Exploring Physics and Technology: A Study in Teaching Kinematics to Student-Athletes

Essential Questions

• Does learning the basic physics principles of motion improve specific soccer skills?

• Are students more motivated to learn if it is through a purposeful, authentic application that interests them?

• Does blended learning promote higher order thinking skills, engagement, ownership of learning, and science literacy skills?
What the future of science education should look like

“Students’ experience in school can either advance or hinder advancement depending on whether or not the full diversity of learners’ interest, passion and creativity are engaged.”

Blended Learning: Soccer Unit Overview

- 32 students (grades 9-12) enrolled in physics classes
- 9–week Unit Physics of Motion
- Utilized blended learning
- Met NGSS Science and Engineering Practices
Blended Learning Environment

• Integrating technology and non-technology based instructional strategies in various learning environments to maximize the potential for content mastery.
  – Learning environment that consists of face-to-face and online learning opportunities.
Blended Learning

Technology Based Instructional Strategies
- Adidas miCoach Smart Ball
- PhET Simulations
- APEX On-line Learning

Non-Technology Based Instructional Strategies
- Small group discussion
- One-to-one instruction
- Whole class instruction

Learning Environments
- In-class
  - Flex time
  - Soccer Pitch
  - Sports related travel
- Out of Class

Passion for Learning
Technology Integration:
Adidas miCoach Smart Soccer Ball

- Soccer ball with embedded sensor
- Sensor captures projectile motion data
- Sensor relays data to smartphones or iPads through an application
Technology Integration: PhET Simulations

- Physics Education Technology Project (PhET)
  - Online simulations
  - STEM
  - Projectile motion
Projectile Motion - collecting and analyzing data

range (m)  height (m)  time (s)

- Golfball
- Baseball

- Angle (degrees): 80
- Initial speed (m/s): 18
- Mass (kg): 0.145
- Diameter (m): 0.074

- Air Resistance
- Sound

Passion for Learning
Technology Integration: APEX On-line Learning

• Served as an on-line resource for the theoretical fundamentals of Kinematics.

• Program features utilized during this project:
  – Tailored unit to meet project needs
  – Gauged for scope and sequence
  – Graded quizzes instantly
  – Posted deadlines on calendar
Technology Integration: APEX On-line Learning

Content Resource: Projectile Motion Video
Applied Blended Learning:
Soccer Research Project Final Task

• Students designed projectile experiment

• Integrated knowledge gained from all blended learning sources.

• Examples of independent and dependent variables
  – How does ball spin affect the distance of flight?
  – How does ball spin affect time of flight?
Technology Summary

1. Adidas miCoach Smart Ball
   • On Field-Drills
     • MLS size 5 regulation weight soccer ball, captures launch speed, launch angle, spin, spin type, strike point, and flight path data

2. PhET Simulations
   • Online Simulations
     • Free online educational simulation demonstrating principles in physics, chemistry, biology, earth science and mathematics

3. Apex Online Learning
   • Content Resource
     • A virtual online learning software with complete course curricula in science, english, math, social studies, world languages and electives.
Non-Technology Summary

Cognitive Skills

- Higher order thinking
- Engagement
- Ownership of Learning
- Science Literacy

Learning Outcomes

- Created a controlled experiment
- Analyzed data from real-world
- Design unique research question based on soccer interest
- Passionate and interested in topic
- Writing using technical vocabulary

Passion for Learning
NGSS Science and Engineering Practices

• Asking questions (for science) and defining problems (for engineering)
• Developing and using models
• Planning and carry out investigations
• Analyzing and interpreting data
• Using mathematics and computational thinking
• Constructing explanations (for science) and designing solutions (for engineering)
• Engaging in argument from evidence
• Obtaining, evaluating, and communicating information
Blended Learning

Technology Based Instructional Strategies

Non-Technology Based Instructional Strategies

Learning Environments

Learning Styles

Visual, auditory, kinesthetic and tactile

Individualized learning

Passion for Learning
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QUESTIONS

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