Math Madness: What's in a Bracket?

Stacy Swanson

Introduction

This unit seeks to engage Middle School students in activities surrounding the NCAA Men's basketball tournament held each year in March. The unit is designed specifically for my seventh grade Honors classes. The unit may be used with any level math class; however, there will be independent research and small group projects involved.

The National Common Core Standards emphasize learning through real-life situations and higher order thinking.[1] As a seventh grade teacher, I feel that it is imperative to make sure that my students are prepared for high school, and the expectations the Common Core provides for high school mathematics students. I hope that by using the basketball tournament, students will become engaged because it is a real-life situation that most find exciting and interesting!

Due to the nature of this unit, the dates for teaching it are very specific. The unit will last two weeks and will begin on March 18, 2013 for this school year. When taught in other years the dates will vary slightly. In addition, it will be necessary to have student access to computers or other devices that will allow them to research team statistics, data, etc.

Objectives

The content of this unit covers statistics and probability specifically, but also utilizes student abilities with number operations a great deal. The Common Core stresses comparing data sets through central tendency measures, investigating probability models, and finding the probability of compound events. The March Madness basketball tournament is all about probability and using data to determine probable outcomes. The unit will also incorporate work with proportions and percent, which will help students determine team placement into brackets.

The overarching purpose of this unit is to encourage students to look deeper into statistics and probability models, and how they affect real-life outcomes. Students will complete in-depth research about players and teams to determine how they were placed (or IF they were placed) in the NCAA tournament bracket. I want to spark the competitive nature found in most students and use that excitement to learn! It is important to show students that the skills they are learning in math class can be easily

translated to life outside of school. This unit is intended to be entertaining and engaging to students of all kinds.

Another objective of this unit is to ask students to use higher order thinking skills. The unit asks students to create their own brackets based on research. They will look at anything and everything that they believe could affect a team's play. They will be encouraged to look at school location, average player height, free throw percentages, or anything else that might affect an outcome. When creating the bracket, students will justify their own thinking processes and how they made educated decisions to complete the project. "Thinking outside the box" is encouraged as we never know how the games will turn out!

Required Background Knowledge for Students

To be successful in this unit, students will need some prior knowledge of certain skills. They will need to be proficient with basic operations involving whole numbers, integers, decimals and fractions. They will need to be able to change numbers between a fraction, decimal, and percent to be able to analyze team data. They will also need an understanding of the measures of central tendency (mean, median, and mode). Not only how to find them, but what each indicates about a set of data.

Changing Numbers Between Fraction Form, Decimal Form, and Percent Form

A number can be represented as a fraction, a decimal, or a percentage. Students will need to have the ability to move between the forms while recognizing that the amount remains the same.

<u>Changing From a Fraction to a Decimal or Percent:</u>

When given a fraction such as $\frac{9}{10}$, the decimal can be found in more than one way. If your fraction has a denominator of 10, 100, 1000, etc, then the decimal is easy to find. In our example, the fraction is read as "nine-tenths", which is .9. If your denominator is something else, the students will need a different strategy. Suppose you are given the fraction $\frac{3}{11}$. Fractions represent division of the numerator by the denominator, so simply divide 3 by 11. Your answer will be .272727… Students can represent this as .27 repeating, or you can instruct them to round the answer off at a certain point. .27 repeating when rounded to the thousandths would be .273.

There are also multiple options for changing a fraction into a percent. If you are given a fraction in which the denominator is 100, or can be easily changed to 100, then the process is simple. Percent comes from the Latin "per centum" or "per hundred",

meaning that all percentages are out of 100. For example, $\frac{19}{100}$ is the same as 19%. As another example, consider $\frac{43}{50}$. This fraction is equivalent to $\frac{86}{100}$, and therefore represents 86%. If you are given a fraction that will not easily change in this manner (i.e. $\frac{6}{17}$), you can have students cross multiply to find the value out of 100. Set up the problem as follows: $\frac{6}{17} \bullet \frac{x}{100}$. Multiply 6 times 100 to get 600, multiply 17 times x to get 17x, and put them equal to each other (600=17x). Last divide 600 by 17 to find the value of x and add the percent sign. Or you can have students divide the numerator by the denominator, then move the decimal two places to the right and add the percent sign.

Changing From a Decimal to a Percent or Fraction:

When given a decimal such as .34, be sure to have the students read the decimal aloud in word form. Therefore they should say "thirty-four hundredths." When read in this manner, they have already said the fraction! "Thirty-four hundredths" is $\frac{34}{100}$, which can be reduced to $\frac{17}{50}$. The decimal .7 is read as "seven-tenths". So, the fraction form of .7 is $\frac{7}{10}$.

To turn a decimal into a percent, simply move the decimal to the right two places and add the percent sign (%). This has the same effect as multiplying the fraction by one hundred. So in the example, .34 becomes 34%. A decimal with a single digit in the hundredths place will be a single digit percent. The decimal .08 is the same as 8% when you move the decimal over two places. If a decimal has more than 2 digits, the percent will not be a whole number. The decimal .846 is 84.6% when you move the decimal over two places.

Changing From a Percent to a Fraction or Decimal:

Moving from a percent to a fraction involves two very simple steps. When given a percent, such as 92%, simply place the percentage number in the numerator, and 100 in the denominator (since percent is always out of 100). In this case you would get $\frac{92}{100}$. The second step is to see if the fraction can be reduced. This fraction reduces to $\frac{23}{25}$.

Moving from a percent to a decimal involves only one step. When given a percent such as 57%, simply move the decimal to the left two places. In this case, you will end up with .57. If you have a single digit percent such as 2%, you will end up with a zero in the tenths place (.02).

Measures of Central Tendency

Students need a clear understanding of how to find measures of central tendency as well as what their findings actually represent in terms of data. For example, the class average on a test was 88%, but what does that actually mean? Did most students make an 88%? Not necessarily, other factors need to be considered as well. If the mode was 40%, then probably the majority of the class scored above 88%. Students will need the ability to compare all factors in order to make reasonable assumptions about team data.

Mean: The more common word for mean is average. The mean is very useful for finding an approximate amount to base a larger population on. If a player has a mean free throw percentage of 80%, that indicates that he will hit about 8 out of 10 free throw shots. This is an approximation based on a large number of free throw shots he has taken over time. To find the mean first add all of the numbers in your data list. Second, divide the sum by the amount of data in the list.
Example:
Data set- 3, 3, 7, 8, 9, 11, 11, and 12
First step: 3 + 3 + 7 + 8 + 9 + 11 + 11 + 12 = 64
Second step: 64 / 8 = 8, The mean of this data set is 8.

Median: The median of a data set is the middle number in that set. I always tell students that median and middle both have 6 letters as an easy way of remembering it. To find the median, first put the data set in order from least to greatest. Then work your way in from both sides until you find one or two numbers remaining in the middle.
Example:
Data set- 17, 19, 14, 15, 16, 13, 12, 19, 22, 15, and 21
First Step: Rewrite the numbers in order- 12, 13, 14, 15, 15, 16, 17, 19, 19, 21, 22
Second Step: Cross off one number from each side (the lowest and the highest) until you reach a central number. In this case that would be 16.
In the case of an even numbered set of data, there will be two middle numbers. Students will need to find the mean (see above) of the remaining two numbers.

Mode: The mode of a data set is the number that occurs most often. I always tell students that mode and most both have 4 letters as an easy way of remembering it. Sometimes there is more than one mode, and sometimes there is no mode. To find the mode, first put the data set in order from least to greatest. Then look to see which amount(s) occur most often.
Example:
Data set- 67, 52, 58, 68, 64, 52, 67, 63, 60, 67, 54, 54, and 60
First Step: Rewrite the numbers in order- 52, 52, 54, 54, 58, 60, 60, 63, 64, 67, 67, 67, 68
Second Step: Find which number occurs most often. In this case, it would be 67 because it occurs three times in the data set.

I try to teach central tendencies with my students all year long. I use the classes weekly quiz scores. Each week, I display the scores in a random order. The students then find each central tendency and determine whether there are outliers or not. This strategy really helps with fluency and overall understanding of what the amounts actually mean because the students are invested in these scores! It is important to make the data relevant to the student for them to truly grasp the meaning behind it. I usually create a challenge between classes and hang up each group's central tendencies on the board. Only a few weeks into school they will be able to tell you how outliers affected the mean, and what they would need to score to beat the other class!

*As a side note, range is often confused as a central tendency. To find the range you subtract the smallest number in the data set from the largest number in the data set. It can be a useful tool for finding the spread of a set of data, but it does not indicate central tendency.

School Background

I teach seventh grade at Bailey Middle School in Cornelius, North Carolina. We are a part of Charlotte-Mecklenburg Schools, which is a district of 159 schools. It is obviously a very large district, and very much an urban one. My school, however, is not similar to most CMS schools in its make-up. It is a fairly affluent school located about 15 miles north of the city. Bailey has 1500 students, and a free and reduced lunch population of 24.1%, which is below the CMS average. The student makeup is as follows: 76.5% Caucasian, 12.2% African-American, 7.3% Hispanic, and 2% Asian, and 1.9% Other. We offer two levels of seventh grade mathematics at Bailey: Honors and Standard. We have a large population of students identified as gifted, and most teachers have at least two Honors classes. I teach two Honors classes and two Standard classes.

Given our population, we are incorporating "Bring Your Own Technology" to our school this year. We are lucky enough to have a large number of students with IPads, laptops, tablets, etc., and Wi-Fi connections are available in every classroom throughout the school. With that being said, this unit does require student research online. If students do not have the ability to bring in their own devices, then a computer lab or laptop cart would be necessary.

Rationale

Why teach this unit? Why not just let the students practice probability models out of the textbook? Reduced written/bookwork in favor of projects and hands-on experience benefits a majority of students. Research shows us that children's brains can only take 12 minutes of direct instruction at a time before it must be processed and practiced.[2] While I do believe there is a time and place for direct instruction and rote practice, probability is an area where I believe students benefit more from hands-on learning and experiments.

Probability and statistics are around all of us in everyday life constantly. I feel like it is one of the easiest areas of math to show students that they really will use it every day!

Research has shown us time and time again how true engagement increases learning in students. You can use students' interests to drive them through the curriculum. Honing in on an interest of theirs, and creating a project around it will lure the students into an activity that they like, and are willing to put more effort into.[3] I believe that this unit will grasp true engagement from all students. Most students that I have come into contact with get excited about the March basketball tournament. Even students who may not watch basketball during the regular season like to tune in for the tournament. I know several adults who do the same thing. There is something about the competitive spirit that sparks an interest in us. I also believe that even if you have a student or two who could care less about the tournament, you can somehow still spark that competitive drive. Maybe they have a relative who attends one of the universities, or maybe they are supportive of the cheerleading squads. Whatever their interest may be, you can tie it in to the tournament. As long as you show genuine excitement about the activity, the students will get excited, too. When a teacher shows positive affective factors such as curiosity, excitement, persistence, enthusiasm, flexibility, skepticism, and open-mindedness, the same behaviors and responses are encouraged in the students.[4]

In this unit, students will be working in cooperative learning groups for the majority of the activities. This is an excellent way for students to not only learn from each other, but make gains in social awareness as well. The National Common Core Standards emphasize high school and beyond readiness. According to Susan Winebrenner, "Cooperative learning is an educational practice that is generally accompanied by some gains in achievement and profoundly improved social interaction behaviors for boys and girls. Since the demands of the adult workplace often require all people to work in groups from time to time, cooperative learning skills are valuable for all students, including those who are gifted." As stated previously, I will most likely be using this unit with my Honors classes. It can most certainly be used with all students, just be aware that there will be quite an amount of group research involved, as well as a finale project that will require small group work for multiple days.

Strategies and Classroom Activities

*Remember this unit is date specific for 2013. If used in other years, the dates will need to be altered slightly. Also, this unit will work best if you have the flexibility to follow the dates of the tournament. It will be very engaging for the students to be able to follow the games as they are working on the classroom activities. However, you could still use this unit in another part of the school year if your schedule is not flexible. Similar activities could be used with another pop culture event if need be. Just adjust your dates around the chosen event!

Introduction to the Unit

In the week leading up to Selection Sunday, I will expose students once again to mean, median, and mode. Instead of using their test scores, this time we will be discussing income. This is another topic that seems to peak my students' interests!

Here is an interesting scenario that will grab the students' interest: What if I told you that the average income of the attendees at the first World Series game was over a million dollars? Would you be surprised? Of course! But then what if I told you that I forgot to mention that Bill Gates attended the game? How does that change your perception?

According to Tim Chartier's blog "Getting Mean About Bill Gates", Bill Gates' net worth in 2012 is $66,000,000,000.[5] Couple that with the fact that the largest baseball stadium in the United States (Dodger Stadium) has a capacity of 56,000 fans. Therefore, if Mr. Gates were to attend a game there, the mean income of a spectator could be found as follows:

$$66{,}000{,}000{,}000 \div 56{,}000 = 1{,}178{,}571.428571429$$

That is an average net worth of $1,178.571.43 per fan at the game!!! Also keep in mind that this is assuming that no one else attending the game has any net worth at all! This is an engaging way to introduce students to the idea of an outlier.

An outlier can seriously affect a team's statistics. Put the same scenario back on the students with a reference to a few statistics. For example, what if the average height of the 5 starting UNC Tarheels is 7 feet? That's a tall team! Unless of course, one of the players is 8 feet tall! It is important for students to really examine the data to be sure outliers aren't affecting the data.

Another challenge that would be relevant to students involves the Bill Gates scenario at a Panthers game. The Bank of America Panthers stadium seats 73,778.[6] Therefore, if Bill Gates were to attend a game there, each fan's average net worth can be calculated as follows:

$$66{,}000{,}000{,}000 \div 73{,}778 = 894{,}575.6187$$

That means that each fan at the Panther game has a net worth of only $894,575.62. Of course, that figure assumes that no one else at the game has any net worth at all. How much other net worth would have to be represented in the stadium to achieve an average net worth of $1,000,000? This will get students working backwards toward the initial amount instead of toward the mean. If you have already taught equations with your students, they should be able to set up the following equation to find out:

$$(66{,}000{,}000{,}000 + x) \div 73{,}778 = 1{,}000{,}000$$

Students should find that there needs to be an additional net worth of $7,778,000,000 for the average net worth in the Panther Stadium to be $1,000,000.

Activities

Activity One (Friday, March 15, 2013)

To start off the unit in an exciting and engaging way, I plan to show a self-made movie trailer. It will be a short preview to grab the students' attention and excite them about the week ahead!

At this point, students are becoming more familiar with how data and statistics are figured, as well as how they can be skewed by outliers. However, keep in mind that there may be some students who are completely unfamiliar with how a single elimination, sixty-four team tournament works. I will start by showing students the bracket of teams. I have a Promethean board in my room, but you could easily use a projector or document camera instead. Students need to understand that if a team wins a game, they advance to the next round. In turn, a team which loses a game is out completely. This could very well be different from student background knowledge of their own sports tournaments.

Next, show a video that provides the students with some idea of how people select their March Madness brackets. I am using a "YouTube" video entitled How to Pick a Winning March Madness Bracket.[7] This particular video gives pointers on the statistics that should be taken into account when selecting a bracket. Since the students are about to do their research, they can decide which factors they would like to use to proceed with their selections.

Another set of fun videos to show following the procedures is a set of videos from ESPN's Sports Science called "Bracketology" and "Bracketology 2".[8] The videos show alternative ways of picking a bracket. One method shown is to set out cups of feed on the floor, and have a chicken select the winning team by eating from that cup! Another method shows a group of one hundred adults picking brackets completely randomly, with no knowledge of which team is where. It will give the students a better perspective of the challenge of picking a winning bracket!

As a side note, this can be a really fun day in the classroom preparing to start the tournament! I will encourage my students to wear their favorite college team's apparel. Also, you could serve popcorn and drinks during the videos to get them really excited.

Activity Two (Monday, March 18, 2013)

On the first two days following Selection Sunday, 64 teams will have been placed in the March Madness NCAA basketball tournament. Actually, it will be 68 teams initially, but the 4 wildcard games will be played by Thursday, March 21.

The students will use these first two days as research days. As stated before, my school is a Bring Your Own Technology school, so I will ask students to bring in tablets or laptops for the next two weeks of this unit. If your students are not permitted to bring in these devices from home, you will need to have access to a computer lab for at least the first two days of this unit. If your school has laptop carts, try to reserve them for the first week at least.

A premade research sheet will be provided for students to get them thinking in the right direction. The first activity will focus on drawing inferences about a population. Students will be expected to examine team data and make a judgment on how a team might perform based on their research. Students should use a variety of resources when compounding their statistics. ESPN's website is one excellent source for current team data and reports on particular players.[9] Have the students look at a team's overall statistics. Then have them look at just the six players who play the most versus six players who never leave the bench. Are these overall team statistics a true representation of the population? Maybe not if only the top six or so players will actually enter the game! If you can assume that the best players on a team will play the entire game, then the overall team statistics are not very valid. However, students also need to think about injuries, foul outs, etc. This is a way for students to begin evaluating statistics as relevant to reality or not.

Activity Three (Tuesday, March 19, 2013)

This third activity focuses on the objective of drawing informal comparative inferences about two populations. Again, students will be provided a premade research sheet to begin looking at the statistics. This is when students will begin to dig a little deeper into more specific data. They will need to be fluent with central tendencies (mean, median, and mode) and percentages to make accurate judgments. Students will look at team height, free throw percentages, field goal percentages, three point percentages, team fouls, and any other statistical data that they feel is relevant to considering a team's performance.

This is an opportunity to refer back to the Bill Gates example from the introductory lessons. How did Bill Gates being in the stadium affect the overall average net worth of a fan at the game? Can you compare that to a star from a certain team? For example, what if the Duke Blue Devils have an overall three point percentage of 45 percent? That sounds like the Blue Devils are amazing three point shooters! However, we need to consider the possibility of an outlier. What if the Blue Devil's point guard has a three point percentage of 50 percent, and he is taking 95 percent of the three point shots??? That changes things!

At this point, students should begin to see that the statistical data does not always tell the entire story. As the students will be picking brackets and teams in the coming

days, it is a good time to start having them think about outlier situations. If a team has an extreme outlier who scores the majority of the points, steals the majority of the passes, and makes the majority of the plays happen, students need to take that into consideration. On the one hand, you can assume that player will be in for the entire game making outstanding plays. On the other hand, what if he is injured or fouls out? It is all up to chance!

Activity Four (Wednesday, March 20, 2013)

Today's activities focus on investigating chance processes and developing, using, and evaluating probability models. Students need to be shown how to assign a certain probability to an event. The indicators for chance probability are as follows: will not occur, unlikely, neither likely nor unlikely, likely, and will occur. These are measured on a scale from zero to 1. Show students the following values:

An event that will not occur has a probability of 0.
An event that will most likely not occur has a probability near .25.
An event that is neither likely nor unlikely has a probability of .5.
An event that will most likely occur has a probability near .75.
An event that will occur has a probability of 1.

To make these numbers relevant to the students, give some examples of events that will mean something to them. For example, what is the probability that you will have to come to school tomorrow? What is the probability that it will snow tonight? What is the probability that the cafeteria will have macaroni and cheese for lunch?

Students will be asked to make estimations of probability on the teams that they have researched. Students will assign each team a value between zero and one based on the statistical data that they feel is relevant to the outcome of the games. Provide each student with a blank copy of the bracket, showing the 64 teams in place for the tournament. Students will then work to create their own brackets based on the probability they have assigned each team. This can be done in partners or small groups if you want to be sure that each group has looked at all of the teams in question. Let the students know that there are 9,223,372,036,854,775,808 (or 2 to the power of 63) ways to fill out a 64-team March Madness bracket, so they will need to rely on their research to make educated picks![10]

Once each student or group has a personal bracket, work together to create a few more for the entire class to pull for. I am planning to use a fifty/fifty bracket. Assign the top team in a matchup "heads", and the bottom team in a matchup "tails." Have each member of the class flip a coin in turn to create a class fifty/fifty bracket.

Another bracket you can use will be based on seed (a team's ranking in the tournament) alone. Each higher seeded team will always win the matchup. When you reach the Final Four, some seeds might be the same. At this point you could go back to the coin toss, or have students vote based on their research.

For the third class bracket, we will pick the winners of each matchup based on a school's location. We will assume that the team located closest to us will always win. This is another chance to look at some interesting probabilities. For example, my school is located outside of Charlotte, North Carolina. There are several teams located near us who consistently perform well in college basketball. Ask the students how your location affects your picks. Would we do as well in this bracket if we lived in Idaho, for example?

As a final example, you could show students alternative brackets based around a weighting scale. Two examples are weighting wins at away locations more heavily than wins at home and weighting wins against known rivals more heavily.[11] I will show an example of weighting a team's performance during different parts of the season. Most people may agree that the way a team is playing during the latter part of the season and their conference tournament is a good indication of how they will play in the NCAA tournament. Of course it is all up to chance, but if you buy into that you can assign each game of a regular season a different value. What if games won in the first third of a season are worth only half a point, games won in the second third of a season are worth one point, and games won in the last third of the season are worth two points? This one could actually make a lot of sense!

In closure, discuss all of the different types of bracket-making that you decided to use with your students. Ask for their opinions on which bracket will perform the best and why. Reinforce the fact that with probability, we can only make educated guesses at the outcome. Unless an event is certain or impossible, we can never know the outcome ahead of time. If time allows, you can sign your class up on ESPN.com and enter one of your brackets online.

Activity Five (Thursday, March 21, 2013)

While you are waiting for the tournament games to get started so you can follow the brackets, here is another fun activity that will keep the students thinking and engaged. Begin by explaining to students that each team will be given a monetary value based on its seed. Each student (or pair of students) will be given $17 of funny money in which to "purchase" two teams. You could use money from a board game or create your own!

Assign each team a value as follows:
A number one seeded team will cost $16
A number two seeded team will cost $15

A number three seeded team will cost $14
A number four seeded team will cost $13
A number five seeded team will cost $12
A number six seeded team will cost $11
A number seven seeded team will cost $10
A number eight seeded team will cost $9
A number nine seeded team will cost $8
A number ten seeded team will cost $7
A number eleven seeded team will cost $6
A number twelve seeded team will cost $5
A number thirteen seeded team will cost $4
A number fourteen seeded team will cost $3
A number fifteen seeded team will cost $2
A number sixteen seeded team will cost $1

Each student or pair of students can select any two teams to support based on their research. Some students will want a number one team, and therefore will also have to select a number sixteen team. Some teams will see a benefit in selecting two teams that are closer to the middle. It will be interesting for students to evaluate their best options within the given parameters! You can give a prize to students based on who picked the overall winner in the end, or possibly which group had both teams go the farthest in the tournament!

Activity Six (Friday, March 22, 2013)

This activity will be a chance for your students to write about the research they have done and the choices they have made up to this point. The National Common Core Standards call for writing to be implemented in all subject areas. The students will be writing an Argumentative Essay.

Show students the format for writing argumentative essays. One major change from sixth grade to seventh grade is the addition of evaluating the counterargument. Students will need to discuss their reasons for choosing the teams that they did. What statistical factors did they take most into account to make their decisions? Why do they believe that their choices are valid? Also, they need to provide reasons against teams they did not choose. Students can refer back to their research and cite the data that they discovered.

Early finishers can look at some deeper analysis questions. Allow students to work in groups to discuss specific teacher-created questions. For example, what portion of the teams in the tournament are in the Atlantic Coast Conference? Can you think of any reasons why? What is the probability that there will be four teams from the ACC in the Final Four? Have the students analyze the teams that made the tournament. What

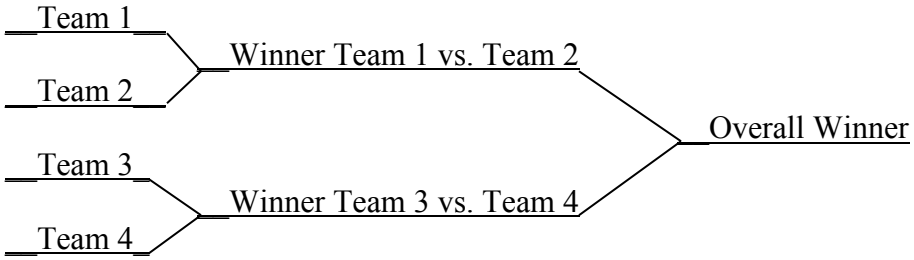
similarities can be seen between them? This is a great opportunity to get students thinking beyond just the numbers at some of the other factors that might affect probability.

*Remind students to try to watch some of the games over the weekend!

Activity Seven (Monday, March 25 and Tuesday, March 26, 2013)

At the beginning of week two, sixteen teams will remain in the NCAA basketball tournament. Start off today's lesson by updating the brackets that the class and individual students created. Who is still in the tournament and why? Were there any upsets? Have the students analyze the upsets and brainstorm reasons why some of the probability analysis was inaccurate. I will also use this time to show a few clips of Sportscenter from the weekend. There will be several students who have not seen any actual game footage, and therefore might still be unaware of what some of the statistics they have researched really mean. When you show some of the footage and game highlights, be sure to point out things such as the three-point line, what constitutes a foul, what a field goal is, etc.

These two days of the unit will be used to dig a little deeper into probability. One of the Common Core Standards for seventh grade math is the analysis of compound probability. This can be a much more challenging task than simple probability for most students to grasp. I hope that using the brackets that students have become familiar with will make the initial exposure to the concept easier to understand.
Example of 4 team, single elimination bracket:



In this example, what are the chances that Team 1 will end up playing Team 4? The chance of Team 1 winning against team 2 is 50%, .5, or $\frac{1}{2}$. The chance of Team 4 winning against Team 3 is 50%, .5, or $\frac{1}{2}$. To find the compound probability of this event multiply 50% by 50%, .5 by .5, or $\frac{1}{2}$ by $\frac{1}{2}$. The students should find that the probability of Team 1 playing against Team 4 (disregarding perceived skill level) is 25%, .25, or $\frac{1}{4}$.

Encourage students to list their answers as a percent, a decimal, and a fraction to increase fluency between the three representations.

Again at this stage I would suggest a premade worksheet to guide students. Have students begin looking at compound events such as what are the chances that Team 1 will play against Team 16? What are the chances that Team 3 will play Team 8? It will be important to alert students to the fact that these statistics will be created without regard to team ability.

Once students have shown understanding of this concept, show other situations that involve compound probability. Dice, spinners, and coins are readily available manipulatives that students can experiment with. What are the chances of rolling a 6 and flipping a heads? What are the chances of spinning a red on a color wheel and rolling an odd number? You should also look at the differences between independent and dependent events. What are the chances of rolling a 3 twice in a row? Do the chances change for the second roll?

Activity Eight (beginning Wednesday, March 27, 2013)

The final activity of my unit allows students to create a product of their own to demonstrate the concepts they have learned. Technology will be needed for this activity, so if your students cannot bring in devices then you will need access to tablets, laptops, or a computer lab.

I will provide students with a project/presentation rubric to guide them (See Attachment 1), but I will allow lots of room for creativity.[12] Students should be able to choose from multiple avenues to show their learning. Some suggestions are as follows:

1. Create a mock ESPN newscast
2. Create a movie trailer and skit
3. Create a digital graphic organizer
4. Write a song and record a music video

Students will need several days to meet with their groups to develop and execute their projects. Time will then need to be provided for students to present in front of the rest of the class.

Optional Bonus Activity (following the end of the classroom presentations)

If you would like to end the unit with a fun activity (perhaps on a Friday), consider having a free throw tournament if your school has the facilities. I will encourage the students to consider how many free throws their willing classmates can make. What is the probability that the teacher will beat all the students?

[1] (Common Core State Standards Initiative, "Mathematics")
[2] (Winebrenner 2001) p.54
[3] (Hutchison 2010) p.150
[4] (Krajcik 2003) p.391
[5] (Chartier, "Getting Mean About Bill Gates")
[6] (Carolina Panthers, "Stadium")
[7] (YouTube, "How to Pick a Winning March Madness Bracket")
[8] (ESPN, "Bracketology")
[9] (ESPN, "NCAA Basketball")
[10] (Langville 2012) p.154
[11] (Langville 2012) p.147
[12] (Rubistar, "Create Rubrics for your Project-Based Learning Activities")

Resources

Carolina Panthers. "Stadium." Accessed November 25, 2012. http://www.panthers.com/stadium/index.html

I used this website to gather information about stadium seating for a central tendency lesson.

Chartier, Tim. "Getting Mean About Bill Gates." Accessed November 25, 2012. http://sites.davidson.edu/mathmovement/getting-mean-about-bill-gates.

I used this blog for ideas on introducing central tendency and outliers.

Common Core State Standards Initiative. "Mathematics Standards." Accessed November 25, 2012. http://www.corestandards.org/

I used this website to access the seventh grade Common Core math standards.

ESPN. *Bracketology.* DVD.

I will use this video in the classroom to expose students to alternative methods for selecting teams.

ESPN. "NCAA Basketball." Accessed November 25, 2012. http://espn.go.com/mens-college-basketball/.

Students will use this website to research team statistics and data.

Hutchison, Charles B. *Teaching Diverse Learners: With Basic Principles, Classroom Insights, and Best Practices.* Charlotte, NC: Catawba Publishing Company, 2010.

I used this book to evaluate methods for motivating and engaging students.

Krajcik, Joseph S., Charlene M. Czerniak, and Carl F. Berger. *Teaching Science in Elementary and Middle School Classrooms: A Project-Based Approach.* 2nd Edition. New York, NY: McGraw-Hill, 2003.

I used this book to look at incorporating project-based learning assignments.

Langville, Amy N. and Carl D. Meyer. *Who's #1?: The Science of Rating and Ranking.* Princeton, NJ: Princeton University Press, 2012.

I used this book to explore options for weighting teams in alternative brackets.

Rubistar. "Create Rubrics for your Project-Based Learning Activities." Accessed November 25, 2012. http://rubistar.4teachers.org/

I used this website to create a sample rubric for Activity 8.

Winebrenner, Susan. *Teaching Gifted Kids in the Regular Classroom.* Minneapolis, MN: Free Spirit Publishing Inc., 2001.

I used this book to look at methods for engaging students in authentic learning.

YouTube. "How to Pick a Winning March Madness Bracket." Accessed November 25, 2012. http://www.youtube.com/watch?v=GX_3h5dap9s.

I will use this video in the classroom as an introduction to picking teams in the NCAA basketball tournament.

Attachment 1

RubiStar Rubric Made Using:
RubiStar (http://rubistar.4teachers.org)

Multimedia Project : Math Madness Final Project

Teacher Name: **Stacy Swanson**

Student Name: _____

CATEGORY	4	3	2	1
Presentation	Well-rehearsed with smooth delivery that holds audience attention.	Rehearsed with fairly smooth delivery that holds audience attention most of the time.	Delivery not smooth, but able to maintain interest of the audience most of the time.	Delivery not smooth and audience attention often lost.
Originality	Product shows a large amount of original thought. Ideas are creative and inventive.	Product shows some original thought. Work shows new ideas and insights.	Product shows little evidence of originality or creativity.	Product shows no originality or creativity.
Content	Covers topic in-depth with details and examples. Subject knowledge is excellent.	Includes essential knowledge about the topic. Subject knowledge appears to be good.	Includes essential information about the topic but there are 1-2 factual errors.	Content is minimal OR there are several factual errors.
Attractiveness	Makes excellent use of font, color, graphics, effects, etc. to enhance the presentation.	Makes good use of font, color, graphics, effects, etc. to enhance to presentation.	Makes use of font, color, graphics, effects, etc. but occasionally these detract from the presentation content.	Use of font, color, graphics, effects etc. but these often distract from the presentaion content.
Participation	All group members participated fully and worked extremely well together.	All group members participated fully and worked fairly well together.	Most group members participated fully and did not argue.	Not all group members participated and/or the group did not get along.

Date Created: **Oct 31, 2012 12:41 pm (CDT)**