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| **Class:** Agricultural Mechanics | **Date:**   |
| **Unit:** SAE Safety | **Lesson Title:** Angles and Stability |
| **Content Standard Alignment:*** **PST.01.02.02.c.** Devise and document processes to safely implement and evaluate the safe use of AFNR related tools, machinery and equipment.
* **PST.02.02.02.c.** Adjust equipment, machinery and power units for safe and efficient operation in AFNR power, structural and technical systems.
* **PST.02.02.02.b.** Apply safety principles and applicable regulations to operate equipment, machinery and power units used in AFNR power, structural and technical systems.
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| **Lesson Objectives/Instructional Outcomes:** 1. **Students will be able to identify and assess safe working limits for tractors and prevent rollovers from occurring.**
2. **Students will develop an understanding of centre of gravity and stability for farm equipment.**
3. **Students will analyse how changes in equipment configuration alter centre of gravity.**
4. **Students will be able to apply lesson to their SAE’s and work to enhance safety procedures and reduce injury.**
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| **Relationship to Unit Structure:** Connect the previous lesson of building a mini tilt-table by introducing the topic of angles, stability and centre of gravity. Also address the relationship of these areas to safety in the workplace, farm or SAE project. |
| **Instructional Materials/Resources:*** Mini-tilt table
* Angle and stability worksheet
* Model tractors and farm equipment
* Eggs
* Velcro
* Metal tray
* Rubber bands
* Small rocks
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| **Methods and Instructional Strategies** |
| **Anticipated Student Misconceptions:** Rollover protection on tractors will make you invincible to injury. |
| **Concept Prerequisites:** 1. General understanding of weight distribution and centre of gravity.
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| **Introduction-****Anticipatory Set:** | <https://www.youtube.com/watch?v=vWy0-Eehwro>Play short video on benefit of ROPS in farm and tractor safety. |
| **Instructional Activities:**Includes questioning techniques, grouping strategies, and pedagogical approaches. | Students will work in randomly assigned groups of 3-4 to complete the exercises. Before they break off into groups, demonstrate a control test of the tilt table and have students record results. Also demonstrate the Mr. Egg portion of the test so students know what to do. Split into groups after this. Give each group member an “Angles and Stability” worksheet to fill out as they progress through the lesson. Allow them free reign to use whatever model equipment is at hand to experiment with different centres of gravity. Make sure that they all perform at least two Mr. Egg tests (one for a tractor with a ROPS and another for a tractor w/o a ROPS.  |
| **Wrap Up-****Synthesis/Closure:** | Use the last 5-7 minutes of the class to discuss what students discovered about stability and centres of gravity in tractors. Some questions to ask: (1) How did changing the weight in the loader effect results, (2) What happened when you raised or lowered the bucket, (3) Did the tractors with a ROPS protect Mr. Egg? Have students share any interesting results they found. Finally, if time, relate back to SAE and farm safety and ask for examples of how they can implement what they learned into their SAE and work. |
| **Differentiation According to Student Needs:**Encourage students to create their own experiments that align with the activity workshop.  |
| **Assessment (Formative and Summative):** Have students take a 10 of 15 question multiple choice or T/F test regarding centre of gravity, factors affecting it, safe operating limits, and circumstances that will change the safety protocols  |

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| **Angle and Stability Worksheet** |
| Situation (how is the tractor oriented, and what tractor you used) | Critical angle (at what angle did the tractor rollover | Why did it rollover at this angle? Specifically relate it to centre of gravity and stability | Was this a greater or lesser angle than you expected? | What was the fate of Mr. Egg? (Safe, cracked, killed, etc.) |
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More cells can be added depending on need