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| **Class:** Agricultural Mechanics | **Date:**   |
| **Unit:** SAE Safety | **Lesson Title:** Angles and Stability – ATV/UTV |
| **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** ATVs/UTVs **and prevent rollovers from occurring.**
2. **Students will develop an understanding of centre of gravity and stability for** ATVs/UTVs**.**
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 ATV/UTV
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| **Methods and Instructional Strategies** |
| **Anticipated Student Misconceptions:** ATVs/UTVs can operate on any kind of terrain/slope safely.  |
| **Concept Prerequisites:** 1. General understanding of weight distribution and centre of gravity.
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| **Introduction-****Anticipatory Set:** | Choose one of the following videos as an introductory/anticipatory set. <https://www.youtube.com/watch?v=umuDLkCSClQ&feature=youtu.be>Play short video on Quadbar crush protection device. <https://www.youtube.com/watch?v=Kua2J4FbHD8>Play short video on safe ATV rider positions. <https://www.youtube.com/watch?v=eF1yOK652Oc&feature=youtu.be>Play short video on general ATV/UTV safety. <https://www.youtube.com/watch?v=XasE3zaovwM&feature=youtu.be> Play short video of ATV accident testimonial. |
| **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. 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 tests (one for an ATV and another for a UTV.  |
| **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 ATVs/UTVs. Some questions to ask: (1) How would changing the weight being carried effect results, (2) How would altering the location of the load being hauled effect results (IE – bags of feed on the front of an ATV versus on the rear), (3) How did results differ between the ATV and UTV? 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 ATV/UTV oriented, and what model was used? | Critical angle – at what angle did the ATV/UTV 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? Explain your thinking. |
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More cells can be added depending on need