step of the project. I developed these objectives from those in different skill and subject areas across the curriculum, and they correlate to school, state, and national standards. These objectives guided lessons and activities.

17.2.1 Mathematics

- Solve problems as they arose and related to the project
- Create word problems of varying degrees of difficulty that integrate new math concepts for others to solve during game play
- Employ problem-solving strategies and techniques to solve in-game math problems
- Use mathematical concepts to plan elements of design

17.2.2 Social Studies

- Develop characters and settings that are historically appropriate to the class social studies theme, the Middle Ages
- Develop monsters and enemies based on research into myths, mythical creatures, and superstitions, correlating with the social studies theme
- Develop chronological thinking and demonstrate chronological awareness

17.2.3 Research Skills

- Develop research questions to guide development of settings and characters
- Use a variety of sources for research (books, interviews, internet, articles)
- Begin to develop good internet-based research practices
- Analyze sources for reliability
- Maintain a record of research questions, sources, and answers
- Synthesize group research
- Evaluate and apply appropriate information to the creation of characters and settings
- Present findings to class and demonstrate application of research to characters and settings
- Evaluate other students' research and research-based creations

17.2.4 Written and Oral Communication

- Develop a background setting for the story to take place that integrates grammar concepts covered in class (descriptive adjectives, colorful verbs, prepositions, nouns, proper capitalization and punctuation)
- Use colorful and descriptive language to bring characters, settings, and monsters to life
- Write well-constructed paragraphs to describe or explain different aspects of project
- Organize presentations
- Demonstrate and explain historical research in oral presentations

- Develop questions to engage audience after presentation is over
- Answer questions raised by the audience

17.2.5 Artistic and Creative Development

- Use mixed media (paint, colored pencils, markers, clay) to create characters and monsters
- Integrate visual reference materials, including books and outside observation, to create settings, monsters, and characters
- Extend research imaginatively to develop rich details for characters, monsters, and settings, both in written and visual forms
- Create a system of symbols to represent elements in the game
- Thoughtfully analyze others' creative works
- Provide thoughtful feedback about others' works

17.2.6 Social and Emotional Development

- Cooperate to develop maps and characters
- Negotiate decisions with team-mates during game play
- Plan out projects and divide tasks evenly among group members
- Support team members, classmates, and partners during project development and game play through suggestions, hints, praise, and encouragement
- Participate in all projects assigned according to ability and interest
- Compromise and allow other members of the group to share equally
- Provide thoughtful, considerate, and specific feedback to group members and other groups during work and presentations

The project was group-based, including large design teams and partnerships of two or three. Some of the groups were allowed emerge naturally, based on students' interests. Other partnerships were comprised of mixed mathematical and verbal ability. I hoped that the students would be able to work with and benefit from each other's strengths in these partnerships. The partners were equally responsible for developing characters and solving problems, and it was my hope that partners could teach each other, making the game fun and rewarding while minimizing frustration.

17.3 The Project

The *Dungeons and Dragons* design project was broken into six major steps, which were co-developed by the students and me. This included the initial play and discussion of the game, the three major design steps, the play of the game, and post-game debriefing and modifications. This entire process would lead to the creation of a

second set of maps, characters, and monsters. The materials created by the students, in-class discussions, presentations, and the game play itself provided numerous occasions to assess the student progress in math, social studies, and language arts.

For each design step, all of which followed the same basic format, students began by discussing the elements they believed were crucial to creating the specific component of the game, and we outlined the necessary steps to complete each task. I then developed a series of worksheets and organizers that integrated students' suggestions and ideas with components that addressed the objectives I had outlined. For the settings, characters, and monsters, students developed their own research questions to facilitate their creation. They then looked for answers independently, in groups, and with my guidance. Students then designed the different game elements, ensuring their research was reflected in their work. After conferring with each other and checking their work with me, they created their final copies and presentations for the class. Students enjoyed showing off and explaining their work. The audience was expected to listen thoughtfully, make note of elements that they thought would be of use to them in their own work, and come up with one specific compliment and suggestion or question that they would like answered by the presenters. Pupils were therefore actively engaged in listening and responding thoughtfully. They also benefited from the work that others had done, making the project more robust overall.

17.3.1 Introducing the Game

I created reference handouts based on the "Heroes of Hesiod" materials that broke the steps of the game down in simple language for the introduction to our game. Students were placed in mixed pairs according to mathematical ability. Before playing, we discussed the rules of the game as a class, pausing to check for comprehension and answer any questions. We also discussed proper behavior while working in pairs and solving math problems during the play of the game. Students then looked over their character and asked the dungeon master (in this instance, me) questions. Characters were not allowed to attack each other, thereby eliminating the possibility of students working against one another. Student pairs could work with others and use the cooperative advantages built into the game, such as working with another hero to perform a special attack. Some students eagerly took advantage of this opportunity.

We began our game by looking at each character and discussing various strategic possibilities. Because the students had already played other strategy games as a part of their social studies curriculum, they had begun to develop some sense of long-term strategic thinking. They applied this experience to their suggestions for possible strategies and tactics they could use in the game. The entire introduction took about two and a half hours.

The pre-game discussion also addressed some of the mathematics objectives. We talked about the different ways we could calculate area and perimeter while considering the game map. Some students were already comfortable with

multiplication and quickly found the area after counting the numbers of squares in the rows and columns. I had other students double-check by counting and adding the squares. We also discussed various ways to find the perimeter and ratios for the number of cages and barriers on the map. I also decided to use three 6-sided dice instead of using one 20-sided die to determine the outcome of an action. Students would therefore have to work through addition problems with multiple addends to figure out if their attack hit their target. Each pair was given a small whiteboard and two dry-erase markers. When a math problem came up, such as calculating whether or not an attack hit, all students were expected to solve the problem quietly on their whiteboard. The pair attacking had to check to make sure their answers were in agreement. Once they had solved the problem, they could share their answer with the group. If they were correct and their attack hit, then damage was done. If they were incorrect, other students had a chance to share the correct answer. The pair with the correct answer could then move their character one space. I noticed that several students who typically worked slowly through addition problems eagerly volunteered correct answers, supporting the argument made in the research reviewed above that students who are engaged in a project or game will more actively apply skills towards a goal in which they are invested.

After the game was over, we discussed ways to modify the game for our math lessons. Students quickly agreed that there should be a variety of problems for the heroes to solve, ranging from easy to difficult, and they quickly began creating problems based on the math unit in which they were working. This was an ongoing process. I often asked students to create problems based on a math lesson that had just been taught or on the content of the unit that had just been covered. Students eagerly developed math problems as a warm-up activity or as homework. It helped them reinforce the concepts that had been covered in class and provided me with an ongoing assessment of their understanding and application of mathematical concepts. I also got a sense of their own self-assessment, as they created problems in accordance with their definition of what "easy," "medium," and "hard" were. While some students created straightforward math problems, others created very involved riddles and puzzles that demonstrated a sophisticated understanding and application of concepts. Having the students share their problems in class inspired others to develop and solve more intricate problems.

Students were also excited about designing the settings, maps, monsters, and heroes for our game. They decided that we should create the settings first, and then students could create their own monsters and heroes. Part of each math lesson was dedicated to creating problems for our game, and we had special blocks of instructional time dedicated to developing the other elements of the game.

17.3.2 Where Will Our Story Take Place? Designing the Setting

Our version of *Dungeons and Dragons* had to conform to our social studies theme, the Middle Ages. The first design step was the creation of settings and maps for our adventure. The students had just finished a project in which they created a medieval

manor house and village, so they had several ideas ready. They had also had some exposure to different settings in their "Story Starters: The Middle Ages" writing program, which helped students develop characters, settings, and plots that were historically appropriate. Using their suggestions, we created a master list of locations: monastery, village, forest, castle, dungeon, mill, and manor. Students were then asked to vote on the different settings. After the votes were tallied, we discussed a reasonable way to decide which settings would be used. One student suggested using data landmarks (maximum, minimum, median, mode, and range) for the tallied votes, as we had just finished a unit about them. We decided that the main part of the story should take place in the setting that got the maximum number of votes, the beginning of the story would take place in the setting that got the minimum, and the story would end in the setting that received the median number of votes. Students created bar graphs, found the landmarks, and determined that our story would start in a monastery, continue into a forest, and end in a castle with a dungeon. I then asked students which setting interested them the most, and assigned them to groups based on their preference.

The students and I discussed the different elements that made up the setting in the original game before beginning the setting design. We talked about the role of the dungeon master in describing the setting, the elements on the map, including cages and barriers that existed in the "Heroes of Hesiod" village, and the perimeter, area, and ratio of barriers and cages. As we talked, the students recognized the need to do some research into the different settings before they could create maps within those settings. They also decided that the forest map should be bigger than the monastery and castle-dungeon maps, as the story would mainly take place in the forest. After exploring these issues, I developed some handouts for the students to organize the steps they would need to take in designing their settings, and we developed specific area parameters for their maps. The monastery and castle both had areas of 200 square inches, as they were the beginning and the end of the story, whereas the forest had an area of 250 square inches. Students also examined the ratio of barriers to cages in the original game. We decided to modify the ratios of the barriers and cages to the total area; the ratio for all of the maps was 1:25 for cages and 1:10 for barriers. The students felt this would give the heroes enough space to move around and a reasonable number of challenges for the heroes. The students also determined the organization of the groups and developed a list of jobs for the members based on their experience in science class, in which each student played a specific role within a group. The jobs for the groups included: the "organizer," who was responsible for overseeing the direction of the project, keeping everyone on task, and making sure that everyone had a chance to participate; the "secretary," who would be responsible for the group's materials, maintaining neat, clean records, and keeping track of assignments; "getters," who would get or return the materials needed by the group and ask the teacher questions; and the "checker," who would double-check the assignments as they were completed to make sure the work was accurate and correct. I emphasized that all of the students were responsible for the work that the group produced and had to perform each role at different points to produce high quality work efficiently. Students negotiated

between themselves which roles they would most like to have in the group. They decided amongst themselves when to switch roles according to preference and perceived skill.

The first step in designing the settings was developing research questions and finding answers. I gave the students some handouts to organize their questions and keep track of the resources they were using. We discussed what sorts of general questions students would need to ask to create settings that were historically appropriate. We also talked about ways to manage their information, including keeping research journals, using note cards, and dividing questions among group members. After the groups were given time to develop their own research questions, we gathered to share the questions with the rest of the class. The other groups had a chance to suggest other ideas to the group and modify the questions presented to fit their own research needs after groups presented. For example, the group designing the forest developed a series of questions about what trees exist and what animals live in European forests. The monastery group asked the students working on the forest if the forests had changed from the Middle Ages to the present. The forest group agreed that this question should be researched, as the trees they wanted to draw may or may not have existed during the medieval period. The castle group praised the forest group for developing questions about the appearance of the forest and added questions to their own research about the appearance of the building materials used to construct a castle. Sharing questions helped students refine their own research questions, and the questions asked demonstrated the students' developing understanding of chronological thinking creating targeted, specific research questions.

To complete the research, students brought in books from our classroom library, the school library, and from their houses and public libraries. We spent some time as a class exploring the different features of these books to guide independent research, including the table of contents and the index. We explored three different resources as a class to find the answer. I also set up my computer for guided Internet research. Students could come and work with me individually or in groups to find questions to their answers using the Internet. We developed guidelines for search terms, examined different websites, and discussed accuracy and reliability by comparing websites to one another and to the information in books. We developed questions to ask when looking at a website to analyze its reliability, including who the author is and what resources he or she used. The web-based research was limited and guided carefully because I was working with a younger group of students, but it provided the opportunity to introduce important questions of reliability and safety. During class, I kept a running list of questions posted on the board to remind students of all the questions the different groups were answering. Students shared their resources with both their own group mates and with the class as a whole, making the research experience richer, more robust, and efficient. This process took approximately two weeks, with about three and a half hours each week given to the project. The students' research prepared them for their subsequent research for their character and monster development, which they conducted independently and with a partner.

Students created their maps based on their research. Using the parameters they developed at the beginning of the design, they figured out how many sheets of 9×6 one-inch grid paper they needed, how many barriers and cages their map needed (based on ratios), and what the perimeter of their map was after they had created it. These activities reinforced the concepts that had already been covered in the math lessons and introduced using and applying ratios, which would be taught formally toward the end of the year. After giving students some time to figure out these issues independently and with their group, we discussed the problem-solving strategies the different groups used. Students had a chance to hear what strategies their classmates were using and worked together to develop shortcuts for solving these problems. The groups then created their rough drafts, designing barriers and cages based on modifications of historically appropriate objects. Students used thick cardstock to create their final draft maps after having their work checked and approved. The entire process reinforced planning strategies and careful attention to detail, as well as using math and research creatively. The final maps were laminated for the game.

Students described their settings and created a style sheet that the dungeon master could use to guide the players through the game. We developed a list of elements all settings should contain. These included the weather and time of day, the appearance of the interior and exterior of the setting, different sounds that the characters might hear in that setting, and objects, people, and monsters that the heroes might run into. Students determined what these elements would be for their setting as a group, wrote short, two-paragraph stories set within their setting, and had their work edited by peers in their groups for content and form. Some of the stories were quite involved. For example, one student in the monastery group was particularly excited about having zombie Templar Knights rise from the grave to attack heroes who had forgotten their homework. His work integrated the writing goals of including descriptive details, such as "dark, smelly tombs," and his research, as the Templar had been buried after being killed in Crusade before coming back to life. After peer editing, students worked with me to edit and produce a final draft. The dual editing process helped foster a greater awareness of grammar rules, proper organization, and well-crafted sentence construction. Groups gave short presentations in which they showed off their maps, shared their stories, and talked about interesting facts that they discovered in their research. The students in the audience took notes and gave feedback, which included thoughtful questions, suggestions, or specific compliments for the members of the group.

The experiences that the students had creating the maps and settings provided a framework for the last two pieces of development, the monsters and the characters. With some modifications, the process the students used to develop the monsters and heroes followed the same steps that were used to develop their settings. Each student was responsible for creating at least one monster and co-creating a playable character for the game. Students were prepared to develop their own research questions, find their own answers, and create their own monsters and heroes based on that research because of their work developing the settings.

17.3.3 What's that Medusa Doing in the Monastary? Creating Our Monsters

Students were responsible for developing one monster that would exist within their settings. They could then create any monsters they wished for the other settings, which only had to follow the same basic parameters developed for the monsters. Students researched medieval myths, mythical creatures, and medieval superstitions and created monsters based on their findings. Some students' monsters were based on different mythical creatures, including those from Greek and Roman mythology. After doing preliminary research, students came up with the following research questions: whether or not they thought medieval Europeans would have believed in the creature, when people believed in the creature, where the creature first originated, what the creature looked like, and what special powers it had. I made up a short worksheet that included these questions and a place to record the titles of books and websites the students consulted. We also discussed the concept of myths as foundation stories or explanations for the way in which the world worked, but the students were not expected to figure out how the creature they researched fit within that worldview. Some visual aids were used to track our research, including a class timeline and a world map of myths. Students put their myth or monster on the timeline and used thumbtacks to mark on a map where the myth originated during their presentations.

The parameters for the monsters were based on those found in the "Heroes of Hesiod." The students decided that the monster attacks would be determined by the roll of a 20-sided die, rather than having the dungeon master solve math problems, and that the attacks would be based on the actual special powers of the creatures and myths they researched. Students also felt that monsters should have more hit points and special attacks as they moved through the game. Monsters in the beginning of the game were therefore weaker and more easily defeated than those at the end. Accordingly, students developed three attacks for the monsters in the monastery, four for those in the forest, and up to six for those in the castle. Monsters in the monastery would also have two-thirds the amount of hit points as those in the forest, and those in the forest would have three-fourths the amount of hit points as those in the castle. We decided that all of the monsters in each setting would have the same amount of hit points, giving us an opportunity to introduce fractions of a whole. The monsters in the castle had between 20-35 hit points, and students used base-10 blocks, money, and other manipulatives to figure out the fractional parts and the appropriate number of hit points for each of the monsters in the other settings based on this. The students shared their problem-solving strategies with the class after working through the problem independently and in small groups. Fractions were later introduced in a formal math lesson, and we revisited the issue of hit point fractions at that time, adjusting the numbers and developing new monsters accordingly.

In presentations, students shared background information about their creature and discussed the modifications they made to make their creature a part of our game.

Although the students were not required to write a back-story for their monsters, they did have to write a one-paragraph summary of the information that they had found on the monster, which would be included in the game. The dungeon master would introduce the monster as it was released from its cage, giving a bit of background information to help the players know what to expect. Students were encouraged to go back and add in interesting and colorful adjectives to make their monsters more exciting during game play. We used the thesaurus in this activity, and the class developed a long list of alternatives for adjectives, such as "scary" and "evil," and this list was referred and added to throughout the rest of the year. This activity helped reinforce the writing objectives for using colorful and descriptive language and using the thesaurus to improve writing.

Some students also developed creatures that had special mathematical abilities, such as the power to slow heroes down according to their ability to solve fraction problems. Should the hero fail to solve the problem, the "fraction ghost" would slow the hero's speed down by the correct fraction for two turns. Although these additional creatures were not based on historical research, they demonstrated the application of mathematical concepts to the game in ways that were creative, innovative, and engaging for the other students.

The monsters and presentations served as an assessment of the research skills introduced during the development. Because of the experience that the students had working in a group to develop questions and using a wide variety of sources to find the answers, students quickly moved through the research process and had monsters ready for the game in a week of four, one-hour lessons, including two nights of homework. The presentations, which were each about five minutes with two or three minutes of questions and feedback, took another hour.

17.3.4 And then I Snuck up from Behind…Creating the Heroes

The last step in modifying *Dungeons and Dragons* was creating the heroes. The entire hero production process was the shortest. Students had done a lot of the preparatory work and had given much thought to the characters they wanted to create. Therefore, character development focused less on research skills and more on writing. This step took one week: three one-hour sessions in class and one research and note-taking assignment given as homework. In pairs, students developed their own character, whose specific traits and skills came from the medieval occupation that he or she had. Students reviewed information about their characters' occupations in their social studies materials and reviewed the specification sheets for the heroes to develop general parameters. Students decided that their character sheets should have a picture, the character's occupation, one-paragraph back-story, two weapons (one of which based on a tool that their character would use in their occupation), three types of attack (which would correlate to the easy, medium, and hard math problems heroes had to solve), hit points, armor strength, speed, and a special attack.

Students were required to figure out what the ratio of armor to hit points was for the heroes that already existed in the game to develop ratios for their own characters. They then applied that ratio to their own character using different numbers. Before assigning them this task, I reminded the students of the work we had done to figure out the fractions for the monster hit points and the use of ratios in the number of barriers and cages for the maps. I asked the students to try to recall the various solution strategies we had used as a class to solve these problems. I anticipated that some students would struggle with this activity because it had not been covered formally. We discussed using even numbers, sets of ten, and numbers related to money to make the ratio problem easier. Most students applied the skills they developed in creating the maps and monsters to this assignment, which helped me assess their progress in math and prepared them for formal ratio and fraction lessons. I used the think-pair-share strategy for this activity. Students thought about the problem independently, discussed it with a partner, and then shared their problem-solving strategies with the whole class. The pairs then developed a hit-point-to-armor ratio for their character, using one of the strategies discussed.

In their social studies lessons, students had learned about the different types of medieval armor and weapons and some medieval occupations. Students therefore did not need outside research to complete their character development and began writing. Using the work that they had done with the "Story Starters: The Middle Ages" writing program, which provides a detailed list of all the elements needed to describe a character fully, the students developed rich descriptions of their characters' faces, eyes, hair, clothing, occupation, hopes, and desires. Students created images of their characters based on their descriptions and made tokens that would represent their character on the game board. Students also created one weapon for their character that was a modified version of a tool commonly used in their occupation. For example, one pair created a fearsome woodcutter who wielded a pair of axes to attack his enemies. His other weapon was taken from the work the students had done with medieval arms and armor; in this case, he had a long bow. The stories were edited and transferred to cardstock, and the tokens were laminated. Students then shared their creations with the class and were ready to play!

17.3.5 Solve to Attack! Playing the Game

The game play followed the same instructions as the original "Heroes of Hesiod," with the only modifications being those that the students had created. The game itself was used as a reward for the whole class completing the work assigned during the week. Students therefore had a greater incentive to finish and often worked more cooperatively and quickly through their assignments. They also continued to develop problems as we covered new material.

The tokens the students developed to represent both the monsters and the heroes were attached to the board using a piece of sticky-tack. This made it easier to track progress from week to week. Students also had folders in which they kept their hero's statistic sheet and a sheet of paper for keeping track of hit points, damage to

monsters, and the math problems they were asked to solve. One of the students suggested that they also keep a log of the heroes' adventures. Students eagerly created hand-made journals and wrote in the voice of their hero as she or he progressed. They routinely shared these journal entries with the class. These entries were often humorous and integrated the work the students had done creating the game. Students colorfully described settings and monsters and built upon these descriptions to create a rich fantasy world. They employed vibrant, colorful adjectives and verbs to describe near misses, frightful encounters, and heroic victories. For example, the woodcutter ran into the "dreaded" fraction ghost in the forest. The ghost, who was "translucent white and floated about three inches from the ground" attacked the woodcutter, "holding him in the ghost's terrifying math clutches." The student wrote that the ghost "demanded, with a voice that sounded like the Black Death" the answer to a "challenging" fraction problem. It was only by the help of the "ingenious hawker" with her "helpful hawk" that the woodcutter was able to solve the problem and escape. This activity strengthened the students' engagement, helped them develop stronger writing skills, and demonstrated their application of social studies, writing, and math.

17.4 Experience and Outcomes

Because the students were involved in this project as designers and co-creators, they maintained a high level of enthusiasm for math class in general and for the design activities specifically. Frequently, students expressed that they were very excited about the project and disappointed that we could not spend more time working on it each day!

At each stage of development, the students were intimately involved in the direction of the project and were instrumental in determining what actions should be taken to complete the project. They often developed new and innovative suggestions for monster and character elements that I had not anticipated. The experiences I had and lessons I developed will serve as a guideline for future project; I am confident that using this model with other students could yield interesting, unique, and rewarding results.

The particular group of students I worked with offered a series of challenges, as many of them were struggling in math and reading, while others had serious attention and concentration challenges. These issues made following a set math curriculum extremely difficult. When I first suggested that we play a game, the students were very enthusiastic and the students struggling the most received the greatest benefit. Students who normally refused to participate eagerly offered answers when designing, adapting, or playing the game. However, these students enthusiastically applied the knowledge they hesitated to share previously in class or demonstrate on written assessments. They reflected on the project and said it did not even "feel like math." These students felt confident about using their math skills and demonstrated an aptitude for math that they did not show elsewhere. One student, who frequently demonstrated an apprehension towards math that translated into poor performance

in class, on assignments, and during assessments, made significant progress as we worked through the project. She eagerly offered answers to questions posed to the whole class that related to the project (for example, easily finding the median, maximum, mode, and range of the votes for the setting) and slowly transferred this confidence in math as it applied to the project into a confidence in regular math. Her assessment performance improved dramatically and her retention and engagement rose significantly. By maintaining records of the problems they created and solved themselves, as well as the progress they showed orally, I was able to assess her mathematical ability more accurately, which I did for the other students as well. During the course of the project, I noticed that the other struggling students were also translating the math skills they developed into their written assessments, homework, and class work.

Students willingly used and further developed their reading and writing skills while creating stories, narratives, and presentations for the project. The students struggling in these areas academically enthusiastically poured through books and took careful notes. They felt invested in what they were doing and were excited about the goal-oriented work they were producing. One student reflected on his progress in reading and said that he "felt like he was actually reading for something," rather than "having to read." The aspects of reading that challenged him were therefore met with more enthusiasm than a "regular" assignment because he felt that his work was purposeful. Working with their own texts and creating written summaries of research also gave students a chance to have several different reading and writing experiences, strengthening their developing language arts skills. I monitored the progress students made in applying formal grammar rules, using spelling strategies, and employing descriptive language in their different writing assignments. Nearly all of the students had made progress in these areas, creating sustained narratives that were grammatically appropriate and used varied, colorful adjectives and verbs to bring the action to life. Editing also helped reinforce phonemic awareness, writing strategies, and application of proper grammar. The struggling students have developed stronger skills and found elements of writing and reading that they can enjoy.

The project also offers several chances to assess the students' progress both formally and informally. Because the students create a great deal of written work, including math problems, back-stories, and summaries of research, I was able to maintain a portfolio of progress in both math and writing. The records that the students keep during the game also track progress. I was able to see progress in all of the students and was especially impressed with the work that those who struggled the most produced. For example, the student whose work regarding the fraction ghost and the woodcutter I quoted above was one of the students struggling with writing. At the beginning of the year, he was unwilling to write anything but the bare minimum for written assignments. He later developed into one of the most prolific journal-entry writers in the class, working both collaboratively and independently on fantastically embellished adventures of the heroes within the settings of the game. For many of the students, the project resulted in longer and more well crafted pieces of writing, better class work and homework, and a greater confidence in their mathematical ability.

The project gave me a chance to assess students' social and emotional progress working in a variety of different configurations, from large groups and partnerships to sustained individual work. I routinely asked students to reflect on their experiences working with different groups. We talked about how students negotiated the division of labor, how they ensured that everyone contributed, and how they managed disputes. Students shared problem-solving strategies and worked through issues in a safe and caring environment. We role-played different scenarios that came up in groups and developed good solutions for managing conflict. While different configurations offered different social challenges, several of the students began to use strategies whole class had developed to cope with conflict. Towards the end of the project, many of the students who had struggled socially developed better social strategies for coping with others who upset them, managing their social issues with greater independence, tact, and success.

17.5 Modifications, Extensions, and Suggestions

I was lucky and grateful to have had the opportunity to undertake a sustained design project like this in an elementary classroom. I think that this project could be used in a wide variety of educational settings, including high school, and could offer more sophisticated opportunities to integrate other subjects, including science. The game could be easily adapted for different social studies themes in different elementary, middle, and high school settings.

One of the biggest challenges teachers may face in using this project is having enough time. There are, however, several possibilities that this project presents to address this issue. In the elementary classroom, students could work on the project in each of the content areas, creating math problems during math class, researching during social studies, and writing during language arts. Students could integrate formal lessons into their specific project design goals during instructional time, rather than carrying these skills into periods devoted only to the project. Teachers can also modify this project according to the time they have. The game itself offers opportunities to use problem solving skills, mathematical concepts, and creative thinking. Teachers could therefore play the game as it is, or with modifications that they develop, as a stand-alone math activity. Students could write reflections and extensions of the adventure after playing the game, applying language arts skills to their experience. Teachers could also decide which elements of the game they would want students to modify, thereby having students work through the research, design, and implementation without using instructional time to discuss and decide on these steps with the students. Teachers could also choose one or two elements to modify and allow students to initiate the process with teacher direction, rather than modifying the entire game.

The project also offers opportunities to integrate other curricula, including science. For example, physics students could calculate the force and distance traveled by different weapons, create ratios of scale, and then apply it to the weapons that the heroes use. Geography students could create scaled-down maps of actual locations for the game and research these areas to add in appropriate details. These

students could also direct their heroes using latitude and longitude. Art students could create small statues of their heroes, three-dimensional cages and barriers, and lavishly illustrated maps and drawings of their adventures. The basic elements of the game offer many different opportunities to teachers in all different disciplines, and I hope that my experience demonstrates some of the possibilities it presents.

Lastly, this experience has demonstrated that game design in the classroom offers a plethora of opportunities for students to grow as creative, critical thinkers. My students generated a list of very interesting game design possibilities and were particularly excited about using *Dungeons and Dragons*. Other students may be excited to develop their own versions of *Monopoly* or *Risk* or use elements of many different games to create their own. Older students would definitely benefit from the opportunity to pull apart and critically examine several different types of games before designing their own. It would bolster their critical thinking, analysis, and synthesis abilities and provide the teacher with different opportunities to assess their progress. Student-initiated design projects invest and engage students in meaningful work that requires them to pull upon a diverse array of skills to create something of which they can be proud. I look forward to using game design as a foundation for building other lesson plans and projects for students, and I hope that my experience will encourage others to do the same.

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