IMPROV TECHNIQUES FOR THE MATHEMATICS CLASSROOM

Although the goals of improvisational comedy and mathematics education may seem diametrically opposed—one is to entertain and the other is to instruct—in fact, the ideas of the former can help to achieve the latter. In this interactive presentation, I will demonstrate how some of the most fundamental tenets of improv can be applied to creating an open and engaging mathematics classroom. Participation will be encouraged.

What is improv?

Improvisational comedy is theater that is made up on the spot, with no script or planning, and usually with no or minimal props and sets. Some examples of well-known improv shows/troupes/theaters are "Who's line is it anyway?", Second City, the Groundlings, Improv Olympic, and the Upright Citizens Brigade theater.

Why involve improv in the math classroom?

It is my experience that many of the students that we see in our lower level math classes have a certain idea of what math is—scary, rigid, hard, formulaic are all adjectives I have heard. Even many students who are good at math like it because once they learn the process of a certain type of problem, they can be successful on assignments and exams. As mathematicians, we know the amount of creativity and imagination that is required to do and understand high-level mathematics. So why do we take the creativity and imagination out of math classes? I hope to demonstrate that, by using techniques from improv comedy, one can create a classroom environment that encourages original thought and stimulating discussion.

Besides being a research postdoctoral fellow in the mathematics department at the University of Arizona, I have performed as an improvisational comedian for the past 9 years. I have performed in literally hundreds of improv shows, have been a founding member of several improv troupes (Girls Girls Girls Improvised Musicals, Junk Improv, and the Foolish Mortals, to name a few), have traveled all over the country to perform in improv festivals, and have generally developed a great love and respect for the art form. I have applied improv techniques in every math class I have taught, to varying degrees of success.

BLOCKS TO CREATIVITY

One reason to study improv (or to apply it in your classroom) is that it can help loosen blocks on our creativity. In (Timpson, 2002), the authors discuss ten "locks that confine our minds":

i. Insistence on the "right" answer
ii. A preoccupations with what is assumed to be logical
iii. A conforming impulse to follow the rules

iv. The call for practicality
v. The pressure to stay on task
vi. The avoidance of ambiguity
vii. The fear of making mistakes
viii. The prohibitions against play
ix. The commandment to be serious
x. The assumption by many that they lack creativity

Improv can clearly be applied to any one of these locks. By allowing our students to explore which of these stop them, we invite the possibility of increasing their ability to think creatively.

Physicists at the European Organization for Nuclear Research, or CERN, have recognized the utility of improv, both in becoming more effective communicators and in developing the ability to think on one's feet. In preparation for switching on the Large Hadron Collider (and for the controversy that was bound to ensue), a group of the scientists hired Improv Olympic founder Charna Halpern to teach them about improv. Bob Stanek, a particle physicist who is leading CERN's improv-comedy experiment, had this to say:

> Improv has got to be more difficult than doing physics. You have to think in milliseconds. When you're discussing things that go on here on a daily basis -- why your detector doesn't work, why your machine isn't collecting data -- you have to know how to respond in a quick manner.

More details can be found at http://online.wsj.com/article/SB122048206487796841.html?mod=most_emailed_day.

Icebreakers/Risk-taking

At the beginning of the semester, I normally find that many of my students are hesitant to ask questions or even to talk to each other in small group settings. It is vital to the success of my classes to create an environment where everyone feels comfortable participating. For many, answering a question in front of the class or even asking one is perceived to be *A RISK.* The sooner I can convince my students that there will be no negative outcome from taking such a risk, the sooner I get the level of interaction that I desire.

A. The circus bow: A big, overly dramatic bow while saying "I failed".
   a. Improv application: I've seen this used in beginning improv classes to encourage students to take risks and, if they fail, to fail gracefully and *shamelessly*. By doing something silly like the circus bow, even failing can be fun (and funny).
   b. Math application: Minimizing the perceived risk of answering or asking a question in class. On the first or second day of class I will tell my students that I have a very difficult lesson to teach them—that its ok to make mistakes in class. I have them all stand, and I demonstrate the circus bow. Then I have them do it as a class (and

I make them repeat it until everyone participates). I tell them that I don't expect them to do a circus bow every time they make a mistake, but they are welcome to do so (I'll usually do one occasionally to keep the tone of class light).

B. Name games: I like to learn my students' names as soon as possible, and just as importantly, I like them to learn each other's names. There are a plethora of name games out there. Here are some of my favorites.
    a. Name with physical action (high risk): Students stand in a circle and each student will say their name and do a physical action. Then we will all repeat the name and the physical action. After everyone has gone, I might go around the circle again (doing the same actions all together) to solidify names. This is sometimes not very successful at the beginning of the semester, because it requires a willingness to look silly. A less risky version would be having students say an alliterative adjective and their name (e.g. Awesome Andrea).
    b. Name with pointing (lower risk): Students stand in a circle and someone will point at another student and say **his or her own name**. That person points at someone else while saying his or her own name. The game continues until everyone has been pointed at several times. Time permitting, the second part of the game continues as the first, except that the person says **the name of the person they are pointing at.** See (Gwinn, 2003) for more variations.

C. Silly warm-up games: Sometimes if I know the day's lecture is going to be a bit dry or if energy drastically wanes during class, I'll play these quick games. They can work as icebreakers or as energy-raisers.
    a. Scream circle: Have the students stand in a circle and put their heads down. On the count of three, they all raise their heads and look at someone. If that person is also looking at them, they both scream and leave the circle. If that person is not looking at them, they stay in the circle. Continue until there are only two people left. This exercise can also be used to divide the students into pairs.
    b. Movement circle: Have the students stand in a circle. Start a motion (with or without sound). The next person should copy the motion and sound as closely as possible. The motion moves around the circle and probably will morph. Go around the circle a few times.

Yes, and

This simple phrase is really the basis of all improv theory. The idea is that we can create something from absolutely nothing if we both agree to agree with the reality we set up and to contribute to that. Its like building a brick wall. You set a brick, I set one on top, you set one on top of that, and before we know it, we have this awesome wall. Well, maybe our wall is not very tall or structurally sound, but we

have built it ourselves, out of nothing (except bricks). Imagine if instead you had started building a wall and that I had decided that I would build a boat instead of helping you with your wall. Or even worse, imagine I had decided to take bricks down just as you put them up. Either way, we aren't going to end up with much of a wall. This metaphor is getting muddy. The point is that saying "yes, and" is the best (most efficient? Easiest?) way to make something happen on stage.

We can apply the concept of "yes, and-ing" to math in at least two ways. First, students can "yes, and" their own ideas. Often, a student will come to office hours having started a problem (correctly) but will have stopped, assuming they were wrong. Usually, all they will need is a bit of encouragement from me, and they will finish the problem on their own. If they could learn to agree with and support their own ideas, they can develop confidence in their own thought processes. Secondly, "yes, and-ing" other members of a group helps foster dialogue and helps to support each other' ideas.

A. Jump Together: This exercise emphasizes the idea of surrendering one's individual desire to that of the group. Have the students walk in a circle. The goal is to all jump at the same time, without anyone clearly leading. The idea is that they should be able to be in tune with their classmates and should feel the moment to jump. You might start calling out when to jump, to get everyone used to the feeling of jumping together. Eye contact can help.

B. One Person Walking: The purpose of this game is to seamlessly take leadership and give it away. This skill is quite applicable to group work. Sometimes one person makes a good leader for a group, but then the topic of the group work changes, and all of a sudden, another member would be more fit to lead. Being comfortable giving and taking leadership is an important (and sometimes difficult skill).

   Have the students stand anywhere in the room. The goal is to have EXACTLY one person walking at any time. If one person starts walking, whoever was walking previously must stop. Similarly, if the person who was walking stops, someone else must immediately start. This game can be expanded to have exactly two, three, or n students walking at any time.

C. That means: This game really emphasizes saying yes. Pair up your students and play all at once. Student A should make some declarative statement. (It's raining, I have no more money, I think math is awesome.) Student B then repeats the statement and adds, "That means ___". Continue this pattern. For example:

   "I think math is awesome."
   "You think math is awesome. That means you have good taste."
   "I have good taste. That means I should start my own fashion line."
   And so on.

This exercise can also be used to review concepts and create connections between ideas. For example, the following exchange could be used to review basic Euclidean geometry.
"An isosceles triangle has two equal sides."
"An isosceles triangle has two equal sides. That means that it has two equal angles."
And so on.

Supporting fellow players

A fundamental principle of improv is that there are no wrong choices. However, this is clearly not entirely true. The beauty of improv is that we create an entire world right before the audience's eyes. The difficulty of improv is that the audience sees everything that we do and trusts that we mean to do it, even though most of the time, we are not so certain. We rely on our teammates to make our "mistakes" look premeditated or at least to not let them derail a scene or show.

For example, suppose that Shana and I are in a show, and her character's name is Sandra. We both enter the stage for a new scene, and I mistakenly call her Sylvia. She has several choices: 1) she can panic, look around, and run off stage, thereby highlighting the fact that I made a mistake; 2) she can correct me in any number of ways ("my nickname/middlename is Sylvia", "I'm sure you meant Sandra", "Sylvia is my twin", etc), which is better than the first choice but it still acknowledges my mistake; 3) she can choose to play a throwaway character named Sylvia. With option 3, Shana has turned my mistake into a deliberate choice.

The notion of supporting one's fellow players goes much deeper than just covering others mistakes. It encompasses the immediate acceptance of others' ideas and the willingness to heighten, or contribute, to those ideas. It involves putting the needs of the troupe or the performance before the individual needs of being the star of the show.

How does support of teammates come into play in the math classroom? In math, there are right and wrong answers, and some ideas to solve a problem just aren't as good as others. I can think of at least two applications of teammate support.

First of all, supporting one's fellow performers or classmates can be quite useful in group work. I do a lot of group work in my classes, and I sometimes have students that do not maximize the potential of this exercise, whether it be by working alone or by rushing through an assignment without making sure all members understand the group's solution. By encouraging the spirit of helpfulness, these types of counter-productive behavior are minimized.

Secondly, a shy or timid student is more likely to share his or her ideas if they know that the idea will at least be explored. Rather than shooting down ideas, group

members can discuss and debate various approaches before determining the best one.

A. Whoosh, Bang, Pow: Have all the students stand in a circle. There are 3 moves in this game. "Whoosh" goes around the circle with a big arm swing, "Bang" has the player cross their arms in an X and it reverses the direction of the whoosh, and "Pow" goes along with a pointing motion to a player across the circle. You cannot bang a pow. If an error occurs, you can either just continue with play or have all the students join hands and come to the center of the circle and make a silly noise like "ah-oo-gaa."

B. Enemy-defender: This game is good for increasing awareness and connection between students. Have the students walk around the room (you should move chairs/desks). Tell them to silently pick another student who is their enemy and one who is their defender. When you say "go", they should continue walking, all the while keeping their defender between them and their enemy. They should try to not make it obvious who their "chosen" people are. Things will probably not settle into a static situation; rather it will probably get more chaotic. A second level to this game is to have the students choose two different people and try to make an equilateral triangle with the two. Your class will probably eventually find an equilibrium.

C. Three-headed expert: This game relies on support and could also be a fun way to review definitions for an exam. Have three students come to the front of the class and introduce them as a mathematical expert. The students should respond to your questions one word at a time (i.e. as though they are three heads on the same body). They really have to listen to what the other "heads" say so that they make sense. You can have fun trying to get them to come up with a name or tell you where they are from. I think this could be an enjoyable, creative addition to a review day.

D. Speak in one voice expert: This is similar to the three-headed expert, but it tends to be more challenging (and often more fun). Have three students come to the front of the room. They must answer questions speaking all in one voice. Going slowly and making eye contact can help ensure success.

Works Cited

Gwinn, P. (2003). *Group Improvisation: the manual of ensemble improv games.* Colorado City, CO: Meriwether Publishing, Ltd.

Timpson, W. a. (2002). *Teaching and Performing: Ideas for energizing your classes.* Madison, WI: Atwood Publishing.