Science Student vs Student Scientist

Science Student

• Master Current Knowledge

Student Scientist

• Master Current Knowledge
• Create New Knowledge
• Publish
Model of the Process of Science

Master Current Knowledge → Conduct Investigation → Create New Knowledge → Write Report → Publish
Master Current Knowledge

Process of Science

- Conduct Investigation
- Create New Knowledge
- Write Report
- Publish

- Class discussion
- Text reading and homework
- Labs
How does the depth of a puddle affect the bounce of a basketball?
International Scholastic Journal of Science 9 (1) Jan-Dec, 2015

Bounce of a Basketball in a Puddle: Depth of Water and Coefficient of Restitution

Chankyu Han
International School Bangkok,

Abstract

A basketball was dropped into puddles with depths of water ranging from zero to 4 mm from a height of 1.1 m to investigate the relationship between the depth of water in a puddle and the coefficient of restitution with measurements of the drop height and bounce height. It is shown that the coefficient of restitution has a square root relationship with the depth of the puddle. A "puddle constant" is defined and found for this drop height and this ball to be 830 kgs⁻¹.

Keywords: basketball, water depth, coefficient of restitution
<table>
<thead>
<tr>
<th>Founded: ISB Journal of Physics</th>
<th>Papers Published</th>
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<td>2007</td>
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<tr>
<td>16</td>
<td>41</td>
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</table>
J. of Material Science and Engineering A. (Elsevier, USA)

Photonic Network Communications. (Springer, USA)

The Physics Teacher. (AAPT, USA)

J. of Micromechanics and Microengineering. (IOP, UK)

Industrial Health. (NIOSH, Japan)

Canadian J. of Physics. (NRC, Canada)
So, how do I get my students to become scientists?
What is it?

How does it benefit students?

Can you do it?
What is it?
SRP: What is it?

- Embedded in an Inquiry-Based Science Program
- Students conduct Original, Entry-Level Scientific Research
- Opportunity to Publish
Model of the Process of Science

1. Master Current Knowledge
2. Conduct Investigation
3. Create New Knowledge
4. Write Report
5. Publish
SRP: What is it?

Embedded in an Inquiry-Based Science Program

Use Standard Experiments

- Design
- Conduct
- Analyze
- Report
SRP: What is it?

Students conduct Original, Entry-Level Scientific Research

Ask Original Questions

- How does the Volume of a balloon affect the force required to pop it?

- How does Spin Rate affect Vortex Formation?
SRP: What is it?

Opportunity to Publish

ISJOS Publishing Process

- Submitted to ISJOS for Review
- Accepted authors **mentored** through the publishing process
How does it benefit students?
SRP: How does it benefit students?

Students in the **SRP Program** VS. Students in the **Standard Inquiry-Based Science Program at ISB**
SRP: How does it benefit students?

Students in the SRP Program

Shown to have a significant positive effect (p < 0.05) on students’ ability to:

- Analyze data
- Think critically and problem-solve
- Formulate a research question
- Read and write scientific reports or papers
SRP: How does it benefit students?

Students in the **SRP Program** are shown to have a **significant positive effect** on students’:

- Confidence in ability to **contribute to science**
- Confidence in ability to **do well in future science courses**
- Ability to **work both independently and collaboratively**
- **Time management**
SRP: How does it benefit students?

Students in the SRP Program

Shown to have a **significant positive effect** on students’:

- Desire to **enroll in** a university program in **science**, **engineering**, or **medicine**
- Desire to **get involved in** scientific **research** while at university
- **Preparation for** more **advanced scientific coursework** and **research work**
“I gained an ability to not only **analyze data and conduct an experiment**, but also to **think critically, plan ahead, and manage my time**. I also discovered an affinity for **seeking and learning new knowledge**, which was inspired in part by experimental research.”
SRP: How does it benefit students?

“The experience enabled me to acquire skills including the ability to **think logically, to plan and practically execute** an individually established idea and to create a **professional account** of an investigation. These **skills can be applied to almost any area of study** and I expect it to help me greatly in the future.”
“[after 4 years of university] I realize how important having a published paper is in the academic world now, and how favorably it is looked upon. I wish I had understood this earlier.”
SRP: How does it benefit students?

“Publishing a paper for the Journal of Science was one of the highlights of my high school education and I feel very grateful for having had that opportunity.”
Can you do it?
SRP: Can you do it?

**Crucial Conditions**

**Lead Teacher(s)**
- Competent, passionate, committed

**Students**
- Motivated to excel in class

**Curriculum**
- Significant time for lab work

**Equipment**
- Computers and data-logging equipment available
SRP: Can you do it?

Important Conditions

- Flexibility
  - Administrative cooperation

- Teacher-Student Ratio
  - Small class size

- Financial Support
  - Funding for program
Lead teacher(s) identified and prepared

Curriculum developed and implemented (Model of Process of Science)

Develop expertise in the skill set needed to implement and run the program
### Resources

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<tr>
<th><strong>StudentScientists.org</strong></th>
<th><strong>ISJOS.org</strong></th>
<th><strong><a href="mailto:Editor@isjos.org">Editor@isjos.org</a></strong></th>
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<tr>
<td>- Resources on the SRP program and its implementation</td>
<td>- Website of the International Scholastic Journal of Science</td>
<td>- For all links, a copy of this presentation, or further discussion</td>
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**Thank You!**

**Questions or Comments?**