Lesson Plan Template-Strawbees CS Tool

3rd-4th grade Science and Computer Science Lesson

Standards / Objective	**<u>NGSS 3-PS2-2:</u>** Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. **<u>MD K-12 Computer Science Standards</u>** **3.AP.A.01** Develop and compare multiple algorithms for the same task. **3.AP.M.02** Modify, remix, or incorporate portions of an existing program into one's own work, to develop or add more advanced features (grade-level appropriate).	**<u>Objective:</u>** Students will create an algorithm for building a swing. Then, students will build a mechanical arm to make the swing move. Then, students will program a Microbit with the Strawbees Robotic Inventions Add-on to make the swing move. **<u>Ext. or G&T Objective</u>**: Students will create an algorithm to build a crane. Then, students will build a mechanical arm to make the crane move. Students will program a Microbit with the Strawbees Robotic Inventions Add-on to make the crane move and/or complete a task.
Warm-up: 10 mins	• Welcome (2 mins) • Attendance (3mins) • Warm-Up (5-8 mins)	**<u>Warm-up:</u>** **What makes something move?** **(A:** a force, a push, a pull, if something bumps into it.) **How can we predict the direction in which something will move when it is moved?** **(A:** The direction of the force determines the direction of the motion**.)**
Review: 5 mins	• Review of previous lessons (5 mins)	**<u>Review:</u>** Review how things are moved when they are at rest. (**A:** Objects in motion stay in motion. Objects at rest stay at rest, unless an outside force acts upon them. *Newton's First Law of Motion)
Intro to Concept: 5 mins	• Objective (3 mins) • Opening Question (related to lesson concept) (3 mins) • Vocabulary (5-8 mins) • Explanation of Materials (5 mins) • Song (5 mins) • Book (5-10 mins) • Game (5-10 mins) • Video (explaining concept) (5-8 mins)	**"Today, we are going to use a STEM tool called Strawbees to write an algorithm to build a structure that can produce motion. Then, we will make the structure move using a microprocessor called a Microbit and a robotic arm."** **"First, let's review some vocabulary"** **<u>Vocabulary:</u>** **Force:** the push or pull on an object with mass that causes it to change its velocity. **Motion**: A change in position with respect to surrounding and time. **Rest:** No change in position with respect to surrounding and time. **Inertia:** the resistance of any physical object to a change in its velocity.

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		Algorithm: a set of directions that can be followed to produce a result.
Activity **(25 mins)**	● Model lesson/activity (5 mins) ● Whole Group Work (5-10 mins) ● Individual work (10-15 mins) ● Small Group work (15-20 mins) ● Unplugged Activity (10 mins) ● Code.org (10-15 mins) ● Scratch (10-15 mins) ● Typing practice ● Basic Computer skills practice	**Whole Group Activity:** Teacher divides students into groups of 2-3. Each group is given a set of Strawbees and connectors. Teacher guides students into building simple structures, such as triangles, rectangles and cubes. Students will use these basic shapes to create more complex structures such as swings and cranes. **Small Group Activity:** Students assign themselves group roles: e.g. builder, programmer, scribe. Students discuss what structure they want to build and first create an algorithm to build the structure with the Strawbees. Students should predict and record how the swing or crane will move when a force is exerted on the structure. Then, students build the structure with the Strawbees and use different forces (pushes or pulls) to move the swing or crane. **Ext:** Groups can then build the robotic arm to make the crane or swing move. Then, students can take turns programming the Microbit to make the crane or swing move. Teacher should provide source code for the program depending on the level of programming proficiency of the students. If students need more support, they can watch youtube videos demonstrating how to make the robotic arm move the swing or crane.
Debrief/ Reflection **(10 mins)**	● Ask students the results of their work (5-10 mins) ● Ask student to explain concepts of the day to class (5-10 mins) ● Have students journal in Comp Sci journals or respond to a journal prompt (5-8 mins)	**Reflection:** **<u>Whole Group Discussion:</u>** ● What forces caused the crane/swing to move? ● In what direction did the swing/crane move? ● Were you able to predict the motion of the swing/crane? How did you know? Teacher should collect students' written algorithms for building the structures, and the programs to move the robotic arm, if applicable.

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