

Mar 4th, 9:30 AM - 10:15 AM

Developing STEM Critical Thinking and Creativity through Team Building in the Classroom

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Recommended Citation

Marks, Kathy, "Developing STEM Critical Thinking and Creativity through Team Building in the Classroom" (2016). *Interdisciplinary STEM Teaching & Learning Conference*. 2.

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Developing STEM Critical Thinking and Creativity through Team Building in the Classroom

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**GEORGIA SCHOLARSHIP OF STEM
TEACHING & LEARNING CONFERENCE**

MARCH 4, 2016



The Work World

- ▶ As technology takes over more of the fact-based, rules-based, left-brain skills—knowledge-worker skills—employees who excel at human relationships are emerging as the new “it” men and women. More and more major employers are recognizing that they need workers who are good at team building, collaboration, and cultural sensitivity, according to global forecasting firm Oxford Economics. Other research shows that the most effective teams are not those whose members boast the highest IQs, but rather those whose members are most sensitive to the thoughts and feelings of others.

<http://fortune.com/2015/03/05/perfect-workplace/>

STEM World

- ▶ In academia, the majority of research in STEM fields is conducted through collaborations and working groups, where a diversity of ideas need to be proposed and analyzed to determine the best strategy(ies) for solving a problem. In the technology sector, product development is done as a team, with specific roles for each individual but its success is predicated on each member of the team providing a different skill set / perspective. Thus, students who are interested in both academia and industry will benefit from learning how to successfully work in a diverse team.

<http://teaching.berkeley.edu/diversity-can-benefit-teamwork-stem>

STEM Initiatives and Problem-Based Learning Connect

Goals and Competencies of Both

- ▶ Critical Thinking
- ▶ Idea and Solution Generation
- ▶ Collaboration
- ▶ Creativity
- ▶ Communication

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What is Team Building?



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- ▶ What do you think?

- ▶ A team is a group of people working towards a common goal

- ▶ Team building is an **ongoing** process of enabling the team to achieve the common goal

- ▶ Team members share expectations for accomplishing group tasks, trust and support one another, and respect one another's individual differences

- ▶ **Team building is a powerful way to unite a group, develop strengths, and address weaknesses.**

Benefits of Team Building

Development of Soft Skills

Personality traits, social graces, communication, language, personal habits, interpersonal skills, etc. that characterize relationships with other people

Help students:

- ▶ Get to know each other better, bond, and improve morale
- ▶ Build team spirit and a community with a common purpose
- ▶ Improve motivation
- ▶ Improve communication within a group
- ▶ Develop awareness, tolerance, and understanding of individual differences, personality strengths and weaknesses



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Benefits of Team Building

Development of Soft Skills

Personality traits, social graces, communication, language, personal habits, interpersonal skills, etc. that characterize relationships with other people

Help students:

- ▶ Gain a sense of belonging and connectivity
- ▶ Grow in a climate of cooperation and collaborative problem-solving
- ▶ Develop trust, care, compassion, kindness and empathy for others AND themselves
- ▶ Build self-esteem
- ▶ Break down barriers



Team Building in the Classroom

Who should Team Build?

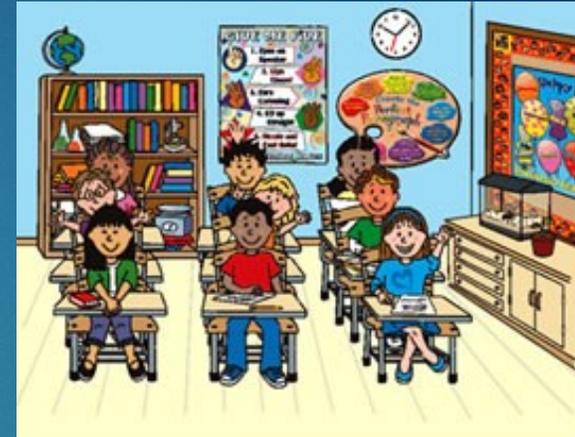
- ▶ Everyone!
- ▶ Small groups, large groups, all academic levels

When should we Team Build?

- ▶ Beginning, middle, end of the day and the year
- ▶ Ongoing throughout the year
- ▶ Warm ups, hooks, recess, fillers, lessons, end of day closure

Where should we Team Build?

- ▶ Anywhere with the space and resources



Team Building in the Classroom

How do we address STEM and academic standards while we Team Build?

- ▶ Soft skills = Character education, group work, and processing skills
- ▶ Critical thinking and creativity = processing skills (analyzing, problem-solving, communication, reasoning, originality, etc.)
- ▶ Can include STEM texts for scenario background or require science/math facts to complete
- ▶ Compare and contrast team building work with their 1) STEM thinking and reasoning, or 2) academic group work
- ▶ PE Movement

Make sure Team Building is:

- ▶ Planned with a purpose
- ▶ Experiential based
- ▶ Debriefed afterward (metacognition)
 - ▶ How did they do? What went well? What could be improved? What skills did they practice?

Must Be Ongoing All Year



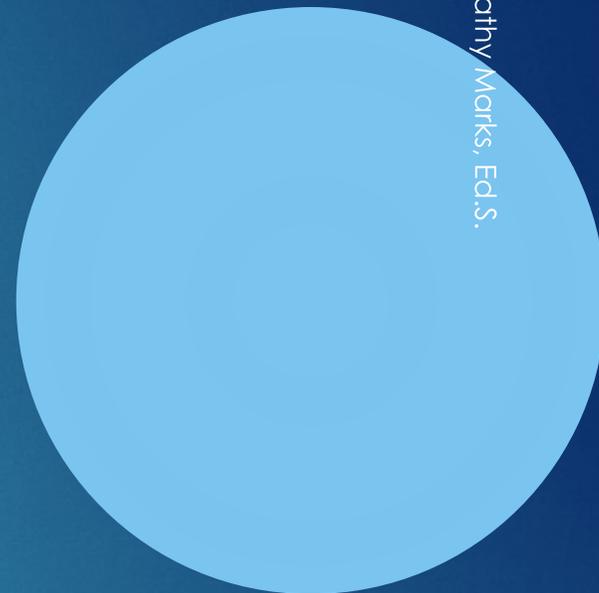
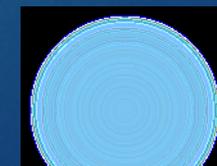
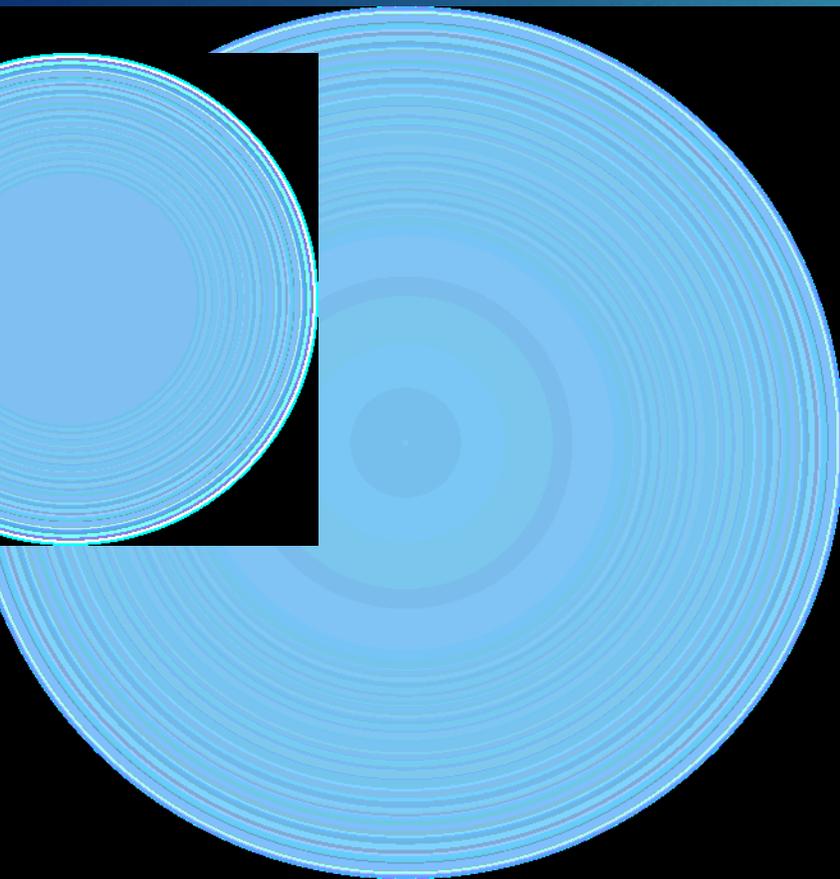
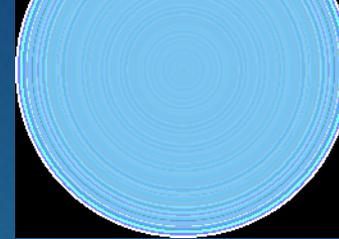
- ▶ Students can *always* learn more about each other and firm up peer relationships
- ▶ Continued speaking/listening skills practice
- ▶ Remedy (or prevent) peer/friend issues that may be starting to bubble up
- ▶ Review/modeling of expectations and appropriate/inappropriate behaviors
- ▶ Icebreakers for new, more difficult academic tasks to come
- ▶ Improve patience, acceptance, problem solving, and creative thinking
- ▶ Shake up any existing cliques that may tend to form as the year progresses
- ▶ Quick brain breaks for nice transitions during day/week

<http://www.scholastic.com/teachers/top-teaching/2014/09/continue-class-team-building-all-year-long>

Don't Forget to Debrief Afterward!

- ▶ What went well? What did not?
- ▶ How did you feel about the process?
- ▶ What could be improved?
- ▶ What connections can you make to other areas in your life?
- ▶ What skills did you practice? What do you need to work on?
 - ▶ **Communication** (speaking, listening, judging, verbal vs nonverbal)
 - ▶ **Leadership** (who emerged as a leader, characteristics)
 - ▶ **Team work** (examples of what worked, how to apply that in other areas)
 - ▶ **Trust** (did you trust or start to trust someone, how does that feel?)
 - ▶ **Support** (what are ways you were supported, apply to other areas)
 - ▶ **Brainstorming, idea generation** (how did your group decide what to do)
 - ▶ **Academics** (what content did you connect with)

Questions So Far?



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Examples

- ▶ **Group Juggle** – have students toss a ball to each other say “Here, (name).” and “Thank you, (name)” until everyone gets it - then let them set goals on doing it again in same order: fastest time, 0, 1, or 2 drops, backward order, multiple balls, etc.
 - ▶ Addresses: Soft skills, setting goals, experimenting, refining
- ▶ **Human Knot** – get 10ish people into a tight circle - each person grabs 2 different group members' hands at random around the circle (not next to each other and not 2 hands of the same person) – must untangle this "human knot" without letting go of anyone else's hand until they are holding hands in a complete circle - can't change hand position
 - ▶ Addresses: Soft skills, communication, visual-spatial, experimenting, refining
 - ▶ Scenarios: circuits, conduits, super glue
- ▶ **Draw Back to Back** – have partners sit back to back - one has a pattern or picture and must describe to their partner how to draw it (variation: have one make a LEGO creation and then describe it to be made by the partner)
 - ▶ Addresses: Soft skills, communication, visual-spatial, attributes, shapes, structures

Examples

- ▶ **Blind Cube** - give all players a blindfold to wear – they must make an equilateral square and later a cube using noodles that are spread about the area - all noodles must be used (variations: Blind Polygon, don't have to use everything, use rope, string, LEGOs)
 - ▶ Addresses: Soft skills, shapes, attributes, structures
- ▶ **Build the Tallest Tower** with provided materials (variations: Strongest Castle, Fastest Roller Coaster, etc)
 - ▶ Addresses: Soft skills, scientific method, measuring, foundations, structures, planning, use of technology (digital and non-digital)
- ▶ **Don't Drop It!** – make a group circle - have a player throw a ball into the air for another player to catch (the same player may not catch his own ball – after a successful catch, add a second ball, then a third, and so on. If a ball touches the ground you must start back with 1 ball again – can have someone different say math or science facts every 5 seconds)
 - ▶ Addresses: Soft skills, movement, coordination, subject-specific facts

Examples

- ▶ **Minefield** – provide space with lots of obstacles (balls, beanbags, stuffed animals, blocks) – have students guide a blindfolded partner through the minefield speaking only in a STEM code
 - ▶ Addresses: Soft skills, subject-specific communication
 - ▶ Scenarios: military, how do scientists overcome obstacles every day?
- ▶ **Stepping Stones** – make a “river” using clear boundaries (string or rope) - show the group some stepping stones/lily pads (foam or rubber spots), 1 for each person minus one - the objective is to cross the river, lava, jelly, etc. without stepping into it - the river is running and if they are not connected to the stone/lily pad at all times it will float away - establish an end point and give them a clear instructions that the whole team has to get from one side to the other – if they fall in part way, they may lose the body part that touched – if they fall all the way in, the whole team has to start over (variations: they have to speak as a famous STEM person or in STEM language)
 - ▶ Addresses: Soft skills, movement, STEM language
 - ▶ Scenarios: Polluted river, volcanic eruption, create their own structure

Examples



- ▶ **TP Shuffle** – (need access to a balance beam or similar object) have all the participants line up on the telephone pole/beam and pick an animal - now they must get in order from largest to smallest animal from one end of the beam to the other without anyone getting off the beam – (variations: birthdays, names in alphabetical order, timeline of events, add the number of their favorite month with the number of their favorite day, etc.) - can have them get in order in silence
 - ▶ Addresses: Soft skills, movement, communication, subject-specific facts
- ▶ **Magic Carpet/Tarp Turnover** – lay a mat/tarp on a flat surface and have all the participants stand on it - the objective is to turn the mat over without anyone stepping off the mat – can have them say a math or science fact each time they want to speak, or speak in STEM language, can use tarp of different shapes
 - ▶ Addresses: Soft skills, movement, communication, subject-specific facts
 - ▶ Scenarios: magic carpet flight, special material needs to be down to block danger

STEM Specific Activities

- ▶ From Jackie Gerstein
- ▶ Some team building activities that use collaboration to explore and solve STEM-related challenges. Note that most of them require minimal supplies and costs
- ▶ <https://usergeneratededucation.wordpress.com/2015/08/14/team-building-activities-that-support-maker-education-stem-and-steam/>

Resources

- ▶ <http://www.scholastic.com/teachers/top-teaching/2014/09/continue-class-team-building-all-year-long>
- ▶ <http://www.teachthought.com/teaching/10-team-building-games-for-the-first-day-of-class/>
- ▶ <http://www.teachthought.com/teaching/10-team-building-games-that-promote-critical-thinking/>
- ▶ <http://www.elementarymatters.com/2013/05/team-building-activities.html>
- ▶ http://www.ehow.com/list_6112919_indoor-building-activities-elementary-students.html
- ▶ <http://www.iowadnr.gov/portals/idnr/uploads/education/teambuilding.pdf>