Teaching Physics in a Foreign Language: Challenges and Opportunities

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“Those who know nothing of foreign languages know nothing of their own.”

—Johann Wolfgang von Goethe
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UBC Facts:

- Public university
- Established: 1908
- Vancouver & Kelowna
- ~63,000 students
- Academic staff: 5474
- Acceptance rate: ~50%
- 34th – World ranking

14,434 international students from 162 countries!
My Physics Education
Trajectory

New tools
New everything
My Physics Teaching Language Trajectory

T: Russian – Hebrew – English

S: Russian – Hebrew+ – English++
My Inspiration

Korina Polinger, Israel

Eugenia Etkina, Rutgers University

These world-class physics educators teach in a non-native language…
Science Teaching ... and Language

Mathematics is the language in which God has written the universe”

– Galileo Galilei

Is English the language of Science? Is it Russian? Is it German?
Why does it even matter? **How do we teach in a foreign language?**
Teaching Physics in a Foreign Language
Teaching Physics in a Foreign Language - Challenges

- Lack of confidence: not a native speaker
- Communication challenges
- Different educational/classroom culture
- Different student & parents expectations
Challenges – Not a Native Speaker

Photo Electric Effect

$E=mc^2$
Challenges – Communication

University of Texas, Austin
Challenges – Classroom Culture
Challenges – Expectations

1960

These grades are terrible!!

2010

These grades are terrible!!
Teaching Physics in a Foreign Language
Teaching Physics in a Foreign Language - Opportunities

- Lack of confidence: not a native speaker
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Problem solving is communicating ideas.
You have to agree on the language you are communicating in by choosing your axes and defining your vocabulary…

Q1. A car is moving on a straight road at 5 m/s. It is accelerated at 3 m/s². What will be its velocity after 4 seconds?

\[
\begin{align*}
data \\
\text{u} &= 5 \text{ m/s} \\
\text{a} &= 3 \text{ m/s}^2 \\
\text{v} &= ? \\
t &= 4 \\
\text{s} &= ?
\end{align*}
\]

\[
v = u + at \\
= 5 + 3(4) \\
= 5 + 12 \\
= 17 \text{ m/s} \text{ Ans.}
\]
Knowing foreign languages helps when teaching physics. It stops you from taking the language of physics for granted!

*Speed and velocity*
Opportunities – Attention to Vocabulary and Concepts

Concepts first, words second…
Opportunities – You are a Foreign Language Learner

- 20% of Americans are bilingual.
- Speaking 2 languages improves brain efficiency & performance.
- There are 6,909 distinct languages spoken around the world.
- Over half of the world's population is bilingual.

55 million Americans speak a language other than English at home.

Language Trainers
The key to teaching anything is to remember what it was like not to understand that thing. That’s a very hard thing to do. Every time you come to understand something you didn’t understand before, you are transformed. You become a different person from who you were before. The key to teaching someone else to understand that same thing is to remember your former, untransformed self. If you can do that, I think you can teach anything, even physics.

David Goodstein
By teaching in a foreign language you naturally slow down and pay attention to the language of physics.

By teaching in a foreign language you bring your knowledge and traditions about physics learning.
Opportunities – Different Educational Culture

- What are expectations of students?
- Assessment of students?
- What is the role of parents?
- What is available at school?

- What are expectations of teachers?
- Assessment of teachers?
- What is the role of parents?
- What is available for Pro-D?
Opportunities – Different Educational Culture

• Your and parents’ views on science and science learning depend on the culture

• You can bring a different perspective

• Your background can help you connect with the students and parents
Being from a different culture helps you to challenge the “normal”:

Who learns physics?

Who teaches physics?

Who are physicists?

According to Unesco, 29% of people in scientific research worldwide are women, compared with 41% in Russia. In the UK, about 4% of inventors are women, whereas the figure is 15% in Russia.
Opportunities – Different Educational Cultures

Women in Math

Brunei leads APEC economies in female graduates of STEM disciplines!

49.2% of graduates in Brunei are females.

In the US – 31.9%
Opportunities – Different Educational Cultures

Different views of physics teacher Pro-D
“A different language is a different vision of life.”

—Federico Fellini

“Teaching in a foreign language gives you a unique chance to reach your students.”

—Marina Milner-Bolotin