“I Just Love It”:
A Qualitative Exploration of Why First Year Physics Students at a Mid-Size Atlantic Canadian University Choose to Major in Physics, Or Not

Laura Stiles-Clarke
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PRESENTATION OUTLINE

- Introduction and Brief Literature Review
- Methodology and Methods
- Results
- Implications, Limitations, Conclusions
- Summary
- Questions
Physics professors have researched decreased enrollment since 1970s

Overall goal to improve:
    a) science, and
    b) society
    by increasing number of contributors and diversifying their backgrounds

Personal/Professional Perspectives
Personal and Professional Perspectives

- My path towards physics
- My physics degree
- Teaching high school
- Teaching postsecondary physics
Population of Eligible Physics Majors at this University

- Completing PHYS 1101
- Enrolling in PHYS 2300

<table>
<thead>
<tr>
<th>Year</th>
<th>Completing PHYS 1101</th>
<th>Enrolling in PHYS 2300</th>
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<td>100</td>
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<td>2013</td>
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<td>15</td>
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Research questions

- What factors influence the decision-making process of students to major in, or not major in, physics at a mid-size university in Atlantic Canada?
- From the perspective of first year physics professors at this university, what influences the students’ decisions to choose or reject a physics degree program?
Literature Review: What is PER?

- Reaction to “loss” of space race, declining interest and enrollments
- Physicists carried out (mostly quantitative) research on the courses they were offering
  - Why couldn’t students learn the same way their professors had learned?
  - Why aren’t there more women in physics?
- “The pipeline” (Aikenhead, 2006)
- Humanistic curricula
- Knight (2004)
Resistance to PER

- Some progress is being made, but why not more?
- Carlone (2003) discussed the culture of physics – elitist, traditional, stalwart
- Professors say there is a “lack of time”
- Why doesn’t a traditional curriculum work for my students?
- Ironically, some students also resist
Influences on the decision making process
Physics identity

- A person’s sense of self as related to physics
- Performance, interests, competence, and recognition by others (Hazari et al., 2010)
- Strong physics identity is a predictor of persistence in physics (Haussler & Hoffmann, 2002)
Relationship to other fields of research

- Science education
- Science identity, self-concept
- Culture studies
- Multiple intelligences, learning styles
The introductory physics course

- “Gateway” course
- Traditional curricula
  - Large lecture, passive learning
  - Very large volume of work
- Transformed curricula
  - Interactive engagement strategies
  - Peer-to-peer learning
  - Conceptual focus
  - Can encourage enjoyment and persistence
Methodology

- Poststructuralist, constructivist paradigm (Denzin & Lincoln, 2005)
- Case study
  - Qualitative
    - (online survey, N=14, professor interviews N=2)
  - Instrumental (Stake, 2005)
  - Boundedness – participants, time frame
  - Context – student’s choice and situation are tightly intertwined
Validity

- Authenticity
  - Sought input from all voices
  - Consistency of findings within and without the study
    - Students
    - Instructors
    - Documents
  - Diverging opinions given voice
The case

- A mid-sized university in Atlantic Canada
- The department
- The courses – PHYS 1100/1101, PHYS 1500
  - About 200 students on the first day
  - 3 hours lecture, 3 hours lab each week for 12 weeks in fall and 12 weeks in winter
  - Some common PER techniques used in 1100/1101
  - All students in both courses invited to participate, plus both professors, and me
The participants

- Students
- Professors
- Researcher
Methods

- Online, voluntary, anonymous, mainly qualitative survey
- Semi-structured interviews with professors
- Physical environment
- Document mining
- Ethical considerations
Results: Student and Professor Perceptions

**Interest**
- Interesting Yet Challenging
- I Just Love It
- Physics is Awesome
- Required
- Decided Previously
- Practical Everyday

**Competence**
- Too Hard/Work Volume
- Time and Resources
- Program Structure

**Recognition**
- Good Instructors
- Genuine Caring
- Personal Letters

**Performance**
- High Marks
- High School Experience
- Theory vs Numbers
- Less Successful Students

**Career Prospects Problem**

Student and Professor data
Professor data only
Student data only
Interest in Physics

“I just love learning physics. It requires a ton of problem-solving and it is super interesting.”

“Wanting to understand how things work”

“I have always loved physics very much. It is very interesting and satisfying to learn. It is the discovery and understanding of the unknown which is incredibly intriguing to me.”

“A great desire to learn more about the cosmos”

“I liked learning about why things happen/work the way they do. Physics explains that.”

“I found it interesting, to learn/know about how the world works, and why things work that way.”

“I found it interesting, to learn/know about how the world works, and why things work that way.”

“Physics is one of the most exciting scientific fields today because of all of the unknowns it has.”

“Physics for me is the study of almost everything that happens around us.”

“It taught me how to problem solve very well, and it explained how everything around me worked, which is exciting!... It's neat and practical stuff!”
Implications

- Good instructors
- Strong emotional connections
  - Decided previously
- Too hard/work volume
- Program structure
Limitations, Conclusions

- Sample size
- Gender issues
- Four dimensions of physics identity: interest, performance, competence and recognition
- Career prospects problem relates indirectly to physics identity
Summary

- Qualitative case study of first year physics students at a mid-size Atlantic Canadian university
- Online survey, semi-structured interviews
- Physics identity, influences on choice of major
- Results agreed with theory of physics identity, especially interest
- Career prospects problem
- Study to be repeated with new, larger data set

Thank you!

Questions?
References


