

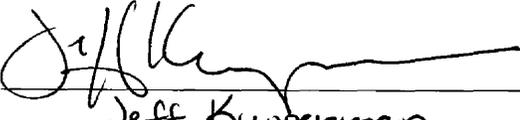
Math Talk: Improving Mathematical Discussion

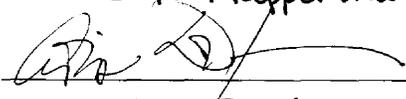
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This verifies that Cody Mattila has completed all the requirements for EDU 560 Master's Project.

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I. Introduction

A. Background

My journey with the following research began in the summer of 2005. I had been teaching for three years and was in the process of switching school districts. I was also at the very beginning of working on my Masters in Education with a Specialization in Technology at the University of Michigan-Flint. As a math teacher, I wanted to choose the Technology specialization because of the burgeoning role of technology in post-secondary education and career possibilities for my students. When I was in high school, the internet and email usage were just becoming widely used. As a teacher of students who have never known anything but the widespread use of those technologies, I felt that it was my duty to become informed about the role those technologies could play in improving learning opportunities in my classroom.

During the summer of 2005, I enrolled in a web design course at the University of Michigan taught by Jeff Kupperman and Gary Weisserman. Working with two other graduate students, Carmen Woodruff and Stephanie Garey, we used html coding to design “Math Talk.” Math Talk is a website that Carmen, a middle school teacher in a different district, and I both use in our math classrooms as a tool for students to learn mathematical concepts through discussion with their peers. Both Carmen and I had used cooperative learning in our classrooms to encourage learning through peer interaction. It was our perception that students can often learn new concepts fairly quickly in through this type of peer interaction that includes some discussion among the students in the group. Math Talk creates one large cooperative learning group. Technologically, it was a completely new idea, but the idea of whole class discussion itself was not new, although not highly used in either of our classrooms. It was our hope that the students would also benefit from this type of interaction. My research investigates the value of this technology in my classroom.

B. Research Questions

Using my classroom and students as my research context, I planned to explore the answers to several questions while having the students use Math Talk.

- Will having mathematical discussions prove important to the learning process?
- When is Math Talk productive in creating good math discussion and deeper understanding?
- How does allowing students to post their own questions on Math Talk, and subsequently answer those of fellow students, affect the quality of their postings?
- Can an online environment enable students that are timid in class to feel more comfortable expressing their ideas and opinions in an online environment?

II. Literature Review

I began my research by searching for literature dealing with connections between mathematics, learning, peer discussion, and technology.

Since my own research involved an online project, I was specifically interested in sources that discussed using some form of online communication to engage students in their own learning processes. It turns out that using computers to teach mathematics is not a new concept. Within the field of mathematics, computers are widely used and there is software readily available for almost any mathematical topic. Each textbook that I use in my classroom comes with a software package for teacher use. My Probability and Statistics students use Microsoft Excel to create tables, graphs, histograms, and other visual statistical representations.

Mathematics educators have suggested that the use of these types of software can increase learning opportunities by providing new outlets for student interaction. Nathalie Sinclair's (2005) article discusses the use of such software in the classroom. "Dynamic geometry software has in fact reintroduced time into mathematics, as one can create and observe continuous

transformations of mathematical entities. This aspect of student interaction with dynamic geometry may in fact be more important than we think in terms of allowing students to tell stories about their mathematics.”(2005) The article discusses an online Cartesian coordinate system activity that makes humorous noises when manipulated. Sinclair claims that this type of “personality” that can be conveyed through an online format challenges the traditional literary conventions of mathematics texts.

A portion of Seymour Papert’s (1993) text *The Children’s Machine* also discusses the role computers can play in helping students learn math. The first chapter of the text poses the scenario of a time traveling educator from the past looking in on a modern day classroom and asks the reader to imagine what this time traveler would think about modern education. Even if the time traveler does not notice any significant changes in the classroom, Papert proposes that if the time traveler were to follow some students home and view the learning and intense interest children have in video games, this time traveler would surely note that learning is occurring, albeit in a non-traditional format. Papert’s own goal in the use of computers is to “strive to create an environment in which all children- whatever their culture, gender, or personality- could learn algebra and geometry and spelling and history in ways more like the informal learning of the unschooled toddler or the exceptional child than the educational process followed in schools” (1993, pg. 13).

Papert explains that mathematics is considered, by most students, to be the educational variety of calculations they are taught and not the intuitive, informal math that is actually the basis for the educational math they are learning. Not understanding this larger basis for mathematical knowledge decreases a student’s ability to learn more formal math. Papert proposes that

the most powerful use made of computers in changing the epistemological structure of children’s learning to date has been the construction of microworlds, in which children pursue mathematical activity because the world into which they are drawn requires that they develop particular mathematical skills (1993, pg. 17).

The author goes on to demonstrate a case of this where a computer programming language, that required new mathematical skills, was used by students to study African textiles. Although it was learned in an informal format, these middle school students were clearly learning new geometry concepts through the use of a computer.

Some educators are not as quick to promote the use of computers as a universal solution to classroom learning challenges. In *How to Teach Mathematics*, author Steven Krantz (1996) initially seems skeptical of using computers in the classroom. “I can make no sense of ‘electronic classrooms’ - in which each student, or each pair of students, has a computer before him” (1996, pg. 26). Krantz goes on to explain that he does acknowledge the benefits of computer usage, but for laboratory work.

If two or three students are sitting together in front of a computer screen, going through the paces of a well-constructed lab, then they definitely have something to talk about. They have a catalyst for some group work... And the computer can pace them through a self-discovery process (1996, pg. 27).

Krantz also discusses how computers can help students visualize mathematical concepts and can replace the tedious aspects of mathematics, making way for more time to concentrate on conceptual aspects.

This laboratory setting concept can be applied to small groups working with or without a computer. One example from the field of mathematics is a quantitative study done on peer collaboration in a middle school setting by Webb and colleagues (Webb, Troper, & Fall, 1995). The authors studied the constructive activity and learning that took place when the students worked in collaborative small groups. Webb et al. do not go as far as suggesting that higher achievement occurs when working in these small peer groups. The authors do, however, hypothesize that increased constructive activity and learning take place when students have the skills to work collaboratively. The results of their study indicated that when students provided detailed explanations to their peers instead of simply providing an answer, it was a “significant predictor of subsequent constructive problem-solving activity” (1995, pg. 416).

The use of computers as a tool for group work, discussion, and a catalyst for self-discovery within the field of mathematics has not been widely studied as indicated by the lack of literature on the topic. Usage of computers in these ways has been studied in other contexts, however, such as in *A Community of Designers* by Michele Evard (1996). Evard studies students working individually on a computer programming project, but the students collaborate via an online forum. The students are in a laboratory setting using computers for their individual projects but also in a group setting online to get help with their program design from other students by asking questions. In turn, the students are able to provide help for other students by answering questions they know enough to answer. Because these questions are of “personal importance” to the students, Evard proposes that the students are truly invested in the learning process that is occurring here.

I believe that children can learn through both asking and answering authentic questions- questions which are of personal importance to them. When asking a question, a child needs to articulate what he or she wants to learn or obtain. Similarly, answering a question requires articulation of thoughts (Evard, 1996, p. 224).

Students are able to find questions that are similar to their own and investigate the answer to those questions. Students are also able to find questions that they find interesting or think they can solve and become personally invested by devoting time to help another student. Suggestions from other students promote self-discovery and investigating the validity of suggestions promotes discussion among classmates.

Computer technology can therefore help students see themselves as not only students, but as teachers; not just as knowledge receivers, but as knowledge creators. In *Empowering Students with Technology*, author Alan November (2001) talks about raising expectations for students as knowledge producers. One of the ways teachers can accomplish this is to publish student work online. November states that “students have a natural tendency to want to outdo the work of other students” (2001, pg. 35) and will therefore demonstrate improved performance upon having access to other exceptional

student work. In an online environment, students have the opportunity for real-time feedback and the dynamics of sound and animation.

Powerful machines allow for more dynamic teaching and best of all, perhaps, they allow students to show what they know in nontraditional and nonlinear ways that more closely approximate the skills they will need to be more successful in the adult world (2001, pg. 49).

November (2001) agrees with Evard's (1996) conclusion that the online assignment must be of some type of personal importance or interest for the students. "It is important for students to share in identifying the problem. Students must have a sense of owning the problem rather than seeing it as an assignment from the teacher... Drawing on areas of student interest promotes fully engaged learning" (November, 2001, pg. 50).

One way that student interest can be enticed and student ownership encouraged is through the use of activities with game-like qualities. Kupperman and colleagues (Kupperman, Stanzler, Fahy, & Hapgood, 2006) have written an article on the benefits of using games in the school environment to promote learning. The article focuses on POOT, an online simulation of a diplomatic trial, in which high school or junior high students role play as non-fiction characters such as King Henry VIII, Shakespeare, Patrick Henry, and Christopher Marlowe. These younger students are joined by university students also playing a variety of characters.

Although the context of the trial and the research required for role playing are clearly educational objectives, the students are able to "grasp the game-like nature of the program right away" (Kupperman, et al., 2006, pg. 2). The characters interact through a series of message boards and are also able to email each other. The authors propose a hypothesis on why students would be more engaged in this type of task than in a typical classroom writing assignment. "One key, we believe, is the potential for getting a response—in particular, a response from somebody other than the teacher, in a form that is not simply a grade or evaluation" (Kupperman, et al., 2006, pg. 5).

One of the concerns for any modern educator is fulfilling the mandated set of state and national standards, as well as district curriculum requirements for any course. Using more time-consuming games or activities in the classroom instead of the typical classroom instruction followed by a homework assignment can appear to be less efficient. Math Talk does indeed take more time for the students to accomplish than simply having an in-class discussion. Kupperman et al. propose that educators try using methods, like games, that are inherently less efficient, but potentially infinitely more valuable (pg. 10). Although these methods may instinctually seem like a waste of time when an educator has a rigorous set of goals to accomplish, these games could create a new learning and not just doing dynamic in a classroom.

Students, especially those towards the end of their high school careers, have become highly skilled in getting tasks done, but not necessarily educated through those tasks. “We want students not just to strive toward task completion goals, but to approach tasks in ways that may be less efficient, but more conducive to learning. Furthermore, we want students not to simply tolerate these efficiencies, but to embrace them” (Kupperman et al., 2006, pg. 9). Math Talk attempts to create an environment where students can embrace such inefficiencies. As a goal, Math Talk provides an outlet for creative thought and learning to take place and replaces the typical math homework assignment. So, although Math Talk might perhaps be less efficient, especially when time is considered, it has the potential to be more facilitative of real learning.

III. Background and Methods

A. Description of Participants

I teach in a homogeneously Caucasian, suburban school district in a rural county of Michigan. Socioeconomic status is more heterogeneous; there are students living in families with poverty status, but also students who live in affluent lake communities. The students are children of both blue collar and white collar workers and come from varied homes. Many come from a home with a traditional family structure, but others come from homes with blended families. The

school district is large, comprised of two high schools, one junior high, and eleven elementary schools. The high school where I am employed houses approximately fourteen hundred eighty-eight students in grades eight through twelve. Most of the students have had limited exposure to technology in their school environment due to a lack of monetary funds for technology upgrades. From my experience with students in the district, it appears that most have been able to access good amounts of technology outside of their school environment.

Each teacher has their own classroom computer, new this year through a district planned technology upgrade for the 2006 - 2007 year. There is one computer lab in my building with thirty-four student stations. The media center has a smaller set of classroom computers and there is also a set of approximately fifteen wireless laptops equipped with a printer. (The number working on any given day is usually several less.) Access to these sources of technology is in high demand and issued on a first-come, first-served monthly basis.

I teach three mathematics courses at one of the high schools: Probability and Statistics (senior course), Integrated Math 3 (junior and senior course), and Algebra Concepts 2 (sophomore course). All of the students that I teach are not on the traditional college-bound track, although many aspire to attend some form of post-secondary institution upon graduation. Even though I am interested in the implications of this research for all of the courses I teach, or any math course for that matter, I have chosen to study my two Probability and Statistics courses. Below, I discuss the reasons for this choice.

Due to the widespread use of statistics across academic fields, colleges and universities are increasingly requiring a statistics course. In my school, Probability and Statistics is offered as an alternative for students who are not expected to succeed in Pre-Calculus or for students exiting the Integrated 3 course. Most of the course is spent studying statistics using a basic college statistics text. These students are often overwhelmed by, unprepared for, and bored by this formula and calculation-based statistics course. Uri Wilensky's (1996) article focuses on the implications of this subject material in today's stat-obsessed world. Wilensky writes,

Beyond ubiquity, the disciplines of probability and statistics have fundamentally changed the way we think about science and the way we think about our world. Yet, despite the rapid infiltration of probability and statistics into our science and media, there is substantial documentation of the widespread lack of understanding of the meaning of the statistics we encounter. (Wilensky, 1996, p. 269)

I designed this research project as part of an ongoing effort to try to lead students to a deeper understanding of the importance of statistics as a topic and of the individual statistical concepts.

I also chose to use my Probability and Statistics course because these students are seniors and I was confident that many or most of them had enough online experience to be comfortable with the “blogging” that this project requires. Lastly, because these students are seniors, I thought that having them do online course work would be good practice for their future college educations. Many of these students are quite comfortable interacting with peers in environments such as “My Space,” but are not proficient in interacting in a more academic context such as Blackboard forums.

I performed all Math Talk activities with both of my statistics courses. For this research I chose to focus on my 2nd hour class of thirty-one students. There are sixteen females and fifteen males in this class and all are seniors in high school. The students come from a wide variety of mathematical backgrounds. Many, but not all, have access to the internet at home. Those who do not have access at home have been encouraged to take advantage of the school library computers before and after school.

B. Description of Activities

1. Student Introduction to Math Talk (Questions 1 and 2)

Early this school year I added each student to the data base. I assigned logins using first initials and last names (Jane Doe’s login would be jdoe) and allowed the students to choose their own six character passwords. For this research, I used “Math Talk” in two ways within my classroom: 1) individual responses to my posted questions; and 2) students asking their own questions and in turn answering questions from other students. After discussing the design and

rationale behind Math Talk with the students in class, I initiated an introduction to Math Talk through two trial questions that I posted.

The intention was to introduce the students to Math Talk and at the same time insure that all logins, passwords, and the site were functional. Initially, some students had trouble finding time outside of class to get onto the site, so I decided that generous time deadlines would be necessary. I decided to generally assign a question mid-week with a Monday by midnight deadline. This gave the students time over the weekend to complete their post. Most of the students got into the habit of responding to Math Talk in a timely manner.

The 1st trial question was “What is statistics?” which prompted the students for a “right” answer. I asked the students to try to explain statistics in their own words and to avoid using the textbook definition. Since I had already introduced the topic of statistics to the class, I was expecting a specific set of “right” responses. The 2nd trial question was “Why is statistics important to you?” which prompted a wider range of answers, but the students were still responding as a student to a teacher prompted question. Although there was not necessarily a set of “right” responses to this question, the question did again prompt a “right” student-to-teacher response. There is no obvious prompt in the context of this question for students to pen responses that encourage student discussion, although I was hoping students would be more creative with their responses to this 2nd question compared to the 1st question.

2. Question 3

I was not satisfied with the responses to the 1st and 2nd Questions because they were neither *thought-provoking* nor did they demonstrate *deeper mathematical understanding*. Generally defined, I was looking for examples of mathematical knowledge or posts that promoted conversation among students and the large majority of posts accomplished neither. The previous terms will be fully described in the Method of Analysis section.

As a result, I decided to approach Math Talk differently for the 3rd question. I retained the format of a teacher-posted question that required an individual response, but the context was

one that I hoped would create a better “discussion” of statistics. “Find a stat. Give it here. Do you think the stat is accurate? Why or why not?” This assignment required some deeper thought on the part of the student and some real knowledge of what makes a statistic accurate. I hoped that students would find statistics of personal interest and write posts in a more student-to-student manner even though they knew I would also be reading their response.

3. Baseball Project

After the 3rd Question, the students had several more blog assignments that will not be analyzed here, but were similar in nature to the 3rd Question. The responses to these blogs increasingly demonstrated a thought-provoking nature and mathematical understanding, but not to an extent that made me optimistic as to the efficiency of Math Talk. I needed to find a way to get the students more involved in Math Talk as creators of their own learning. I also needed to heed Evard’s advice and find a topic that was of some type of personal importance to the students. To meet these two goals I, with the help of Professor Jeff Kupperman, designed a Baseball Project.

The students were presented with data on two baseball players and were asked a series of five questions about those two baseball players. (A copy of the student handout for this project is provided in Appendix D.) Although this topic may not be of “personal importance” to the students who could not care less about baseball, it certainly had the potential to be more appealing to those students than contemplating a series of made up textbook story problems. The key Math Talk ingredient in the Baseball Project was the Q & A forum. It was here that I hoped to meet my first goal in allowing the students to play a larger role in their learning process. The students were allowed to post any relevant questions in this forum and students who were knowledgeable about baseball were asked to be active participants in answering those questions.

Since their responses on the Q & A forum would not be graded by me, but were solely for the benefit of other students, I hoped the students would find this exercise academically challenging and beneficial.

C. Data

Over the course of the school year I asked the students to use Math Talk several times, and almost every time was assigned as homework. Questions 1 and 2 were assigned at the same time as homework, but each required a separate post. The students had from the Wednesday of one week until the next Monday at midnight to complete both posts. Question 3 was also assigned as homework and the students were given the same time frame as with Questions 1 and 2. For the Baseball Q & A, I went over the assignment in class prior to spending two class periods (approximately fifty minutes each) in the computer lab where the students could use a Q & A forum simultaneously.

Each assignment was answered by the majority of students in the class, but the actual number of responses varied for each question. The blogs for each of the four analyzed questions, in their original formatting, are provided in Appendices A, B, C, and E. Student names have been replaced with pseudonyms in all blogs that were signed. For Question 1, Question 2, and Question 3 there were thirty students enrolled in the class. There were thirty-one students enrolled in the class when they participated in the baseball project. For Question 1 there were twenty-five responses and none were excluded from the appendix. Question 2 had twenty-six responses and none were excluded from the appendix. There were twenty-six responses to Question 3 and I eliminated two responses from the appendix because they consisted of data copied from the internet and the formatting did not transfer correctly. In the Q & A forum there were seventy-one responses from twenty-eight different students. I deleted several inappropriate comments from the online database and omitted two student mistakes from the appendix.

D. Method of Analysis

Each Math Talk question had a set of criteria that needed to be met in order for the student to receive full credit for the blog response as an assignment. Those formal grading criteria are not what I wish to analyze for this project, however. In order to answer my research questions, I will examine the student blogs to see to what degree answers are thought-provoking

and lead the responding student and classmates to a deeper mathematical understanding. “Thought-provoking” responses should present information not already presented in the classroom, question the validity of another blog, pose a question, or present some type of controversial statement sure to spur conversation. In order to exhibit a “deeper mathematical understanding,” blog responses should apply mathematical concepts learned in class to blog responses. A student could demonstrate this by using a statistical term such as standard deviation or sample size to describe data. A student could also use commonplace terminology or a phrase does not include mathematics vocabulary, but demonstrates a mathematical foundation in its nature. Making connections between previously unlinked mathematical concepts could also demonstrate a deeper mathematical understanding.

Although I will not be using the techniques of Conversation Analysis formally in my analysis of student blogs, there are some general ideas of this technique that will factor into my examination. Conversation Analysis, commonly abbreviated CA, is the study of talk in interaction. CA generally attempts to describe the order, structure, and patterns of interactions in formal or casual conversation. I will be looking at how the students interact with each other and if the type of language they use in their blogs is conducive to interacting with fellow classmates. Ideally the posts will not simply be statements for me to read, but will demonstrate some qualities of conversation such as annoyance or agreement with a fellow student or enthusiasm concerning a specific topic.

I will also examine the actual participation levels to see if students who are not normally involved vocally in class feel more comfortable to express themselves here. To accomplish this, I will use my knowledge as the teacher of the class to compare in-class and online dynamics of individuals. I will also use my knowledge of individual achievement levels to evaluate the level of understanding.

IV. Analysis

A. Questions 1 and 2

As previously stated, the 1st Question prompted a “right” answer that the students knew would be read by their teacher. The students were also aware that they would be receiving homework credit for this assignment. For those reasons, the majority of blogs for the 1st question were “dictionary” responses. For example:

Statistics is the collection of data that is to be organized and interpreted. Brad

To me statistics is pretty much just collecting data from surveys, putting it in a chart or table, and drawing conclusions from the data you collected.

Ashley

Staticts is gathering data from an experiment and analyzing and using it to change the way something works. Carol

Statistics is the collection of data that is collected to be summarized and analyzed for graph or chart purposes. Debbie

None of the answers to the 1st question displayed a deeper mathematical understanding, nor were they thought-provoking. Although many students who are not normally vocally involved in class did post their responses here publicly, the low risk nature of the question negates the ability to evaluate comfort levels of those students.

For the sake of consistency, I have chosen to include examples from the same 4 students for the analysis of the 1st, 2nd, and 3rd Questions. Brad is an overall very high achieving student who is well respected among his peers. Ashley is a mid-achieving (C) student with an eccentric personality, and although she gets along well with her peers, is not necessarily outgoing by any means. Carol is a popular cheerleader and is also mid-achieving academically. Debbie is a high achieving student in mathematics, and although Debbie is not popular among her peers, she does

feel comfortable expressing her opinions in a large group format and often volunteers answer in class.

The 2nd Question “Why is statistics important to you?” gave the students more of an opportunity to express their opinions because there was a set of potential “right” answers to this question. A few students seemed to catch on to this idea:

Statistics is important to me because it enables me to review nfl stats and find out which player would be the best ones to put on my fantasy draft. Brad

Well statistics is NOT important to me because of sports, i dont even like sports. It is important to me because of the information I can learn from studies and research by looking at charts and graphs of data that help me prove or disprove my point. Plus I like knowing little tid bits of info like the U.S. is only 6% of the world's population, yet we have 50% of the planet's wealth. Nice Huh. Ashley

Brad’s response turns out to be thought-provoking as demonstrated by Ashley’s response based on his sports comment. Ashley’s response is also thought- provoking because it provides a statistic not previously discussed in class, but of potential interest to her peers. Ashley’s response also demonstrates some real mathematical understanding by mentioning that charts and graphs are part of what statistics is to her.

Both of these responses seem very honest and not necessarily written simply to please the teacher. We are able to catch a glimpse of each student’s personality by their response. High achieving Brad hopes statistics will benefit him in a non-academic setting. I was surprised at the candidness of Ashley’s blog. Although I had caught glimpses of this personality in one-on-one interactions with Ashley, I was surprised to see Ashley express herself so freely in Math Talk.

The majority of students, however, responded to the 2nd Question in a manner that indicated that they were concerned with what I thought of their response and not with the potentially thought-provoking nature of the assignment. For example,

Statistics are important to me because if I couldn't read a graph I wouldn't be able to pass certain parts of the ACT that will help me get into college. Carol

Statistics are important to me because they are there for future or current research I might want/ need to do. Debbie

Carol and Debbie both seem to respond directly to the teacher with their responses. Although other students may be able to relate to Carol's comment on graphs on the ACT, the comment is not necessarily new information and is therefore not necessarily thought-provoking or demonstrating any mathematical understanding.

Since the purpose of Math Talk is to get students talking about mathematical concepts and not simply regurgitating textbook information, I could tell from the blogs to the 1st and 2nd Questions that my approach to Math Talk would need to change. I would need to follow Evard's advice and choose questions that were of some type of personal importance to the student if I really wanted to get invested responses from the students.

B. Question 3

Keeping my newly attained insight in mind, I posted a 3rd question on Math Talk. Although this was still a teacher prompted question, I tried to encourage more student involvement by having the students find their own statistic to post and then commenting on that statistic. "Find a stat, Give it here, Do you think the stat is accurate? Why or why not?" Students did seem to jump right in to expressing a little bit of themselves here. There was an overabundance of copied and pasted online sports info, but I had some really political statements about underage drinking and drugs and poverty. There were also some popular culture responses from magazines and newspapers. Examples from the 4 sampled students follow:

In the Cosmopolitan magazine it says," Are guys less respectful and polite than they used to be?" 84% say yes and 16% say no. This poll was taken on the Cosmo web poll.

I don't think it is accurate because this poll is being taken by mostly girls who will say that men are impolite. Because it is mostly girls who read the magazine. Carol

This pop culture response assumes that girls that read the magazine think that men are less respectful and polite than they used to be. Even though this assumption may not be accurate, this student does demonstrate some deeper mathematical understanding by recognizing the fact that the polling audience for this question may not be unbiased. Her actual statistic has a thought-provoking nature by being potentially controversial to any male that feels that the statistic is biased or unfair.

From a telephone survey of 1,090 adults from across the United States conducted for President Nixon on April 1, 1971.

QUESTION: Do you think President Nixon should free Lt. William Calley, substantially reduce his sentence, or uphold his life imprisonment sentence (in connection with the My Lai incident)?

Free Lt. William Calley	51%
Substantially reduce his sentence	28%
Uphold his life imprisonment sentence	9%
No opinion	12%

Yea i think these stats are true because no one has nereason to lie about how they feel. The sample audience seems large enough and over a broad enough area as well.

Brad

This student was also able to demonstrate some statistical knowledge by talking about the sample size and area. The student also mentions that he thinks the results would be accurate because the subjects have no reason to lie.

between 1970 and 1996, crimes committed by men grew by 57%.

Source- Criminology Text Book

I think it is accurate because it came from the text book and the information has to be right in a text book. Debbie

This student does not seem to put much thought into the assignment. She simply assumes that all textbooks must present correct information. This response is neither thought-provoking, nor does it present any true mathematical understanding.

There is a significantly higher incidence rate of Parkinson's disease found among men with the relative risk being 1.5 times greater in men than women. This statistic was found at

<http://jnnp.bmjournals.com/cgi/content/full/75/4/637>

I do believe this statistic is accurate because it was performed in seven studies around the globe, and each study met the inclusion criteria.

~Ashley~

This student is also able to refer to what she has learned about sample size and area, but also mentions that the study meets “inclusion criteria” that she does not describe here. It is unclear if the student determined that all of the studies met such “inclusion criteria” or if the site where this statistic was found provided that statement. It does show that this student knew enough about statistics to think that this characteristic was mathematically important.

I was much happier with the responses to the 3rd question; I thought the students did really well with this assignment. I believe they got a chance to express their personalities and perhaps responded more thoughtfully online knowing that other students were going to be reading their blog instead of just the teacher reading a paper assignment. In order to encourage this successful use of Math Talk, I decided that it would be a great idea to print out some of the Math Talk responses from both classes and discuss them as a whole class.

As a class, we discussed the positive qualities of each blog. The students were quick to point out the negative qualities as well, as the students themselves are most often their own

harshest critics, but I reminded them that the point of this exercise was to learn some interesting statistics and discuss what could potentially make those statistics valid or invalid. The students in either of the two classes do not have access to responses from the other class, so this gave them a chance to see how students in the other class were using Math Talk and the type of responses they were giving. I hoped that the students who were excelling at this type of interaction would set a good example for those who were still struggling with the blogging activities.

C. Baseball Project

After several more teacher-posted questions with opinion-based answers, I again wanted to try a new approach to Math Talk. The students were given the opportunity to ask questions that would help them answer questions on the Baseball Project. They would also be responsible for answering questions of other students when possible. The Q & A forum was set up in almost a chat room format and the students seemed very comfortable interjecting questions to other students, as well as answering questions.

Although several students showed a general lack of interest in participating, several other students became standouts in helping other students who were struggling with the material. The students that emerged as experts on the topic sat at their computers and refreshed on a regular basis while waiting for new questions to appear. Students with very little or absolutely no baseball knowledge responded well to their helpful advice and continued to post questions. The students asked questions that ran along the threads of the 5 questions that were posed as part of the project.

One of the questions that I posed to the students was “Which player better earned their salary in 2005?” Following are some of the related blogs.

Does A-Rod just get paid more bc he's older and has
played longer? Tracy

This student demonstrates mathematical understanding by analyzing the data she’s been given and understanding that the player that has played much longer also makes more money. Her

question is thought-provoking because it questions the concept that longevity should be rewarded with higher pay.

Why did A-Rod make less money in 2006 than in 2005?-April

This student poses a generic question, but it proves to be thought-provoking as demonstrated by the by the following two responses.

A-Rod made less money in 06 because he is a wash up and there are better players than him that are out there now John

maybe the reason that A Rod made less money in 2006 was maybe because he had a bad year and they didnt want to offer him as much money if he wasnt playing good -Tiff

The first response interjects this student's personal opinion of the player but shows mathematical understanding of the change in the data and contributing factors in the baseball world. The second response seems to confirm the more opinionated student.

Although none of these responses gives away a clear answer to actual project question, these blogs do display an interest in creating conversation on the topic. One of the players made exponentially more than the other in 2005, but the students seem to be examining factors outside of just that single year to explain the immense wage discrepancy between the two players.

Two interconnected questions that I asked the students were "Who was actually the best in 2005?" and "Who's been better over the last 6 years?" The blogs for these two questions were intertwined since the general topic is really the same for both questions. The blogs start with a general plea from a baseball novice, but this student is also very comfortable expressing herself in-class and previously on Math Talk:

So all you baseball guys who is the better of the two? cuz i don't really know anything about pro baseball

This blog was followed by another plea for help, also from another baseball novice, but this student was a normally shy student not excelling in the course.

how do you know whos better over the last 6 years when the one only played 6 seasons? Stacy

Although this student is a baseball novice, her question demonstrates some mathematical understanding because she has noticed that one of the players has played for ten years and the other has only played for six. There were several blogs in response to these two pleas and other following questions. Some examples of the response blogs follow.

looking at both of their stats, they're both really good, but Albert Pujols has way less experience, yet his averages are just as good, if not better, than A-Rod's. I'm kind of on the fence on this one, but I think I'm gonna have to go with Pujols. kaitlyn

Pujols, "the machine" dominates over little a-rod. His stats for the last 6 years are better than rodriguez's first or last six, not metion his overall BA, H, SLG, FP are all better. the only thing alex beats him in is errors.

does anyone know who has a better batting all together, because like one season or year someone else is better than the other one...so if you could help that would be great!!!! Amy

How do you compare the two when pujols hasn't played as much as Rodriguez? Rodriguez has a good 7 years on pujols, he has had longer to get good. Owen.

Pujols averaged a higher batting average and RBI for his career than A-rod did. Thats all i felt like averaging out yesterday but i think that is the essence of batting right there. steven

Its hard to compare the two players because one has been playing for six years and the other for twelve years. Pujols stats are better but he doesnt have as many years to average out while A-rod has alot more. Kevin

Bryce, just compare pujols' six years with a-rods first six years.....DUH steven

Albert Pujols has a better batting average and rbi's than A-rod, therefore making him a better player.-Erin

The shier baseball novice seems to have developed an understanding from her classmates' responses and responds by blogging:

albert pujols numbers are better. their higher then alex rodriguez's so thats means something right? stacy

There were also many more excellent questions and responses during the Q & A forum that will not be analyzed here, but are available for examination in Appendix E. I was very happy with the interaction between students. They were generally very respectful of each other's opinions and really seemed to enjoy participating in this online conversation with their peers. I saw many great examples of mathematical understanding and thought-provoking questions and answers. Some students that were baseball novices seemed overwhelmed going into the project but appeared more comfortable with their ability to answer their project questions by the time class participation in the Q & A had ended.

V. Conclusions

A. Overall Feelings

I was very happy with the overall results of using Math Talk in my Probability and Statistics course this year. It is important to note that any conclusions that are made here not be overextended to any other forms of online learning. This study was done specifically with senior level Probability and Statistic students in my own classroom. Some students benefited and some did not and I can hypothesize as to the causes, but that is beyond the scope of this study.

B. Answers to Research Questions

Within the framework of this research and by gathering information from literature, I will present an answer to each of my aforementioned research questions.

- Will having mathematical discussions prove important to the learning process?

My data are inconclusive on this score: I am not really sure that my in-class Math Talk research leads to a definite conclusion for this question. Although the students seemed engaged when there was a lively discussion about mathematical topics, it is hard to measure the

importance of this aspect in their learning process. In the directions for further research section of this paper, I discuss further research that could be attempted to solve this problem.

- When is Math Talk productive in creating good math discussion and deeper understanding?

The answer to this question is demonstrated by the evolution of my own use of Math Talk. Math Talk was not useful in this context when utilized for questions with a single “right” answer, such as Questions 1 and 2. Math Talk did seem to encourage deeper mathematical understanding when the students were asked to respond to a question, such as Question 3, that required some actual thought on the part of the individual student in order to post a suitable response. These responses were often thought-provoking to classmates and created a good math discussion.

- Can allowing students to post their own questions on Math Talk and subsequently answer those of fellow students affect the quality of their postings?

Math Talk is able to demonstrate that when the students were allowed to ask and answer their own questions in the Q & A forum, the students seemed to be more engaged and invested in the type of discussion that occurred when compared to the responses from Questions 1 and 2. In the Q & A forum, some students genuinely needed a lot of assistance and their personal interest in acquiring information encouraged those students to post lots of inquiries. Knowledgeable students felt “important” by being able to assist their fellow students and did an excellent job of providing helpful information. The students also seemed to progress to asking more specific questions when necessary to get a better answer. Student questions also demonstrated a thought provoking nature exemplified by the many satellite questions that developed from just one main question.

The quality of the postings when the students were asked to choose their own stat and comment on it in Question 3 also seemed much improved compared to Questions 1 and 2. Hence, it may not be as necessary for the students to actually post their own questions, as it is

necessary that the nature of the Math Talk assignment introduces a sense of personal interest or ownership for the students. The students were responsible for finding their own statistic and then backing up their opinion on that stat in Question 3. This sense of ownership seems to have had the same effect as being able to post their own questions in the Q & A forum.

- Can an online environment enable students that are timid in class to feel more comfortable expressing their ideas and opinions in an online environment?

Solid conclusions for this question are more difficult to confirm. Most of the students that do not actively participate in in-class discussions on a regular basis generally participated in Math Talk. It could indeed be the technological medium that allowed them to be more involved, but there are several other contributing factors to their involvement. The students were receiving assignment credit for each Math Talk post and that could be enough encouragement in itself. Generally, the students were not required to sign their posts if they preferred to remain anonymous, so they could have felt more comfortable to freely express their opinions as an unknown classmate. It may have been the topics of the individual questions or the freedom the project inherently held. The “on-the-spot” factor may have also played a role. Students may be more reluctant to volunteer to respond in an on-the-spot class discussion situation. It may not be possible for many students to feel confident in when compelled to give an immediate answer. Having several days to respond to an online question and read other classmates answers prior to responding could affect the timidness of a student. I do, however, feel that this method was successful in getting some of the seemingly more timid students to express their opinions to classmates, but ideas on how to analyze the effectiveness of this technology for that purpose will be discussed in the directions for further research section.

VI. Discussion

A. Limitations

Since this research was conducted in a limited environment, the results cannot be generalized to other teachers and classrooms. The class that I used for this research was my largest this year. Due to class size, it is more possible to have students that become wallflowers in the classroom and appear to be uninvolved. Therefore, the comparison between in-class involvement and online involvement for those students may be exaggerated. There are also several students in this class that I have for the 2nd year in a row. My prior establishment of rapport with these students could have changed the dynamic of in-class discussions and the comfort level students felt while writing blogs. In situations with limited access to technology, creating an experiment similar to the Q & A forum I was able to run with the baseball project may not be possible in the sense that this was an anonymous, whole class discussion. Although this could be done as an in-class discussion as a whole class or in smaller groups, the results would depend on the makeup of each small group and how comfortable students felt with expressing their opinions vocally in a non-anonymous environment.

B. Implications

If using this type of technology does indeed help students to better grasp mathematical concepts, then I would hope that its usage would increase in all classrooms. The State of Michigan is currently mandating that all school districts rely on the same curriculum for their students and in creating this incredible challenge in an enormous amount of classrooms across the state, increased research must be done on alternative methods of instruction.

C. Directions for further research

In order for this research to be more generally applicable, I would suggest that the concept be extended and be experimented with across the curriculum. Perhaps students in English class that have never before shared their ideas would feel free to share in an anonymous environment. Maybe an enthusiastic science student could share his passion for a particular

subject area. Currently, Math Talk's co-creator, Carmen Woodruff is using Math Talk periodically in her 6th grade classroom during math lessons. I would like to see Math Talk used not only for a variety of age levels in the field of mathematics, but also for a wide variety of math courses.

In reference to my first research question "Will having mathematical discussions prove important to the learning process?" I would suggest that Math Talk be used on a frequent basis for the duration of a specific topic or unit. Perhaps the unit could be started without Math Talk and then introduced partway through the unit. If improvements are clearly demonstrated in the results of formal or informal assessments, then Math Talk would prove to be useful in this context. If a teacher had a situation where Math Talk could be used in an experimental and a control group, quantitative differences in final comprehension could be compared.

In reference to my last research question, "Can an online environment enable students that are timid in class to feel more comfortable expressing their ideas and opinions in an online environment?" quantitative data would need to be collected for a sample of students that fit into that category. Several uses of Math Talk would need to be run in order to get any conclusive evidence. Class discussions with similar course material would need to be held in-class as well in order to compare student participation. Using Math Talk with and without the anonymous option may be needed to see if the anonymity is a contributing factor.

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VIII. Appendices

A. Appendix A

Question posted on Tuesday, September 05, 2006 at 07:10:20

Question 1

What is Statistics?

Student Blogs for Question 1

Statistics is when you take something for instance sports you can log data in sequences or time intervals. Or the collection of data in quantitative form. Jennifer

Statistics is the collection of data that is to be organized and interpreted. Brad

To me statistics is pretty much just collecting data from surveys, putting it in a chart or table, and drawing conclusions from the data you collected. Ashley
drawing conclusions from your collected data by analyzing, organizing, and summarizing
April

Statistics is the collection of data that is collected to be summarized and analyzed for graph or chart purposes. Debbie

Statistic to me is collecting data that you have just recorded and putting it together either in a chart or a graph -Tiffany

Statistics is pretty much collecting data from something and recording that data on a graph or a chart. -Kaylee

I think statistics includes collecting data, organizing it, and applying it to the population.

I think statistics includes data collection, organizing it, and applying it to the population.
Brienne

think statistics is the collection of data and then to draw a conclusion from what you researched Darren

Statics is the process of collecting data on a subject or an experiment and then recording, analyzing, summarizing, and then presenting your data. Sabrina

Statists is gathering data from an experiment and analyzing and using it to change the way something works. Carol

After acquiring the data I believe representing that data shows statistics Owen

To me statistics is the gathering of data and aplying it into an organized value. Dennis

Statistic is getting information from surveys or anything and putting into graphs or tables. Getting information and organizing the data. Becky

Statistics is any data gather or collected, then organized to be put into charts or graphs to be presented or adversed for other people. Tracy

Statistics is when you have a graph that has information in it. The information is usually based on a certain subject like for example sports. You use the graph to get batting averages if you were looking at a graph of Baseball. Shelly

To me, statistics is the collection of data that is used in an equation or a problem. Wyatt

Statistics are useless facts used to either make a performance or a product look good or bad. They can be shown in either a graph or table, and can be about anything from sports players to laundry detergent, overall they are useless facts that are just for show. Steven

In my personal opinion i would venture to say statistics would be the mathmatical science pertaining to the collection, anazlyzing, interperation, and presentation of data.... Luke

statistics are gathering data to show people information; however most of the time they are changed to effect peoples views on the expeiements so therefore dont belive any statsistics Elijah

Statistics are a collection of data obtained by doing a study and are organized into some sort of graph. In most cases the statistics are misleading preventing the consumer from seeing said data for what it is. Statistics is the process of collecting data and presenting it to prove a point. keith

Statistics to me is when you take an event say sports and you record all the data that you collected from the game. you organize it into a graph and you make a point. Amy

Statistics is idea of gathering information that is to be displayed later on in an orgnaized and understandable manner.

Statistics is where you take data and then make a graph or table or somethng to make it easier to understand. ♥ Todd

B. Appendix B

Question posted on Thursday, September 07, 2006 at 11:25:30

Question 2

Why is statistics important to you?

Students Blogs for Question 2

Statistics is important to me because, well I'm in track and I can gather my time records and see the sequence in which the times I ran. It is also important to me because on the news they give you information on for instance the deaths of our boys over in Iraq. They give you numbers of the range. So i guess those are ways statistics are important to me

Statistics is important to me because it enables me to review nfl stats and find out which player would be the best ones to put on my fantasy draft. Brad

Well statistics is NOT important to me because of sports, i dont even like sports. It is important to me because of the information I can learn from studies and research by looking at charts and graphs of data that help me prove or disprove my point. Plus I like knowing little tid bits of info like the U.S. is only 6% of the world's population, yet we have 50% of the planet's wealth. Nice Huh. ~Ashley~

Statistics is important to me because it can help me figure out things i need to know quickly and accurately.

Statistics are important to me because they are there for future or current research i might want/ need to do. Debbie

Statistics is important to me because it can help me figure out things i need to know quickly and accurately. April

I think that i will need statistics beause the firld that i am interested in will probally have to do something with statistics -Tiffany

Well i guess statistics are important because it important to know how to look at a graph and know how to read it. Not to mention math is a good thing to learn so that you can figure things out quicker and more accurately. -Kaylee

Statistics is important to me because I will need to use it in college and later in life. Statistics is probably the only math class that I will actually use the mathematical procedures from, outside of the classroom. Brianne

Statistics is important to me because I will probably use it almost every day in my life.
Darren

Statistics is important to me because I plan on going to college and then pursuing a career in business and I will need to look at charts and data collections to see how my business is doing compared to my competition. Sabrina

Statistics are important to me because if I couldn't read a graph I wouldn't be able to pass certain parts of the ACT that will help me get into college.
Carol

I use statistics to help me acquire more and better knowledge. It helps to increase the accuracy of my personal data. Owen

Statistics is important to me because it teaches me how statistics are used in the media, business, and political fields. Dennis

Statistics are important to me because when I have a good volleyball game it's cool to have my stats in the paper. Becky

Statistics is important to be because it's an easy way of gathering or learning information. Also it is often used in many careers in some way or another. Tracy

Statistics are important to me because if I didn't know how to read them then I won't be a very good teacher when I have to teach this to my class in the future. Plus I probably wouldn't do very good in my math course in college if I didn't know what it meant. Shelly

Statistics is important to me for if I ever want to gamble and win some money. It also gives me a better understanding of the economy and surprisingly how a lot of media works. Wyatt

Well, since we just learned how statistics can be misleading, I think they are not important to me. I used to look at statistics as a tool to help me decide whether or not to buy or use a product or to do anything at all, thanks to Mrs

Mattila, i cannot trust anything or anyone, thanks Mrs. Mattila.....thats how statistics are important to me Steven

statistics are not important to me when i am looking to find out information about certain products even though they are all false, so they arent useful, and mean nothing to me.

Elijah

I can use statistics to better understand data as well as make informed decisions; however ever many faulty statistics may be out there i belive there is still some good in the world and sift through the bad ones to find the good ones which in turn, help me become a much better person/consumer. Luke

Statistics are important to me because I plan on going into teaching, and I need statistics to show the number of jobs that will be open to me in each given area at the time of college graduation. Steven

I have found statistics to be not very important to me in my life.However i do find that looking at them can be interesting and surprising sometimes.if I think some statistics are true I may use them to help make a decision. keith

I feel that statistics is important to me because i wouldn't know how to do the things i do now with my life.. Amy

I need statistics to make good decisions in my life, such as deciding which subdivision would statistically pay me more for mowing their lawns.

Statistics is important to me because it is yet another field of mathamatics that challenges me to learn and expand my knowledge. i love to learn ♥ Todd

C. Appendix C

Question posted on Friday, September 15, 2006 at 10:43:01

Question 3

Find a stat in some source other than your math book: an article, newspaper, magazine, science book.....

Write the stat here and give the source. If this stat gave a source for the stat please give that info.

Do you think this stat is accurate? Why or why not?

Student Blogs to Question 3

In the Cosmopolitan magazine it says, " Are guys less respectful and polite than they used to be?" 84% say yes and 16% say no. This poll was taken on the Cosmo web poll.

I don't think it is accurate because this poll is being taken by mostly girls who will say that men are impolite. Because it is mostly girls who read the magazine.
Carol

a survey on the affects of, Does heavy metal lead to aggresion in college students? On <http://www.clearinghouse.missouriwestern.edu/manuscripts/194/asp>

this article states that out of 32 participants 28 female and 4 male took a survey while listening to heavy metal music will score higher than people not listening to heavy metal.

The results: poeple not listening; mean=48.0

music group: 45.9

this isn't a significant difference between the two.

I belive this survey isn't true because i listen to heavy metal and i dont have aggressive behavior. Aggression really doesnt have to do with anything. They needed to have a more wide range of people, niot all females,and theymight need more people to give a more through job!

Some 20% of type two diabetes is linked to one gene.-Reader's Digest June 2006.- I do believe this is accurate because it would benefit the magazine in no way to give you misleading information. keith

In a poll on how well do you think President Bush is doing his job at the washingtonpost.com 52% said they disapprove 47% said they approve and 1% said they have no opinion. I believe this is true statistics because of alot of bush bashing I've been hearing from adults. Owen

President bush's job approval.

rcp average-

approve: 40.1%

disapprove:54.7%

spread:14.6% -Real clear politics- 9/14/06

i think the the statistics are true because its from a good source, and its a true avrg. Dennis

In last weeks People magazine one of the polls that they had was, Who is handling her breakup the best?

Christie Brinkley 34%

Heather Locklear 33%

Kate Hudson 32%

Heather Mills 1%

I think that this could be true but i dont really understand how the public can judge who is handling there break up the best because know one really knows what those girls are going through and what they think other then themseleves.

-Tiffany

Lapeer Community Schools Counseling Department packet. (Packet that was handed to all seniors by the counselors about colleges)

*Survey on what college admissions officials consider most important for admitting students:

85% Academic Record

8% Class Rank

7% ACT/SAT Scores

1% Essay

.1% School Recommendations

I think this survey is true because college officials must have some sort of requirements to look at while accepting and denying applications.

In June 2005 Cosmo magazine, it said that 97% of people hire wedding planners to make all the plans for their wedding. I dont think that is true because of all the people that i know that have been married, not one has hired a wedding planner for their wedding so it doesnt seem all that common. Tracy

In 1996 persons age 65 and over accounted for less than 1% of arrests. Source- Criminology Text Book

I think it is accurate because most people over 65 cannot move very well or do anything wrong and it is a text book so it should all be right.

between 1970 and 1996, crimes committed by men grew by 57%. Source- Criminology Text Book

I think it is accurate because it came from the text book and the information has to be right in a text book.

PASSING	Cmp	Att	Pct	Yds	Yd/A	TD	Int	Rating
<u>Chad Henne</u>	34	63	54.0	468	7.4	5	1	139.4
<u>Jason Forcier</u>	2	2	100.0	21	10.5	0	0	188.2

i think that these stats are corrected because they are official stats.

In Globe (September 2006) on a weight loss pill called ZoPlex, it said that 77% of test subjects lost weight using the product.

I don't think this is right because people who take pills to loose weight don't want to exercise all the time, so how could they loose weight when half of them don't exercise.

Amy

The October issue of Glamour magazine did a study on "How normal are your shopping habits?" 88% of young women buy clothing in any given month. 30 is the average minutes women spend shopping every day. 33% of women's purchases are impulse buying. The average number of shoes a women owns is 30. 75% of women will buy another pair this month. 58% of women would prefer a shopping spree over a night with the man of their dream.

Yes I believe this accurate because I'm pretty sure that I spend that amount of money and time shopping.

From a telephone survey of 1,090 adults from across the United States conducted for President Nixon on April 1, 1971.

QUESTION: Do you think President Nixon should free Lt. William Calley, substantially reduce his sentence, or uphold his life imprisonment sentence (in connection with the My Lai incident)?

Free Lt. William Calley	51%
Substantially reduce his sentence	28%
Uphold his life imprisonment sentence	9%
No opinion	12%

Yea i think these stats are true because no one has nereason to lie about how they feel. The sample audience seems large enough and over a broad enough area as well.

Brad

Drinking Prevalence Among Eighth, Tenth, and Twelfth Graders

Prevalence	8th Graders	10th Graders	12th Graders
Lifetime	47.0	66.9	78.4
Last 30 days	19.6	35.4	48.6
Heavy Drinking*	12.4	22.4	28.6

I Agree with these stats. I because it is evident by all of the newsreports and throughout the community as well as the world in a list of problems. www.ccn.com

Most teen driver deaths due to motor vehicle accidents occur on weekends 53% of the time.

I agree because there are more teens going to partys and other events on weekends than on weekdays causing more accidents during the weekend.

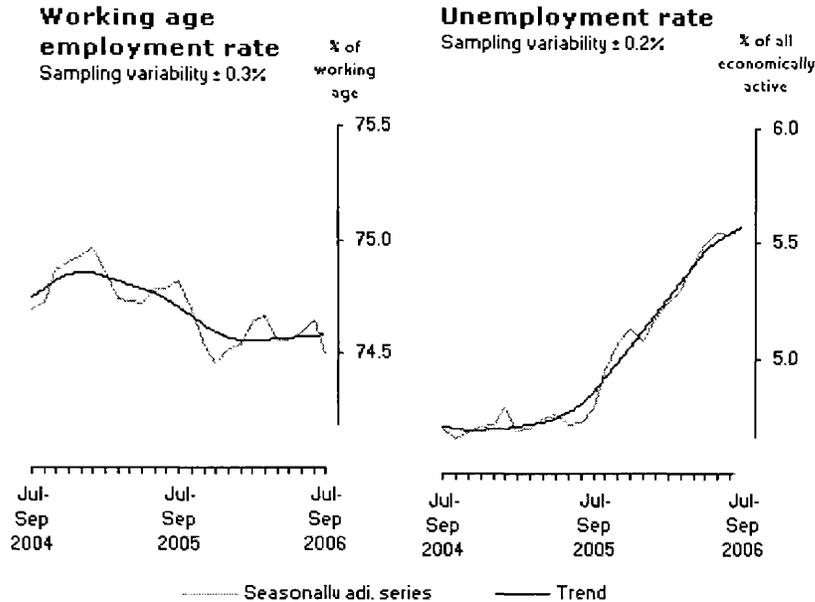
www.drivehomesafe.com elijah

According to the Bureau of Justice Statistics, homicide rates recently declined to levels last seen before 1970. The homicide rate doubled from the mid 1960's to the late 1970's. In 1980, it peaked at 10.2 per 100,000 population and subsequently fell off to 7.9 per 100,000 in 1985. It rose again in the late 1980's and early 1990's to a peak of 9.8 per 100,000 in 1991. Since then, the rate has declined, reaching 6.8 per 100,000 by 1997.

I believe these stats are true because they are taken by the government and cover a wide range of areas and people. John

Employment

Rate falls to 74.6% in 3 months to July 2006



Source: Office for National Statistics

I think the statistics are accurate but I think that they used a very small sample.

There is a significantly higher incidence rate of Parkinson's disease found among men with the relative risk being 1.5 times greater in men than women. This statistic was found at <http://jnnp.bmjournals.com/cgi/content/full/75/4/637>

I do believe this statistic is accurate because it was performed in seven studies around the globe, and each study met the inclusion criteria. ~Ashley~

Percent of Students Reporting Drug Use, 1999–2003

	1999	2001	2003
Lifetime marijuana	47.2%	42.4%	40.2%
Current marijuana	26.7	23.9	22.4
Lifetime	9.5	9.4	8.7

cocaine			
Current cocaine	4.0	4.2	4.1
Lifetime inhalant	14.6	14.7	12.1
Current inhalant	4.2	4.7	3.9
Lifetime heroin	2.4	3.1	3.3
Lifetime metham.	9.1	9.8	7.6
Lifetime MDMA	na	na	11.1

According to the 2003 National Survey on Drug Use and Health, youths who participated in activities during the past year were less likely to have used drugs in the past month than youths who did not participate in activities. Among youths aged 12 to 17 who participated in two or more youth activities (for example, band, sports, student government, or dance lessons), 10.4% had used an illicit drug in the past month. Among youths indicating one or no youth activities in the past year, 17.9% reported past month illicit drug use.⁶

I think these stats are true because if you participate in sports, band, ect. then you have less free time on your hands and you are more likely to stay out of trouble and you will have more motivation and a reason to turn down drugs rather than to give into peer pressure. :)

Dean.....<http://www.whitehousedrugpolicy.gov/drugfact/juveniles/index.html>

In the magazine guitar world, it states that 45% of professional guitar players play Ibanez guitars more than any other guitar. (August 2006) I do not think that this is very accurate because of the fact that they dont say how large or how small their sample group was.

in a Michigan out of doors magazine, a fishing lure company stated that their new lure catches 25% more fish than a variety of others. I don't think this is a accurate stat because the lure doesn't have everything to do with how many fish you catch it is also experience and skill. Steven

n 2005, only 4 states had obesity prevalence rates less than 20 percent, while 17 states had prevalence rates equal to or greater than 25 percent, with 3 of those having prevalences equal to or greater than 30 percent (Louisiana, Mississippi, and West Virginia). <http://www.cdc.gov/nccdphp/dnpa/obesity/trend/maps/>

I believe this stat is true because with all the unhealthy fastfood chains in america its easy to believe that we have people who are obese.

**Some 20% of type two diabetes is linked to one gene.-Reader's Digest June 2006.- I do believe this is accurate because it would benefit the magazine in no way to give you misleading information.
Todd**

D. Appendix D

Probability and Statistics Baseball Project

You've been provided with a large amount of data on 2 baseball players: Alex Rodriguez from the American League and Albert Pujols from the National League. These 2 players were each voted MVP for 2005.

You will have several goals:

- ↘ Answering the following questions:
 - Which player better earned their salary in 2005?
 - Who was actually the best in 2005?
 - Who's been better over the last 6 years?
 - Who's improved the most over time?
 - Who's the most consistent?

- ↘ Helping other students and/or receiving help by using Math Talk throughout your entire project.
 - Q & A Forum- here you can ask/answer questions from fellow students about the player's statistics, which stats to look at to answer each question, other student's opinions on the questions. In this forum, please give your name on each question/answer.
 - Answer Forums- your project results will have to be "formally" turned in as follows below, but there will be a forum for each question to poll how many votes each player is getting.

"Formal" Report Requirements

On Monday, November 13th, 2006, you will need to turn in answers to each of the 5 questions listed above. Each answer must be backed up with statistical evidence and an explanation of why you chose to analyze specific sets of data. I will be looking for use of measures of central tendency (mean, median,...) and measures of variation (standard deviation, ...). You may want to link questions if their answers are similar or based on one another.

This does not need to be typed, but it can be.

E. Appendix E

Question posted on Monday, November 06, 2006 at 08:06:00

Q & A Forum

Here you can ask/answer questions from fellow students about the player's statistics, which stats to look at to answer a particular question, other student's opinions on the questions,... In this forum, please give your name on each question/answer.

Student Blogs in Q & A Forum

So all you baseball guys who is the better of the two? cuz i don't really know anything about pro baseball

What does rbi stand for?

R= runs

H=homers

what is post season batting?

What are the most important numbers to look at because i hate baseball so i dont know anything about it.?

What does sb stand for?

what is G?

what does SB, CS, BB, SO, OBP, SLG, TB, SH, SF, PO, A, E, DP, FP, GS, and HBP mean??????david h

What does CS mean?

What do LG, G, AB, R, H, 2B, 3B, SB, CS, BB, SO, OBP, SLG, TB, SH, SF, IBE mean????

I think G stands for how many games they have played Becky

what do PA, RC, RC/27, *lgBA, *lgOBP, *lgSLP, *lgOPS, AND *OPS+ mean? Brianne

Pujols in my opinion, hes had six unbelievable seasons Wyatt

how do you know whos better over the last 6 years when the one only played 6 seasons?Stacy

h=hits hr=homerumesBrad

Post season batting is how they did in the playoffs-Wyatt

Alexander Emanuel Rodriguez is the greatist baseball player ever to play. i agree that Jose Albert Pujols is a good player but the claim that he is better than Alexander Emanuel Rodriguez is not valid. Jose albert Pujols may become a great player but only time will tell. ♡ LOVE Todd

Albert Pujols improved more over time right? Stacy

RBI stands for RUns Batted IN. websters dictionary will verify my definition ♡ LOVE Todd

Hitting Stats

2B - Doubles

3B - Triples

AB - At Bats

AB/GIDP - At-Bats per Grounded Into

Double Play

AB/HR - At-Bats per Home Run

AB/RBI - At-Bats per Runs Batted In

AO - Fly Outs

AVG - Batting Average

BB - Bases on Balls (Walks)

CS - Caught Stealing

G - Games Played

GIDP - Ground into Double Plays

GO - Ground Outs

GO/AO - Ground Outs/Fly Outs

Pitching

AO - Fly Outs

APP - Appearances

AVG - Opponents Batting Average

BB - Bases on Balls (Walks)

BB/9 - Walks per Nine Innings

BF - Batters Faced

BK - Balks

CG - Complete Games

CGL - Complete Game Losses

CS - Caught Stealing

ER - Earned Runs

ERA - Earned Run Average

G - Games Played

GF - Games Finished

GIDP - Grounded Into Double Plays

<u>GSH</u> - Grand Slam Home Runs	<u>GO</u> - Ground Outs
<u>H</u> - Hits	<u>GO/AO</u> - Ground Outs/ Fly Outs Ratio
<u>HBP</u> - Hit by Pitch	<u>GS</u> - Games Started
<u>HR</u> - Home Runs	<u>GSH</u> - Grand Slams
<u>IBB</u> - Intentional Walks	<u>H</u> - Hits
<u>LIPS</u> - Late Inning Pressure Situations	<u>H/9</u> - Hits per Nine Innings
<u>LOB</u> - Left On Base	<u>HB</u> - Hit Batsmen
<u>NP</u> - Number of Pitches	<u>HLD</u> - Hold
<u>OBP</u> - On-base Percentage	<u>HR</u> - Home Runs
<u>OPS</u> - On-base Plus Slugging Percentage	<u>I/GS</u> - Innings Per Games Started
<u>PA/SO</u> - Plate Appearances per Strikeout	<u>IBB</u> - Intentional Walks
<u>R</u> - Runs Scored	<u>IP</u> - Innings Pitched
<u>RBI</u> - Runs Batted In	<u>IRA</u> - Inherited Runs Allowed
<u>SAC</u> - Sacrifice Bunts	<u>K/9</u> - Strikeouts per Nine Innings
<u>SB%</u> - Stolen Base Percentage	<u>K/BB</u> - Strikeout/Walk Ratio
<u>SB</u> - Stolen Bases	<u>L</u> - Losses
<u>SF</u> - Sacrifice Flies	<u>LIPS</u> - Late Inning Pressure Situations
<u>SLG</u> - Slugging Percentage	<u>LOB</u> - Left on Base
<u>SO</u> - Strikeouts	<u>MB/9</u> - Baserunners per 9 Innings
<u>TB</u> - Total Bases	<u>NP</u> - Number of Pitches Thrown
<u>TP</u> - Triple Play	<u>OBA</u> - On-base Against
<u>TPA</u> - Total Plate Appearances	<u>PA</u> - Plate Appearances
<u>XBH</u> - Extra Base Hits	<u>P/GS</u> - Pitches per Start
Fielding	<u>P/IP</u> - Pitches per Innings Pitched
<u>A</u> - Assists	<u>PK</u> - Pick-offs
<u>CS</u> - Caught Stealing	<u>R</u> - Runs
<u>DER</u> - Defensive Efficiency Rating	<u>RW</u> - Relief Wins
<u>DP</u> - Double Plays	<u>SB</u> - Stolen Bases
<u>E</u> - Errors	<u>SHO</u> - Shutouts
<u>FPCT</u> - Fielding Percentage	<u>SLG</u> - Slugging Percentage Allowed
<u>G</u> - Games Played	<u>SO</u> - Strikeouts
<u>INN</u> - Innings Played	<u>SV</u> - Saves
<u>OFA</u> - Outfield Assists	<u>SVO</u> - Save Opportunities
<u>PB</u> - Passed Balls	

PO - Putouts

RF - Range Factor

SB - Stolen Bases (allowed)

TC - Total Chances

TP - Triple Plays

TB - Total Bases

TP - Triple Plays

UR - Unearned Runs

W - Wins

WHIP - Walks + Hits/Innings Pitched

WP - Wild Pitches

WPCT - Winning Percentage

XBA - Extra Base Hits Allowed

Dean

RBI's are runners batted in. Brianne

What does SB and CS mean? Becky

In the long run A-Rod improved way more-Wyatt

I think the fact that Alexander Emanuel Rodriguez has had more post season experience proves that he is Jose Albert Pujols' better, not only on the field but off. Who ever disagrees knows nothing LOVE Todd

Are hits better than runs? Jennifer

Albert Pujols makes way less cash then a-rod per year so he is obviously ballin love Dean

who would be more consistant Pujols or Rodriquez? stacy

I thought runs are better, because those are points scored. Hits are just hitting the ball, not actually scoring a point. Brianne

looking at both of their stats, they're both really good, but Albert Pujols has way less experience, yet his averages are just as good, if not better, than A-Rod's. I'm kind of on the fence on this one, but I think I'm gonna have to go with Pujols. kaitlyn

Pujols was definatly more consistent Wyatt

I think that rodriguez is way over- payed and no one can actually earn that high of a salary. Keith

what fielding position do each of them play?? brad

Pujols is an unbelievable player, but Rodriguez is a little better.... a little

Alex Emanuel Rodriguez plays short stop while Jose Albert Pujols plays first base. this makes it hard to compare fielding stats since Alexander emanuel RODriguez has more opportunities to make errors. Alexander Emanuel RODriguez has also been consistant for more years than Jose Albert PUjols. ♡ LOVE TODD

Does A-Rod just get paid more bc he's older and has played longer? Tracy

alex rodriguez has a .359 batting average while albert only has a high of .358 ♡ dean

I totally agree with Mark. 🙄

Albert Pujols seems to have a better ratio of at bats per home run. Keith

hey mark! isnt first base harder than short stop

look under postseason batting under round and what does NLDS mean? - Tiffany

Fred that *is* the largest batting difference i have ever seen. 🙄

Pujols, "the machine" dominates over little a-rod. His stats for the last 6 years are better than rodriguez's first or last six, not metion his overall BA, H, SLG, FP are all better. the only thing alex beats him in is errors.

Does anyone know what colleges did they go too, and did they get scholarships to play at those colleges?
Tracy

Alex Pujols is better stacy

SB is stolen bases and CS is how many times he was caught stealing. John

Why did A-Rod make less money in 2006 then in 2005?-April

how can you really judge which players better? Sabrina

does anyone know who has a better batting all together, because like one season or year someone else is better than the other one...so if you could help that would be great!!!!Amy

How can you tell who is a better player without comparing the players with eachother and now their team as well?John

Does anyone know if these two baseball players have families?
Becky

Brittany, NLDS means NATIONAL LEAGUE DIVISION SERIES..... your
welcomeSteven

I think the best number to look at when figuring out who plays better would
be hits and home runs. answering the 5th question. -Tiffany

I think the only way to tell who is a better player is compare there stats.
Becky

It is hard to say who has a better batting average because Rodriguez has
been playing longer. Carol

How do you compare the two when pujols hasn't played as much as Rodriguez?
Rodriguez has a good 7 years on pujols, he has had longer to get good. Owen.

A-Rod made less money in 06 because he is a wash up and there are better
players than him that are out there nowJohn

i know nothing about baseball so i really dont know how to compare them or
any thing else. i need some help. Kaylee

Definately look at pujois" batting average's and RBI's their consistant all
through the years he's played.Dennis

Runs are definately better than hits because runs get points hits dontShelly

Runs are alot better than hits. hits are just how many times you hit the ball.
runs are what you get when you score, and the more times you score the
better chance your team will win.Kevin

Pujols averaged a higher batting average and RBI for his career than A-rod
did. Thats all i felt like averaging out yesterday but i think that is the
essence of batting right there.steven

albert pujols numbers are better. their higher then alex rodriquez's so thats
means something right?stacy

At the top below Debut, it says vs. BOS , what does that mean?Ashley

Its hard to compare the two players because one has been playing for six
years and the other for twelve years. Pujols stats are better but he doesnt
have as many years to average out while A-rod has alot more.Kevin

Bryce, just compare pujols' six years with a-rods first six
years.....DUHSteven

maybe the reason that A Rod made less money in 2006 was maybe because he had a bad year and they didnt want to offer him as much money if he wasnt playing good -Tiff

I'm pretty sure VS. BOS means his team played Boston the day he started
^ April

What is a slugging percentage allowed mean??Shelly

Albert Pujols has a better batting average and rbi's than A-rod, therefore making him a better player.-Erin

are any specific stats i should look at to determine who was the better of the two? Kaylee

Why do you get to walk if you get hit? you should get a run in my opinion.
Debbie