Making the Move from Teacher Centered to Student Centered Classroom

Presenter: Gail Dickinson
We believe educators have the most important job in the world.

Together let’s create extraordinary classrooms.
Session Notes

For a copy of the notes go to the following website.

GMSmavs.com/Teachers/Gail Dickinson/SDE

Note: the videos will not work on the PowerPoint presentation.
Session Focus

Participants will

• explore the difference between teacher-centered and student-centered classrooms.

• learn ways to transform the typical teacher-centered classroom by encouraging discovery and exploratory learning that requires student engagement to solve problems.

• take on the role of students and will execute STEM performance based activities.

• be able to “flip” their classroom from teacher to student centered.
Why Change?

Today all students must be able to

• think critically
• communicate effectively
• collaborate with others
• analyze information
• deal with real-world problem solving

While meeting rigorous benchmarks, such as those contained in the common core state standards
What are student expectations?

- Video
## Comparison

<table>
<thead>
<tr>
<th>Teacher-Centered</th>
<th>Student-Centered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher is active</td>
<td>Students are passive</td>
</tr>
<tr>
<td>Instructor &amp; decision maker</td>
<td>Teacher is facilitator &amp; students are decision makers</td>
</tr>
<tr>
<td>Bases teaching on standards</td>
<td>Learning is based on prior knowledge &amp; constructivism</td>
</tr>
<tr>
<td>Relies on textbooks &amp; lectures</td>
<td>Highlights real life examples</td>
</tr>
</tbody>
</table>
## Comparison (cont.)

<table>
<thead>
<tr>
<th>Teacher-Centered</th>
<th>Student-Centered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rote knowledge</td>
<td>Experiential Knowledge</td>
</tr>
<tr>
<td>Isolated teaching and learning</td>
<td>Collaboration</td>
</tr>
<tr>
<td>Learning takes place in classroom</td>
<td>Learning goes beyond the classroom</td>
</tr>
<tr>
<td>Focus is on procedure</td>
<td>Focus is on thinking</td>
</tr>
<tr>
<td>Little or no differentiation</td>
<td>Differentiated</td>
</tr>
<tr>
<td>Little knowledge of every student</td>
<td>Gets to know students</td>
</tr>
</tbody>
</table>
Examples of Student-Center Activities

- Repurpose
- Role play/Simulations
- Cooperative learning
- Inquiry
- Solve a problem
Get to Know Your Students (DI)

- Paper Plate
- Wordle
- Concept Map
- Write a Fairy Tale/Song
- Bioglyph
Paper Plate-Student
Paper Plate-Teacher
Wordle

www.wordle.net
Paste in a bunch of text:

Kate, Kate, Kate, Kate, Kate, Kate, family, family, family, friends, friends, school, soccer, shopping, dog,
Bioglyphs

Use these symbols to create your bioglyph diagram.

- **Face Shape:**
  - Male
  - Female

- **Hair Color:**
  - Blonde
  - Black
  - Brunette
  - Red

  The # of strands indicates the month of birthday.

  Long strands indicate long hair, while short strands represent short hair.

- **Eye Color:**
  - Green
  - Blue
  - Brown
  - Hazel

  An oval eye shape indicates glasses or contacts. A circular shape indicates perfect vision.

- **Eyebrows:**
  - (Favorite color)
    - Red
    - Green
    - Purple
    - Other

- **Nose:**
  - Rides bus to school
  - Rides in car
  - Rides bicycle
  - Walks

- **Ears:**
  - Sister(s)
  - Brother(s)

  Use dots (*) inside the ear indicates number of siblings. Dots in upper ear indicates older sibling(s). Dots in the lower ear refer to younger sibling(s).

- **Mouth:**
  - Loves science
  - Thinks science is ok
  - Thinks science is scary
  - Does not like science

- **Cheeks:**
  - Likes vanilla ice cream
  - Likes chocolate ice cream
  - Other

- **Freckles:**
  - The # of freckles indicates the day of birthdate.

- **Eyelashes:**
  - The # of eyelashes indicates the # of pets.
Student-Centered STEM Projects

- Repurpose
- Parachute Role Playing
- Hummingbird Feeders
- Design an App
- Snack Attack Engineering Project
Repurpose an Everyday Item

Lesson Focus

• This lesson focuses on students thinking out of the box.
• Practice cooperative learning
• Develops speech skills – communicate effectively
• Fun
Items

- Straws
- Filters
- Balloons
- Index card
- Cotton balls
Let’s try it!
Repurpose an Everyday Item

✓ Can you come up with a new use for gum?

✓ Create a way to tell the world about this exciting new way to use gum!
Role Playing (parachute project)

You have been hired to drop a payload (from an airplane) of medicine in the middle of a Rain Forest to a local hospital. This medicine has powerful antibiotics that will help control the outbreak of Necrotizing fasciitis (flesh eating bacteria).
Parachute Project

Lesson Focus

• This lesson focuses on parachute design. (S)
• Teams of students construct parachutes from everyday materials. (E)
• During a class contest, students will test their parachutes to determine whether they can transport a paper clip to a target on the ground with the slowest possible rate of descent. (M)

Sample lesson can be found:

• http://www.tryengineering.org/lessons/playingwithparachutes.pdf
Parachute Project Introduction

1. Class Discussion using Socratic method about Necrotizing fasciitis (S)

Examples –
- Anyone sick lately? What was wrong?
- What do you think causes sickness?
- What types of diseases can kill someone?
- What do you think of when I say flesh eating bacteria?
2. View video/Worksheet or take notes

“How Things Work – All About the Parachute” (T)
3. Create a parachute while modeling teacher.

Practice launching parachute and timing with stopwatch. (Launch 4 times – gathering and recording the average of the 4 launches.) (M)
4. Change one variable that you think will allow your parachute to hang in the air longer than any other classmate’s parachute. (S)

Class contest (this is for all students to observe each other’s project so as to help with the construction of the final parachute.)
5. Students will collaborate with their group and design a parachute from scratch using “junk”. They will draw and label their design and explain their design to the class during the class contest. (E)

Class contest

Wrap up – class discussion (can also be done as a blog)
- Why did some of the parachutes fail?
- Why did some of the parachutes stay in the air longer?
- What caused some parachutes to flip on their side? Any way to prevent this?
- What materials were not available that you wish you could have used?
Extension

- Have students create one of the following documenting work that was done during this project.
  (T)
  - PowerPoint Presentation
  - Video
  - Report
Lesson Focus

- Students will study the anatomy/physiology/physics of hummingbirds. *(S)*
- Students will chart hummingbird migration. *(T M)*
- Students will design a “better” hummingbird feeder and observe feeding behavior *(E M)*
- Students will document their findings using technology *(T)*
Flight of the Hummingbird Project

1. Students will research the anatomy/physiology of hummingbirds *(S)*
2. Students will create an “All About Hummingbirds” Video/PowerPoint *(DI)*
Video on Physics of hummingbird flight (S)
Research Migration Patterns
5. Feeding behavior/ Design Feeder

- Research what hummingbirds eat
- Research hummingbird feeder designs.
- Design your own hummingbird feeder using Google SketchUp
- Using the design students will build and hang feeders in school yard for observation.
Example of Feeder Designed in Google SketchUp
6. Observe feeders each day and document using photos the number of hummingbirds sighted.

<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th># of Birds Feeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon.</td>
<td>3/4</td>
<td>1</td>
</tr>
<tr>
<td>Tues.</td>
<td>3/5</td>
<td>3</td>
</tr>
<tr>
<td>Wed.</td>
<td>3/5</td>
<td>1</td>
</tr>
</tbody>
</table>
7. Class Discussion

- At the end of the project students will compare notes with the other groups and will participate in a class discussion about their observations.
- They will write a reflection about their participation in the project.
8. End of Project Activity

• Students will create a Glogster or Prezi project that will include all of the mini projects they created during the lesson.
Glogster
poster yourself

Hummingbirds

Predators
The only predators of a hummingbird are cats and hawks.

Habitat
Hummingbirds are only found in the Western Hemisphere, in a variety of different habitats. They usually live in grasslands, wooded areas, forests, and deserts.

Adaptations

FUN FACTS
The smallest hummingbird is the bee hummingbird, which is about 3 inches long. The biggest large hummingbird can be more than 8 inches long.

The large eyes help detect ultra-violet colors.

Bibliography
Lesson Focus

- This lesson focuses on the research and development of a new iPhone or iPad “app. (T)
- Students will design their own app using PowerPoint. (T & E)
- Students will research and document the app development process. (T & E)
Design an App Project

Class discussion

What is an app?

Look at some examples of apps on the phone.

What types of apps are available (categories)?
2. Recommend an App

Students will research and review apps from the Internet.

App Detail » Barefoot World Atlas
Published by: Touch Press
Universal App - Designed for iPhone and iPad
Price: FREE!
Current Version: 2.2.7
Released: 2012-03-15

Share this:

What's New
- German localisation added
- Re-engineering of the animations that has reduced the app size by 600MBs
- Minor bug fixes

App Description
Barefoot World Atlas is a magical 3D globe that invites children to explore the regions and countries of the world, discovering hundreds of fascinating features and immersing themselves in the rich wonders of our planet. This is a multi-language, universal app for the iPad, iPhone, and iPod Touch. The rich and beautifully detailed graphics take full advantage of the amazing new high definition retina screen.

Geographer and BBC TV presenter Nick Crane is your guide, as you fly at will around a beautiful 3D globe created by artist David Dean. Explore the world's continents, great oceans and changing environments. Meet different people around the planet and find out about their way of life. Encounter amazing wildlife, discover landmarks, natural features and famous buildings.

This is an interactive atlas for the digital age. This engaging and educational app vividly communicates how all parts of our world are interconnected and reveals some of the ideas and initiatives that are helping to shape a sustainable future. Young children will delight in playing with the 3D globe and exploring its features, while older children can delve deeper to discover a wealth of facts and insights including live data for every country from Wolfram|Alpha.

Barefoot World Atlas is the result of a year-long partnership between award-winning children's publisher Barefoot Books, and Touch Press, the people behind numerous apps of the Week including The Elements, Solar System for iPad and March of the Dinosaurs.
2. Recommend an App

Students will research and review apps from the Internet. They will create a flyer (Word) recommending an app for one of their friends.
3. Create Your Own App

- Dinner Finder
  By Cameron

- SOCCER SHOT
  By: Rob
4. Research the Process from Design to Production

- Students research how to take their design and create a product that can be sold through iTunes.
- Their findings will be documented in a research paper using Microsoft Word.

**Steps of Designing an App:**

1. The why and who-
   - Think about what your app will be about and state why. Also, ask yourself if another person may have the same interest.

2. What and how-
   - Make a template of what you want your app to consist. Be sure to be very detailed in this process.

3. When-
   - Make a plan before hand to look at all the materials you will need to build this app. Some may cost too much which may cause you to have to start over.

4. Building-
   - Have the right helping hands to help you build your dream app.

5. App Builder-
   - Have the best of the best and keep the app high. They will help you publish your app and get many people to buy it.

6. Team work-
   - Get a couple of friends and people who understand or have the same interest as you on board. They can give ideas and could be a good second hand builder.

7. Buying a team-
   - Don’t be afraid to spend a little money. Hire multiple of talented people that want to build the app with you and are respectful of your ideas and wants.

8. Get technical with it-
   - Know the program like the back of your hand. You will seem a lot smarter by answering a question 3 seconds after someone asked about your app.
Snack Attack Engineering Project

• Students will design the most economical package for a single serving of a S’more that must withstand certain environmental conditions.
S’more Lesson

• Observation – students observed the packaging and artwork of an everyday snack.
• They shared their findings in a class discussion. We noted any “patterns” in the type of materials that were used.
• As a class we decided prices for materials.
• Students chose a role to play – Design engineer, packaging artist, product tester, materials manager and reporter/recorder.
S’more Lesson cont.

• Students worked in groups to draw/design and create their package.
• The package was tested for breakage, heat and water damage.
• Students assessed damage and brainstormed ways to improve their packaging.
• The artist created an appealing product package for their S’more.
Student Assessment

- Gimme S’more

- Yummy graham crackers, marshmallows and chocolate!!

Includes 1 serving
Other Project Ideas

- **Redesign** – students redesign a product to make it better (ex. Coke bottle, cell phone, computer mouse)
- **Adaptive Device Design** - Lesson focuses on the engineering of adaptive or assistive devices, such as prosthetic devices, wheelchairs, eyeglasses, grab bars, hearing aids, lifts, or braces.
- **Role Play** – students are given a role (job) and will design a product. (Ex. Health Educator – create an advertising campaign to encourage people to get the flu vaccination)
More Project Ideas

- **Biomimicry in Engineering** - Lesson focuses on the concept of Biomimicry and students learn how engineers have incorporated structures and methods from the living world in products and solutions for all industries. Students then work in teams to develop a structure or system based on an example in nature that would help people living on the moon. They design their structure on paper, learn about patents, and share their designs with the class.
More Project Ideas

- **Get It Write** - Lesson focuses on how writing instruments have been engineered over time. Students work in teams to design and build a functional "pen" out of everyday materials that can deliver washable liquid watercolor (ink) to a sheet of paper in a controlled manner. They design their pen, build and test their design, evaluate their results, and share observations with the class.
Websites

- Try Engineering
- **Teach Engineering**

<table>
<thead>
<tr>
<th>Title</th>
<th>Summary</th>
<th>Grade</th>
<th>Educational Standards</th>
<th>Time</th>
<th>Group Size</th>
<th>Cost/Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teach Engineering</td>
<td>Students act as engineers to apply what they know about how circuits work in electrical/mechanical devices to design their own battery-operated micro motor vehicles with specific parameters. They can... more</td>
<td>16 (9-11)</td>
<td>ITEA</td>
<td>1 hr. 40 mins</td>
<td>3</td>
<td>$20.00</td>
</tr>
<tr>
<td>Applying Hooker’s Law to Cancer Tracing</td>
<td>In this activity, students will explore Hooker’s Law in small groups at their lab benches. They will collect displacement data for a spring with an unknown spring constant k, by adding various masses of... more</td>
<td>11 (10-12)</td>
<td>ITEA, Science</td>
<td>1 hr. 30 mins</td>
<td>3</td>
<td>$0.00</td>
</tr>
<tr>
<td>IODD Vision</td>
<td>Students determine their own retinal acuity and calculate what the average eye can see for the class would be. They learn about characteristics that enhance visual and how engineers play an important role in the development of these technologies.</td>
<td>5 (3-5)</td>
<td>ITEA</td>
<td>50 mins</td>
<td>2</td>
<td>$5.00</td>
</tr>
<tr>
<td>Able Sports</td>
<td>This activity focuses on getting students to think about disabilities and how they can make their sport more enjoyable. The students are asked to pick a disability and design a new kind of sport for it.</td>
<td>8 (6-11)</td>
<td>ITEA, Math</td>
<td>50 mins</td>
<td>4</td>
<td>$0.00</td>
</tr>
<tr>
<td>About Accuracy and Appreciation</td>
<td>Students learn about the concept of accuracy and how it pertains to robotics, gain insight into experimental accuracy, and learn how and when to estimate values that they measure. Students also explore sources of error when determining robot setup and number rounding.</td>
<td>6 (4-7)</td>
<td>ITEA, Math</td>
<td>40 mins</td>
<td>3</td>
<td>$0.00</td>
</tr>
<tr>
<td>Accelerometer: Centripetal Acceleration</td>
<td>Students work as physicists to understand centripetal acceleration concepts. They also learn about the good robot design and the accelerometer. Lastly, they learn about the relationship between... more</td>
<td>8 (8-10)</td>
<td>ITEA</td>
<td>2 hrs. 30 mins</td>
<td>5</td>
<td>$3.00</td>
</tr>
<tr>
<td>Add and Subtract Magnets</td>
<td>Students are introduced to the differences between poles and bases and how to use indicators, such as paper and nail, to distinguish between them. They learn why it is important to... more</td>
<td>6 (4-6)</td>
<td>ITEA</td>
<td>1 hr. 30 mins</td>
<td>3</td>
<td>$0.00</td>
</tr>
<tr>
<td>Add Trade</td>
<td>In this activity, students explore the effect of chemical reactions on stability and movement. They use sticks to see what happens when limestones are placed in liquids with different pH values. They also... more</td>
<td>5 (3-6)</td>
<td>ITEA</td>
<td>1 hr. 45 mins</td>
<td>3</td>
<td>$0.00</td>
</tr>
<tr>
<td>Add Pair Effects</td>
<td>Students conduct a simple experiment to model and explore the harmful effects of acid rain (higher) on living (paper and eggshell) and non-living (paper clip) objects.</td>
<td>5 (4-6)</td>
<td>ITEA</td>
<td>1 hr. 30 mins</td>
<td>1</td>
<td>$0.00</td>
</tr>
<tr>
<td>Active-Sketch Software</td>
<td>Students construct a rocket from a balloon propelling along a guide string. They use the model to learn about Newtons third law of motion, examining the effect of different forces on the motion of the rocket.</td>
<td>8 (7-9)</td>
<td>ITEA</td>
<td>1 hr. 15 mins</td>
<td>4</td>
<td>$1.00</td>
</tr>
</tbody>
</table>
• **EGFI** – Engineering, Go for It
Extraordinary educators need flexibility and variety in accessing professional development...

...that's why SDE provides multiple formats to fit how you learn best.