



FUTURE GOALS™

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Hockey Scholar Curriculum Guide

NHL Future Goals – Hockey Scholar

Your local NHL team has made it all the way to the Stanley Cup Final – and now you just need to win 4 games to bring home the cup! You've been asked to head down to your team's headquarters to help them prepare for each of the games. Each day leading up to the game you are faced with new tasks that require a strong understanding of science, math, and engineering concepts to succeed. The countdown has begun: help get all the preparations done in time so your team can compete to win the ultimate prize: the Stanley Cup.

*Future Goals – Hockey Scholar*TM brings science, math & engineering concepts to life using the exciting, fast-paced game of hockey. Through immersive hockey simulations, each online module enables students to explore real-life applications of fundamental STEM concepts. Designed for elementary and middle school students, this online course combines cutting-edge instructional design and game-based simulations to build students' confidence, mastery, and excitement around critical STEM topics.

Each online module is structured to reinforce scientific method by mimicking the steps of a typical science experiment. Student progression through a module parallels the steps of a science investigation: making initial predictions and observations, performing experimentation, analyzing data, and devising a conclusion.

Each online module is designed to:

- *Build student's conceptual understanding of foundational science, engineering and math concepts.* Students must master a unique STEM challenge in each module. From understanding area calculations of an ice rink to exploring the conservation of energy involved in a falling puck, students are exposed to concepts that form the foundation of a strong STEM education.
- *Develop scientific and critical thinking.* The online modules are structured so that students experience each part of the scientific method. Students perform every step of a typical investigation, from making predictions to analyzing physical phenomena and making evidence-based conclusions.
- *Learn about potential STEM careers.* Students are exposed to the behind-the-scenes STEM careers – such as equipment managers and ice technicians - that make a hockey game possible.

The online modules are accompanied by a variety of offline, paper-based lessons that reinforce and extend content covered by *Future Goals – Hockey Scholar*. Students can access these offline lessons directly through the course.

COURSE OVERVIEW

Future Goals – Hockey Scholar consists of:

- **Modules:** The course is composed of 12 online learning modules, each taking approximately 10-20 minutes. Modules can be sorted by subject area – either science, math or engineering design. Cumulative course time is estimated to be between 3-5 hours of computer seat time.
- **Standards Alignment:** The curriculum aligns to Next Generation Science Standards (NGSS) and Math Common Core State Standards (CCSS) in elementary and middle school grades.
- **Assessments:** Pre- and post-assessments to measure student knowledge gains
- **Offline lessons:** The online course includes access to a companion offline curriculum that covers STEM topics from the course, related fitness and nutrition lessons, as well as PE lesson ideas to get your students up and moving!

DETAILED COURSE OUTLINE

The Equipment

In Modules 1 through 3, students are tasked with helping the Equipment Manager get all the players' gear ready for the next game. Students must learn about the engineering design behind the team's skates, sticks, and padding to help the team's performance.

Module 1: The Skates

- **Overview:** Students learn the effect of the skate blade's radius of hollow (ROH) of on stopping distance. Students test players' stopping distances with different ROH values and analyze the impact on stopping performance.
- **Learning Objectives:**
 - SWBAT perform controlled experiments by adjusting experimental variables
 - SWBAT identify relationships and patterns between variables

Module 2: The Stick

- **Overview:** Your team has lost their sticks, and it's up to you to return the right one to each player. Students explore the variables of stick design (flex, lie, and curve) and apply this knowledge to choose a stick that matches the player's individual preferences.
- **Learning Objectives:**
 - SWBAT meet design criteria for a proposed solution
 - SWBAT identify relationships and patterns between variables

Module 3: The Goalie Pads

- Overview: Students test different materials and shapes for the goalie's leg pads, and determine which combinations provide maximal protection and maneuverability.
- Learning Objectives:
 - SWBAT must meet design criteria for a proposed solution
 - SWBAT perform controlled experiments by adjusting experimental variables
 - SWBAT identify relationships and patterns between variables

The Ice

In Modules 4 through 6, students must work with the Ice Technician to prepare the perfect skating surface for the next game – everything from getting the optimal ice and air temperature in the arena to painting the correct geometric constructions on the ice.

Module 4: Uncover the Ice

- Overview: It's time to uncover the ice. To remove each individual section of the ice covering, students must first determine the area of the section to be removed. When the ice has been fully revealed, the user can use the collected information to determine the area of the rink itself.
- Learning Objectives:
 - SWBAT identify and explain the units of measurement used for area and volume calculations
 - SWBAT describe how unit squares can be combined to create an object of a given area
 - SWBAT analyze area calculations to derive the area formula
 - SWBAT apply area formulas for whole-number edge lengths

Module 5: Prepare the Surface

- Overview: Help create the perfect ice surface for the upcoming game. Students have a molecular view of the ice surface, and explore the impact of different air and ice temperatures on the ice conditions. Students learn about the different states of matter – solid, liquid, gas – and how the temperature changes will affect skating and the motion of the water molecules.
- Learning Objectives:
 - SWBAT explain that matter is made up of particles that are too small to see (i.e. molecules)
 - SWBAT explain the effect of temperature on phases of matter, as well as molecular motion
 - SWBAT identify the freezing/melting and the condensation/evaporation temperature points for water

Module 6: Paint the Ice

- Overview: The ice needs to be repainted. Before the next game begins, students must follow the mathematical instructions step-by-step to draw the lines correctly on the rink, and form the correct geometric constructions.
- Learning Objectives:
 - SWBAT define parallel, perpendicular, congruent, radius and diameter
 - SWBAT identify points in a grid based on coordinates provided
 - SWBAT identify and draw parallel and perpendicular lines and circles (based on radius and diameter provided)

The Drills

In Modules 7 through 9, students must help the head trainer prepare the players for the next game. Students collect critical data during the players' drills to analyze their speed, strength, and endurance.

Module 7: Speed

- Overview: During a game, most races towards a loose puck are won or lost in the first strides. For this reason, you need to build your players' explosive speed. To help prepare for the next game, you are running drills to time your players and analyze their speed. Once each sprint is complete, determine the average speed by calculating distance over time.
- Learning Objectives:
 - SWBAT recognize how to measure time and distance using appropriate tools
 - SWBAT perform calculations to find the average speed over time
 - SWBAT analyze graphical representations of distance vs. time

Module 8: Strength

- Overview: You need to build your players' leg strength to help with their speed on the ice. No two skaters are alike, however, so you'll need to train each player in their target zone to make the training effective. Students can adjust the weighted sandbags (mass) or the speed of each player to reach each individual's target training zone.
- Learning Objectives:
 - SWBAT explain the positive relationships between mass, velocity, and kinetic energy
 - SWBAT recognize that velocity has a greater impact than mass on kinetic energy

Module 9: Endurance

- Overview: Help the head trainer closely monitor the players' conditions during practice to ensure they are training in the most effective zone. Students monitor heart rate, breathing rate, and body temperature over the course of a workout, and see how physical exertion can impact these factors.
- Learning Objectives:
 - SWBAT collect data to analyze the relationship between physical exercise and its effect on heart rate, breathing rate, and body temperature

The Final Practice

In Modules 10 through 12, the head coach needs your help running the final practice. Students must help the team with critical components of the game – from face-offs to passing and shooting - to make sure the team brings home the win.

Module 10: The Face-off

- Overview: Help your team maximize their face-off percentages by ensuring the perfect puck drop for your player. Students must select the best puck drop height for each player to ensure it reaches the ideal range of kinetic energy before hitting the ground.
- Learning Objectives:
 - SWBAT explain the difference between kinetic energy (KE) and potential energy (PE)
 - SWBAT identify the relative amount of KE and PE in a system, based on an object's speed and position relative to the ground
 - SWBAT explain the relationship between KE and PE in a closed system (i.e. energy is conserved)

Module 11: The Pass

- Overview: Students learn how to utilize angles to pass the puck around their opponents. Students must find and measure the correct angle for their bank pass – which causes the puck to bounce off the boards – to complete the play successfully.
- Learning Objectives:
 - SWBAT measure angles in whole-number degrees using a protractor
 - SWBAT recognize angles as additive
 - SWBAT describe that supplementary angles form a line with a measurement of 180 degrees
 - SWBAT analyze data in tables to reveal patterns that indicate relationships (e.g. supplementary angles & the Law of Reflection) to predict future results

Module 12: The Shot

- Overview: Students are tasked with hitting the puck across the ice such that it will stop at a specific spot. However, the friction of the ice changes depending on how fresh and how cold the ice is. Students must adjust their force depending on the friction level to successfully land the puck in the target area.
- Learning Objectives:
 - SWBAT describe net force on the puck and how this leads to the puck's motion (ie. unbalanced forces lead to motion)
 - SWBAT explain how different friction will influence the force on the puck