National Differences in an International Classroom

Jennifer DeBoer

jdeboer@mit.edu

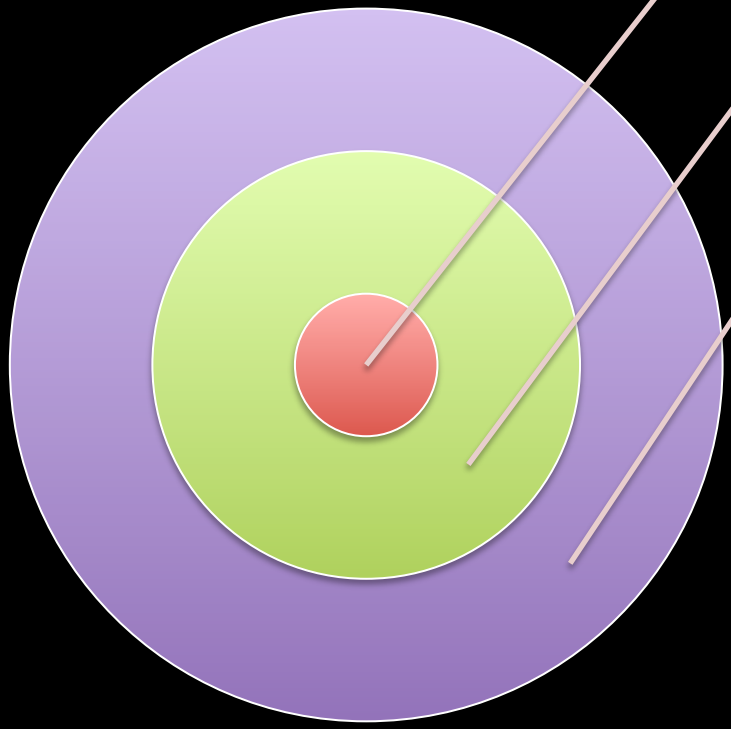
TLL Teaching & Learning Laboratory

Massachusetts Institute of Technology

1. Background on 6.002x
2. Student demographics
3. Differences in behaviors and outcomes
4. Predictive modeling

Students are nested within a country context

Real-world and virtual "classroom"



Student

National context

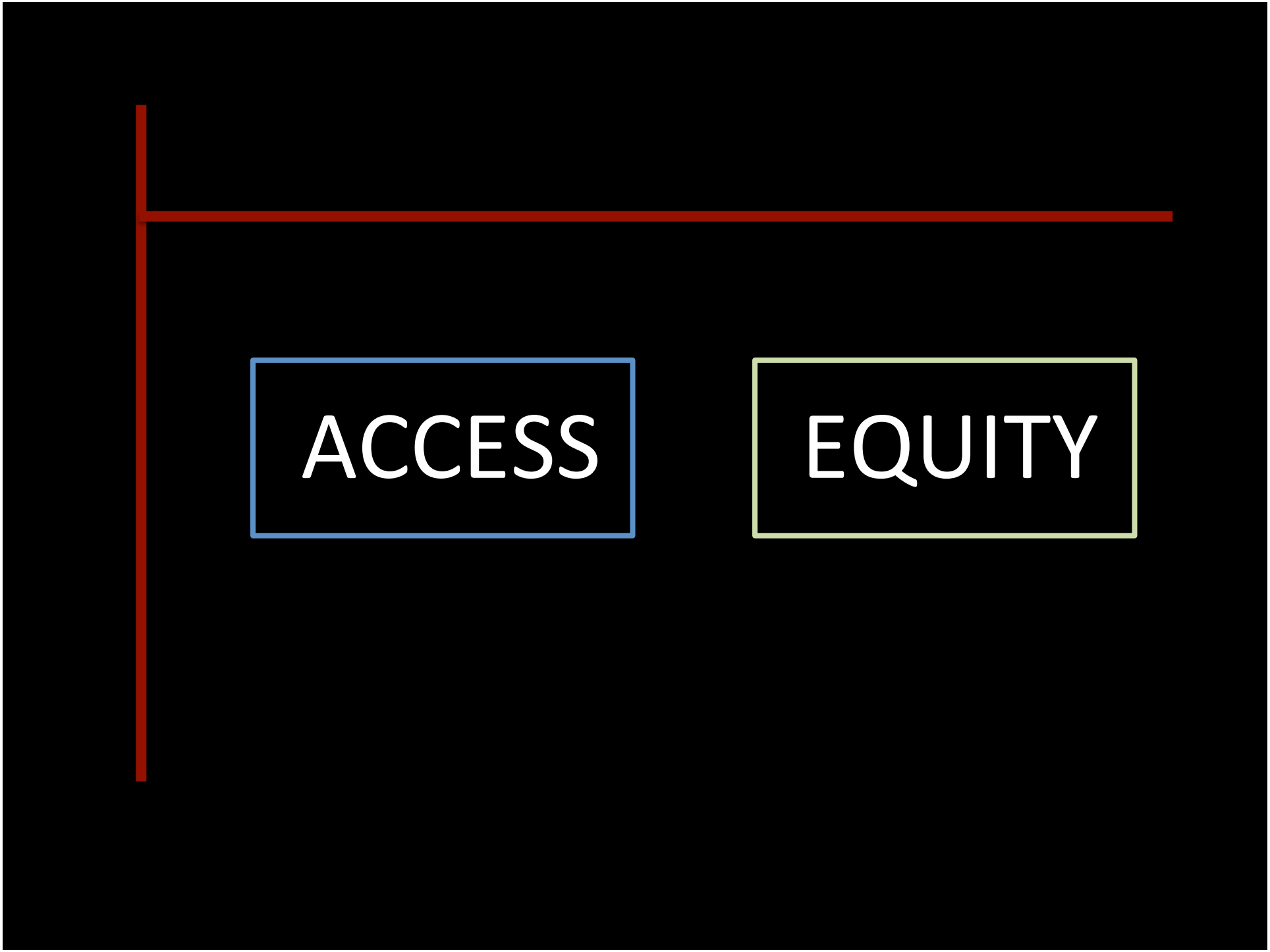
- Education system
- Political, social, economic characteristics

Virtual classroom

Need to understand interaction between virtual classroom and real-world context

Therefore, we ask:

- Who are the students?
- What are their behaviors and outcomes?
- Which individual and contextual factors predict higher achievement?
- *How can international policymakers use such tools as a vehicle for increased access to educational opportunity?*


ACCESS
EQUITY

Background

Background

"Circuits and Electronics" (6.002x)

- First MOOC offered by MIT
- March to June 2012

In-depth analysis of one class to inform the xMOOC "classroom" context and its analysis

This project is supported by NSF grant No. DRL-1258448

Background

6.002x course site

Courseware Index

Overview

Week 1

Administrivia and Circuit Elements
Lecture Sequence

Circuit Analysis Toolchest
Lecture Sequence

Basic Circuit Analysis
Homework due March 18

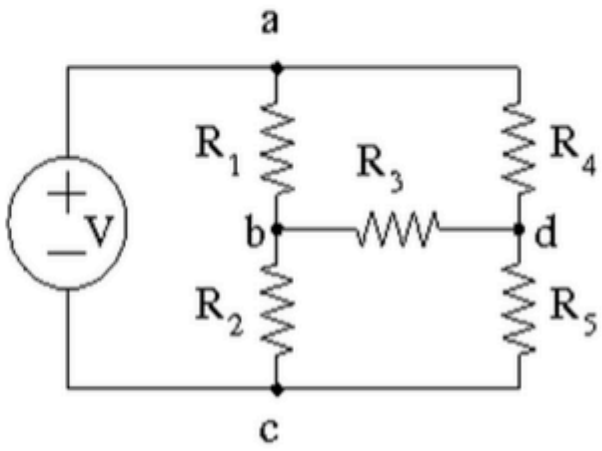
Resistor Divider
Lab due March 18

Week 1 Tutorials
Tutorial Index

Week 2

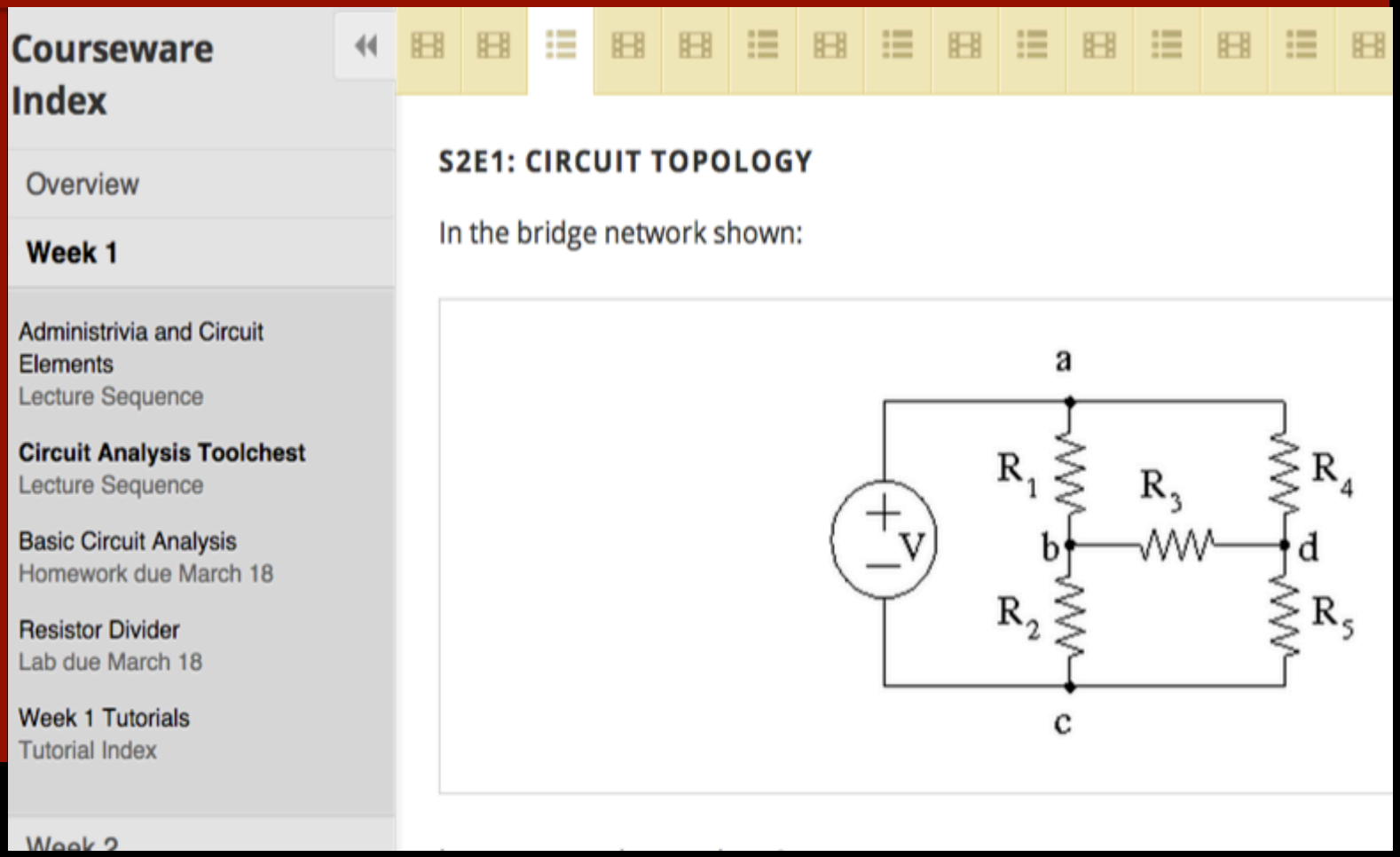
S2E1: CIRCUIT TOPOLOGY

In the bridge network shown:



Background

Variety of resources available



- "Khan Academy-like" videos
- Questions between video segments
- Tutorials
- Discussion forum
- Wiki
- Assessments (problem sets, labs, midterm, final)

Data overview

- **Clickstream data**
  - **230 million interactions**
  - **IP addresses, interactions with course components, assignments and exams**
- **Threads on discussion forum**
  - **12,696 threads 96,696 posts**
  - **Questions, answers, or comments**
- **End-of-course survey**
  - **7,000+ [matrix sample]**

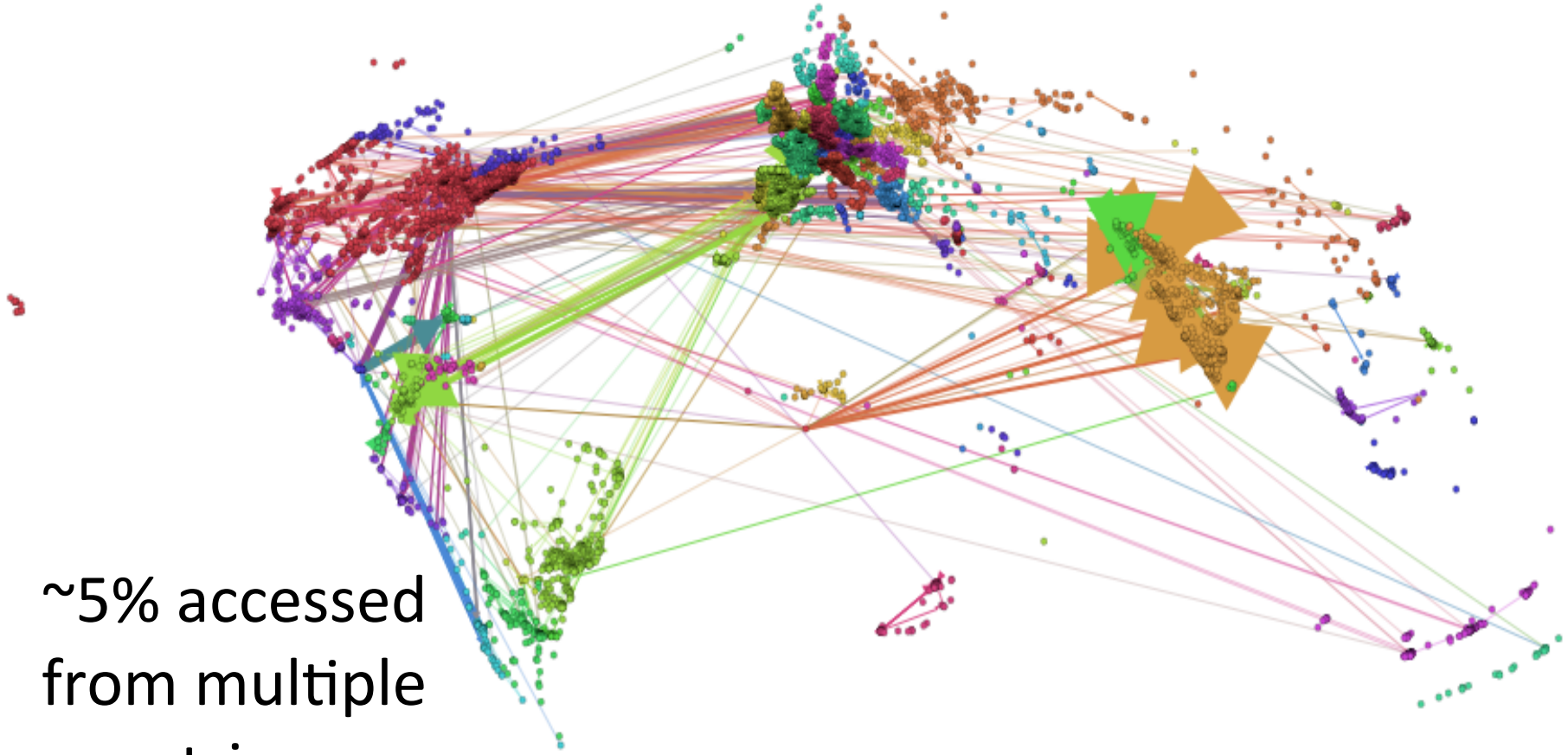
Individual students' backgrounds: general demographics

Who is accessing this MOOC?

- Where are they from?
- Have they had access to these materials before?
- What are their individual goals?

Student locations

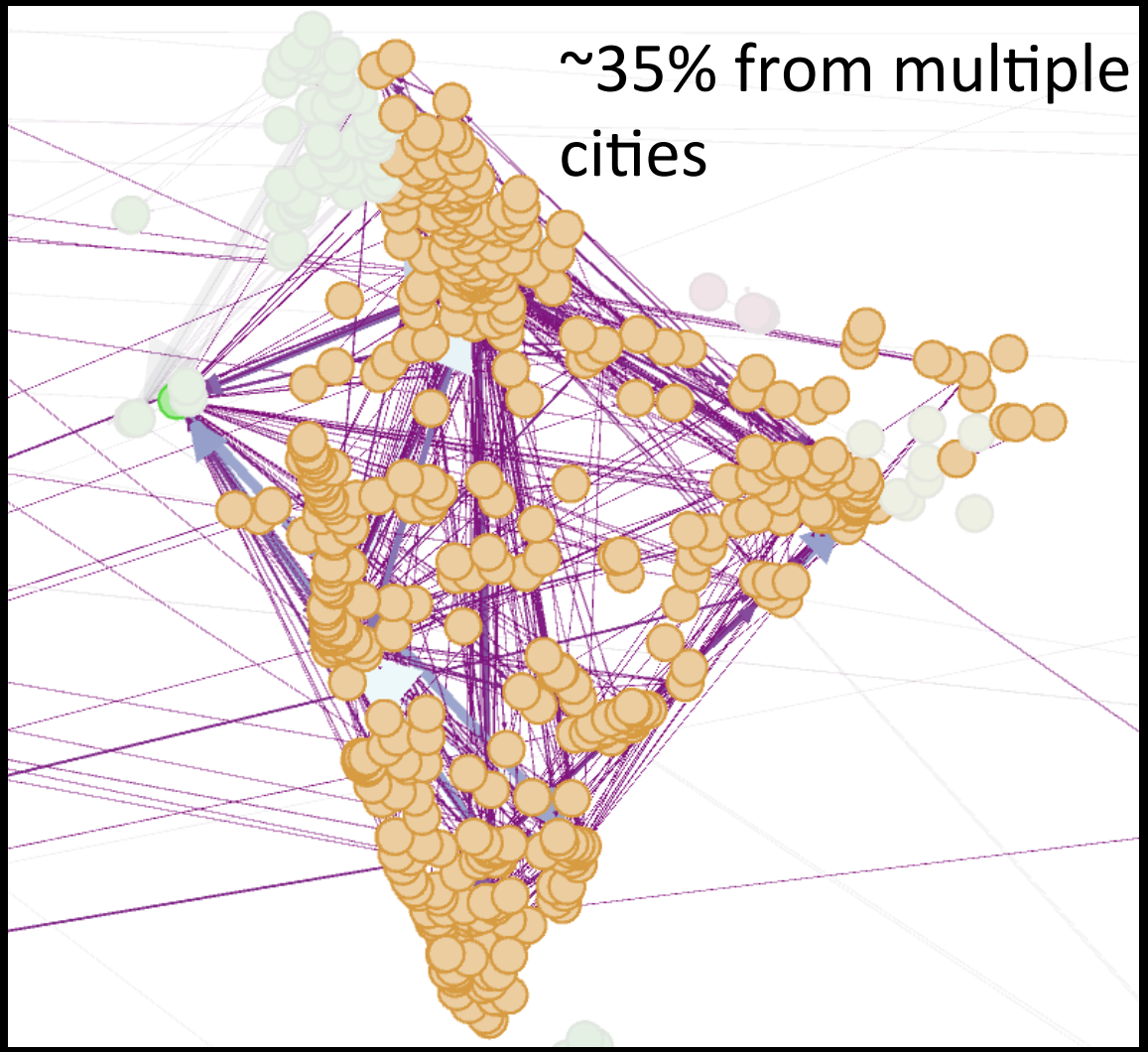
Mobile students



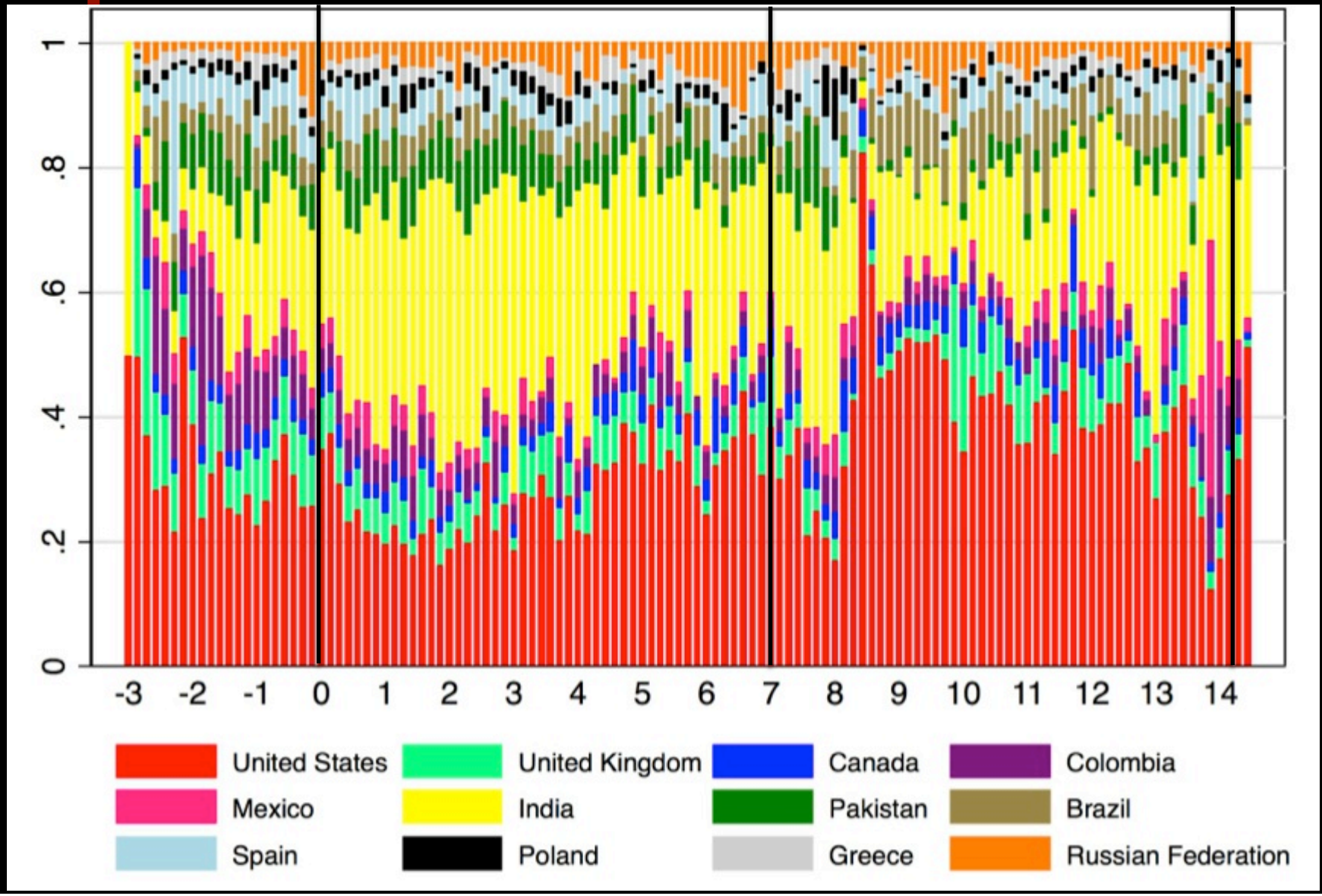
~5% accessed from multiple countries

Real-world and virtual "classroom"

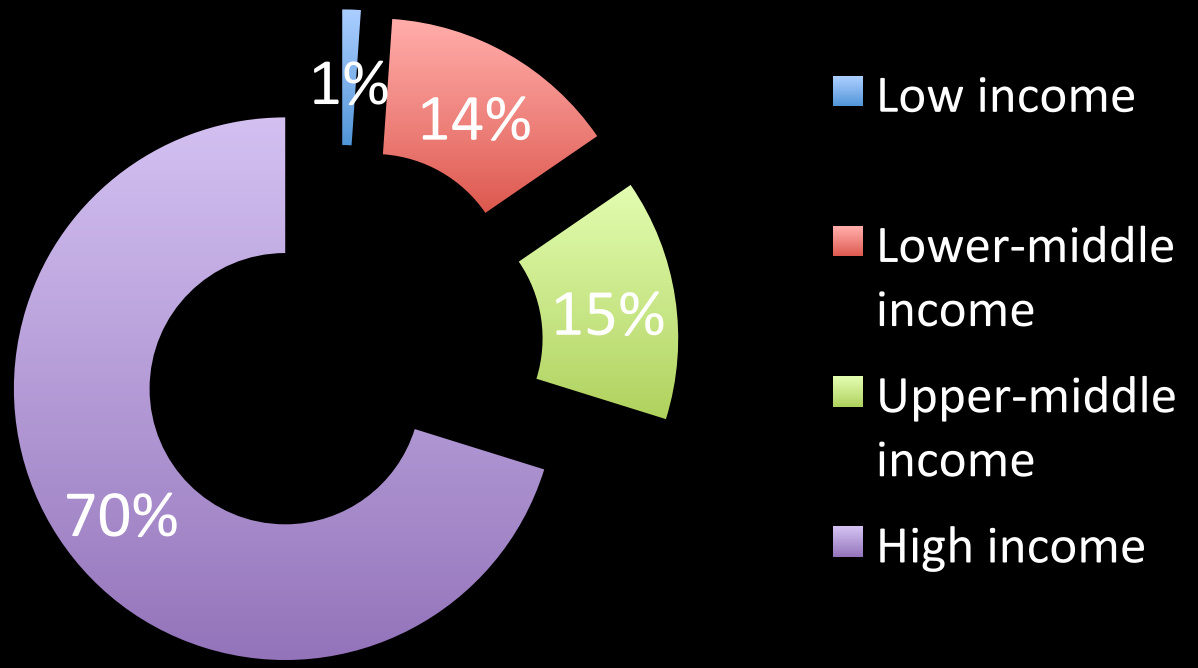
Travelers within India



Registration waves

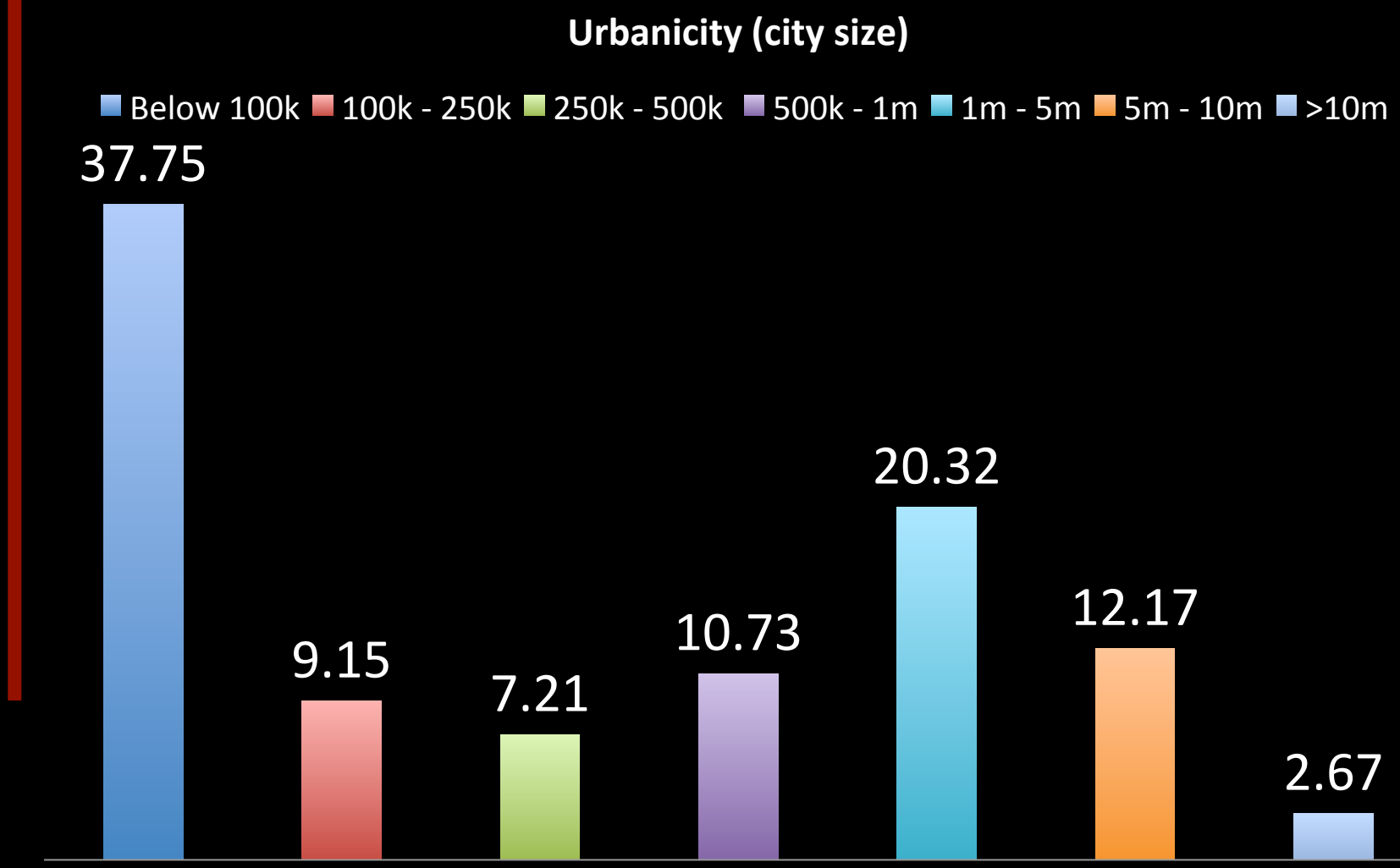


National context



National per capita income level

National context



First language reported in “profile”

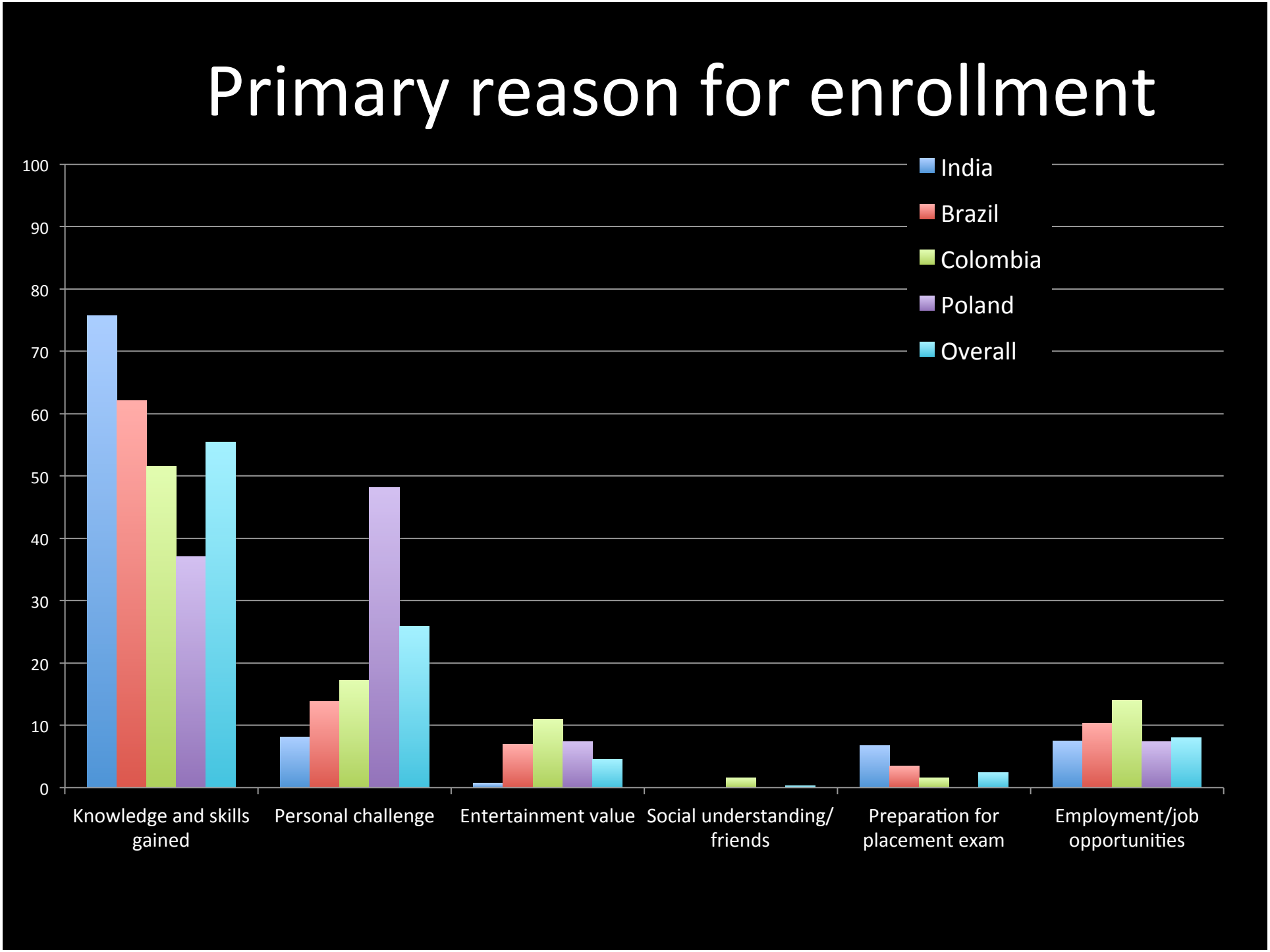
First language reported	**Percentage**
English	66.97%
Spanish	15.78%
Portuguese	2.40%
Russian	1.31%
French	0.85%
German	0.58%
Languages and dialects of India	0.56%
Polish	0.53%
Chinese	0.50%
Greek	0.45%
Arabic	0.33%
Other	9.72%

Predominate language in country

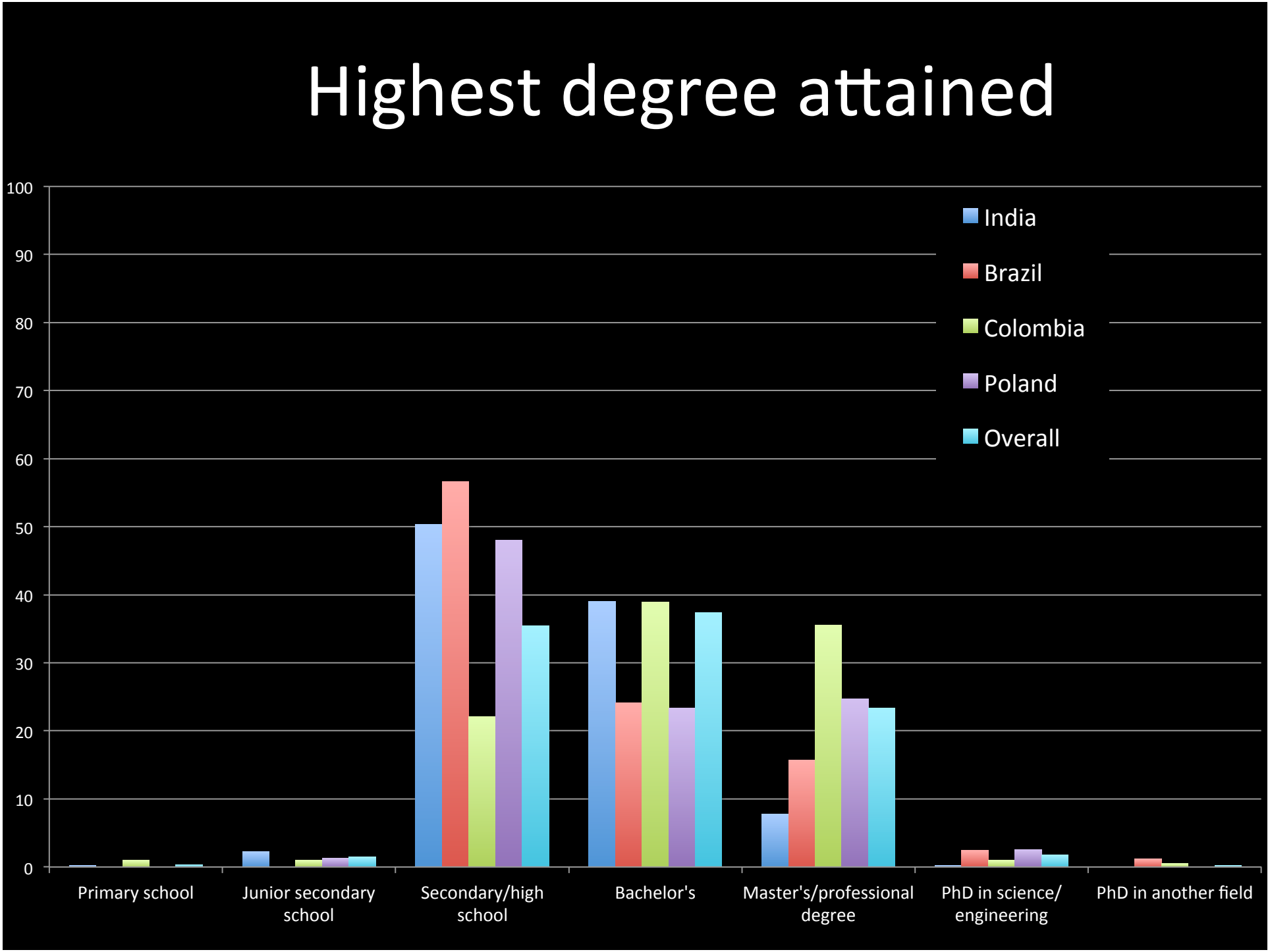
Non-English predominate country	Predominately English-speaking country
56.28%	43.72%

Individual students' backgrounds: survey data

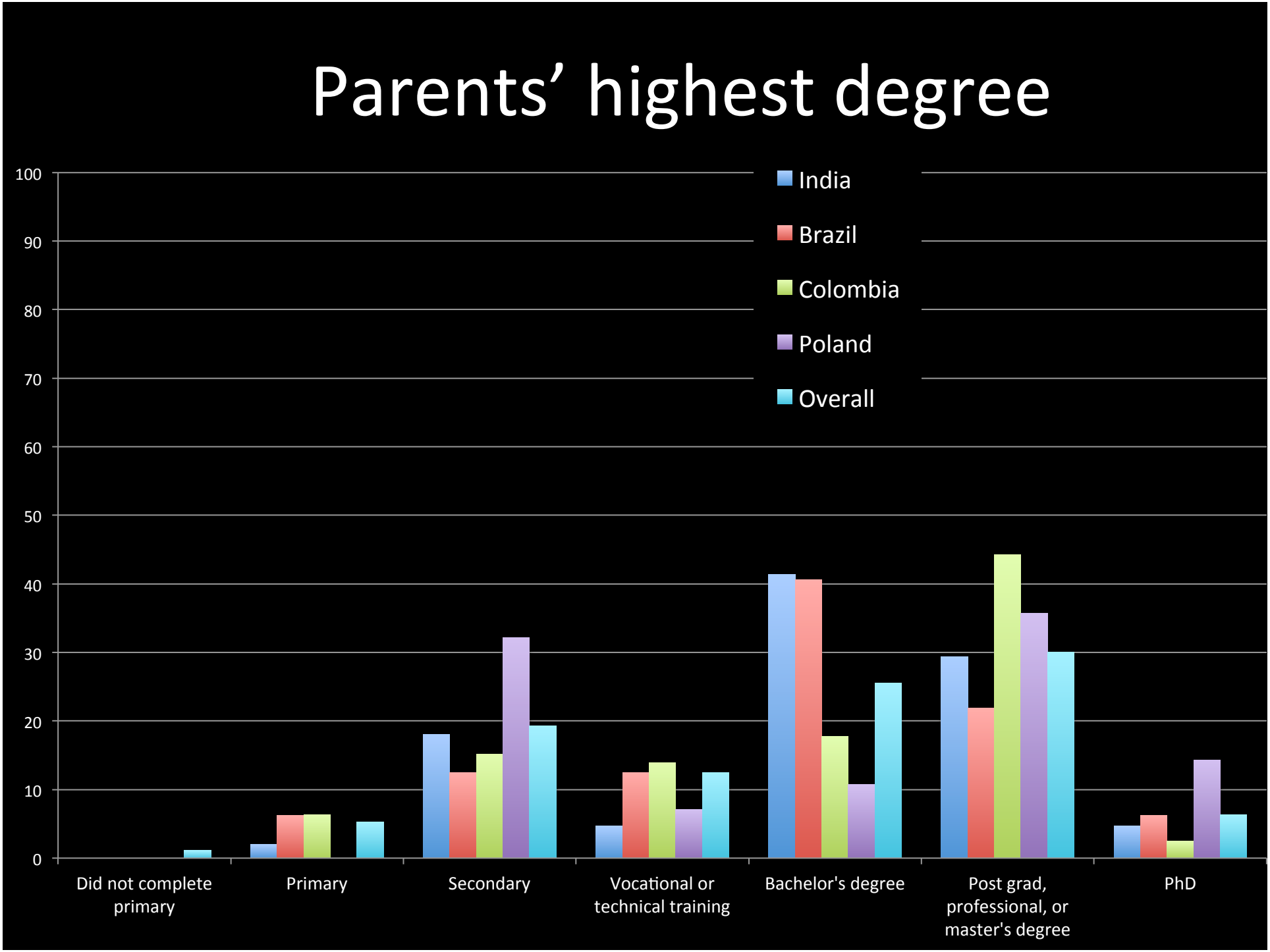
Primary reason for enrollment



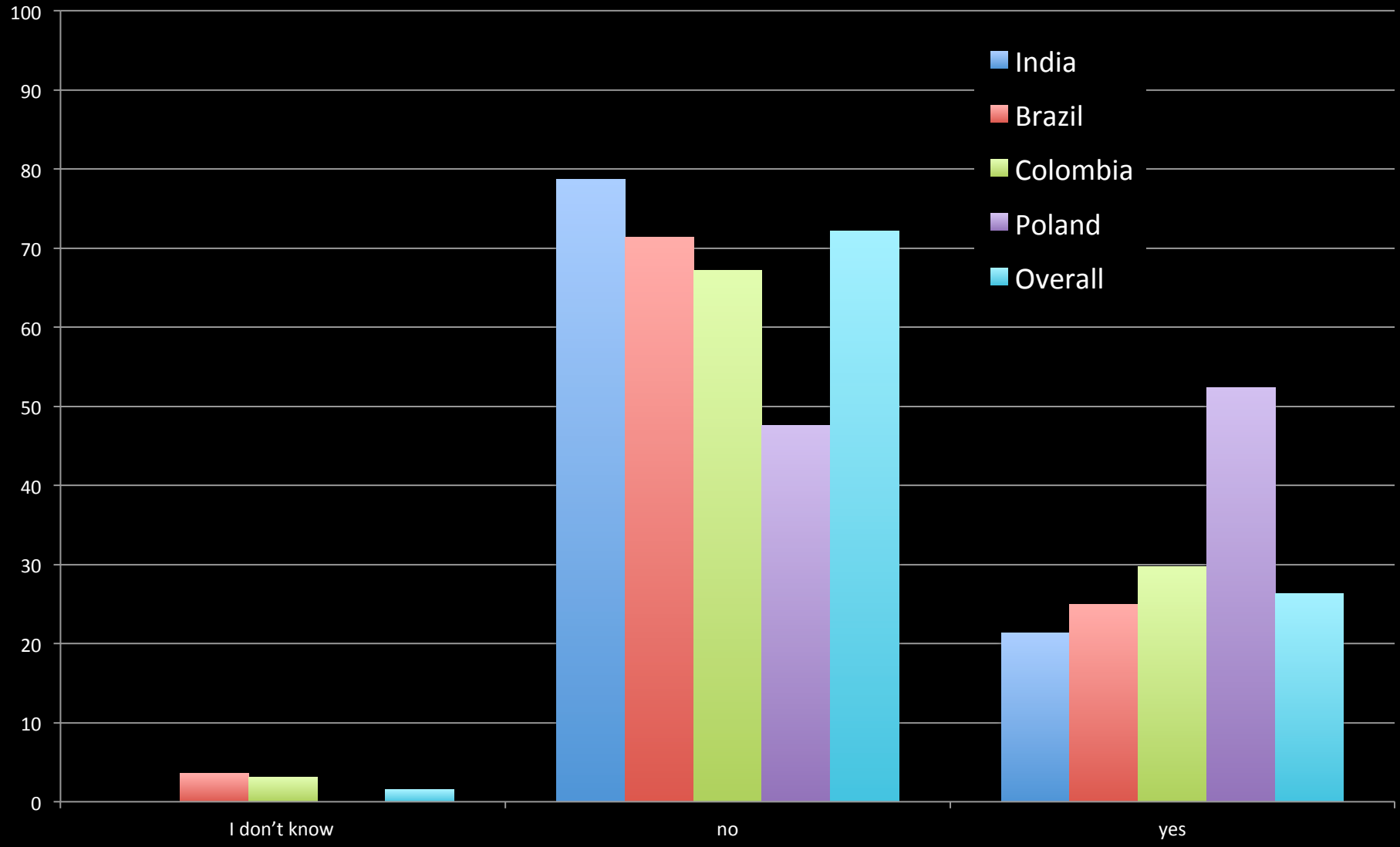
Highest degree attained



Parents' highest degree



Parents engineers



Background, behaviors, and outcomes

Detailed behaviors and outcomes

A closer descriptive look

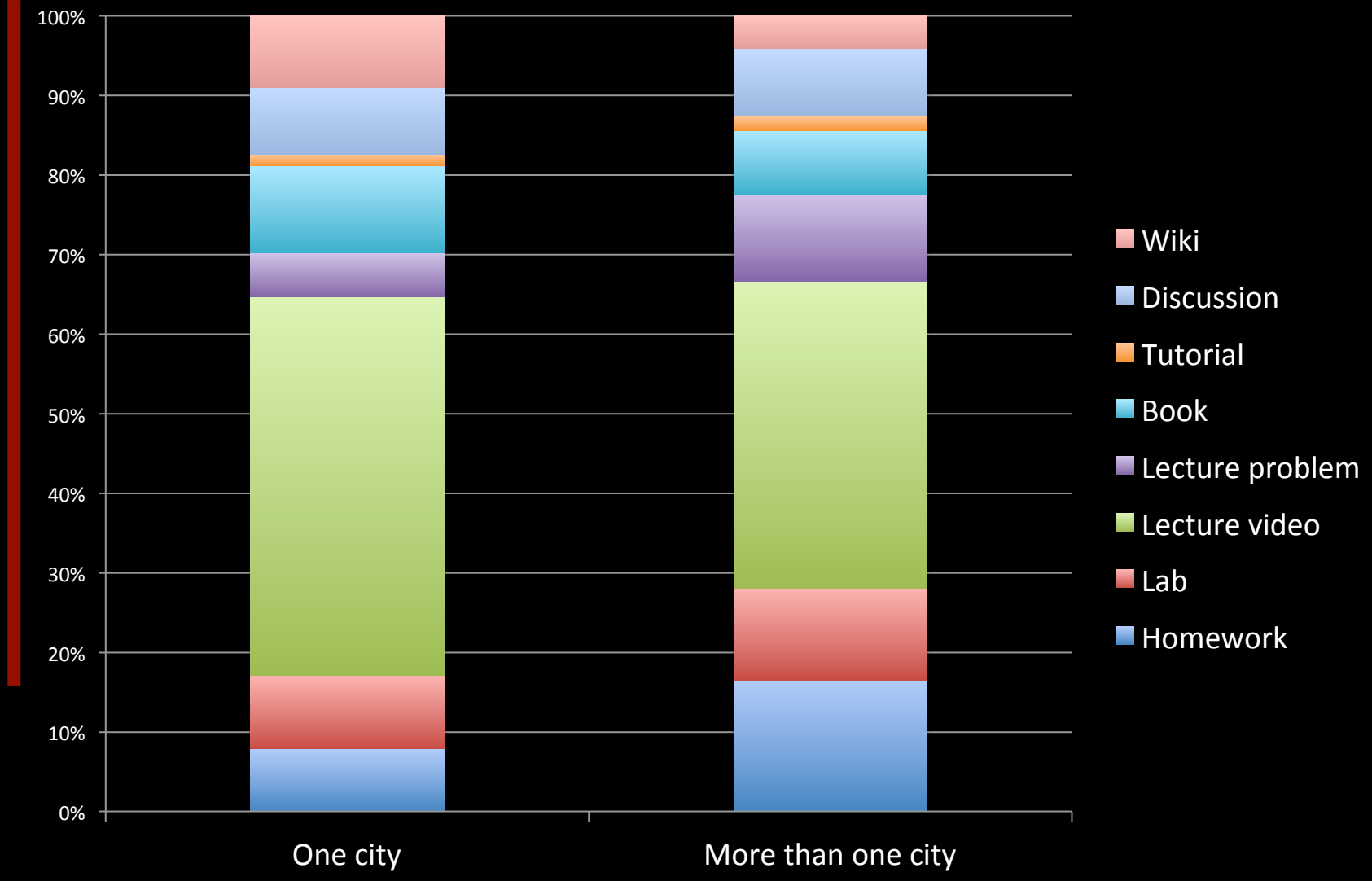
- What different groups of students can we observe within national contexts?
- What resources are students in various contexts using?
- Are they successful?

First language reported and country context

	Non-English country	Predominately English-speaking country	Total
English	31,062	41,337	72,399
Spanish	15,595	347	15,942
Portuguese	2,542	24	2,566
Russian	1,574	51	1,625
French	794	131	925
German	657	21	678
Polish	601	20	621
Greek	545	9	554
Chinese	271	126	397
Arabic	314	27	341
Languages and dialects of India	295	253	548
Other	6,041	4,496	10,537
Total	60,291	46,842	107,133

Usage and demographics

Travelers use different resources



Behaviors and performance by language and language context

Country

Individual

	Predominately English	**Predominately other language**
English	1.) 24.15%	1.) 29.68%
Other language	1.) 23.80%	1.) 29.35%

1. Average grade (in percentage) for students who scored any points

Behaviors and performance by language and language context

Country

Individual

	Predominately English	**Predominately other language**
English	1.) 24.15% 2.) 93.02	1.) 29.68% 2.) 107.165
Other language	1.) 23.80% 2.) 72.42	1.) 29.35% 2.) 112.76

1. Average grade (in percentage) for students who scored any points
2. Homework problem attempts

Behaviors and performance by language and language context

Country

Individual	**Predominately English**	**Predominately other language**
English	1.) 24.15% 2.) 93.02 3.) 0.59	1.) 29.68% 2.) 107.165 3.) 0.78
Other language	1.) 23.80% 2.) 72.42 3.) 0.54	1.) 29.35% 2.) 112.76 3.) 0.54

1. Average grade (in percentage) for students who scored any points
2. Ave. homework problem attempts
3. Ave. number of posts on the discussion forum

Behaviors and performance by language and language context

Individual

Country

	Predominately English	**Predominately other language**
English	1.) 24.15% 2.) 93.02 3.) 0.59 4.) 3.1	1.) 29.68% 2.) 107.165 3.) 0.78 4.) 3.2
Other language	1.) 23.80% 2.) 72.42 3.) 0.54 4.) 2.5	1.) 29.35% 2.) 112.76 3.) 0.54 4.) 3.2

1. Average grade (in percentage) for students who scored any points
2. Homework problem attempts
3. Number of posts on the discussion forum
4. Hours spent on lecture videos

Detailed behaviors and outcomes: anomalies in use and performance

Urbanicity – generally weak relationship

High performers, concentrated in urban centers

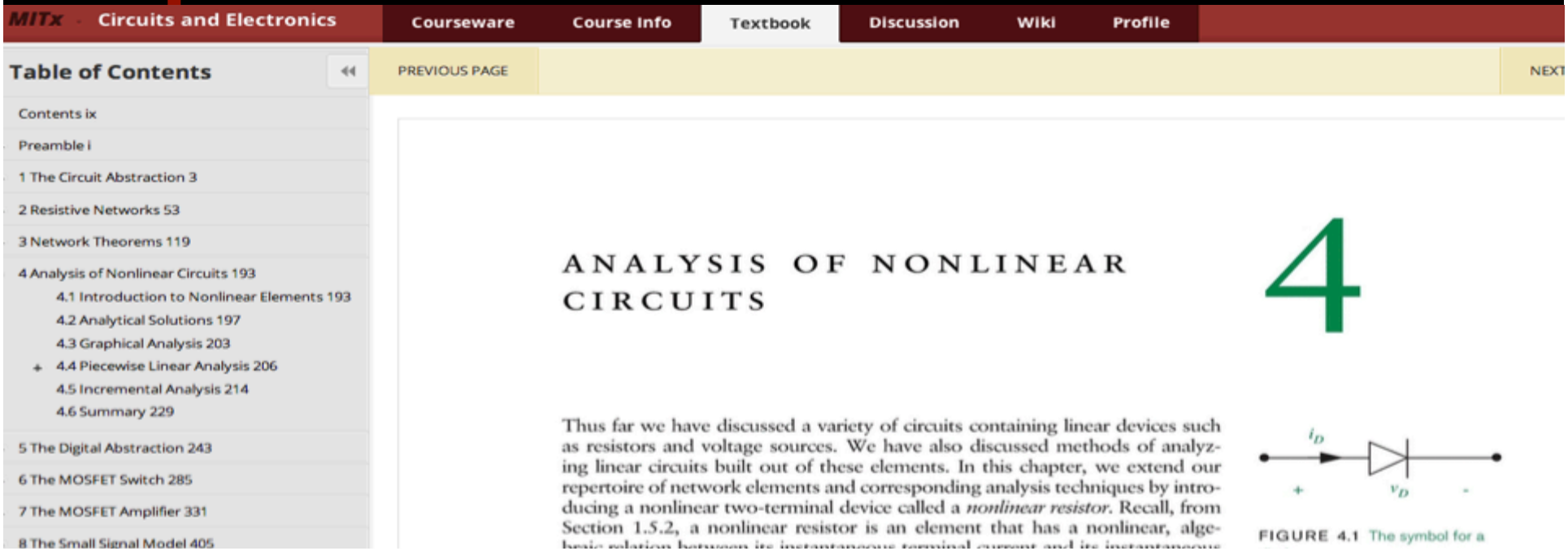
- Significant positive relationship between city size (urbanicity) and grade in class
  - India
  - Nigeria
  - South Africa
  - Chile
  - Egypt

High level of posting in low and lower-middle income Spanish-speaking countries

- In Venezuela, average number of "answers" posted was over 1 (1.03)

Most proportional time allotment similar across countries

- Most countries averaged low proportions of time spent on the e-textbook; students in Nigeria spent nearly 17% of their time on the e-text



Differences in aggregate performance

Students are nested within a country context

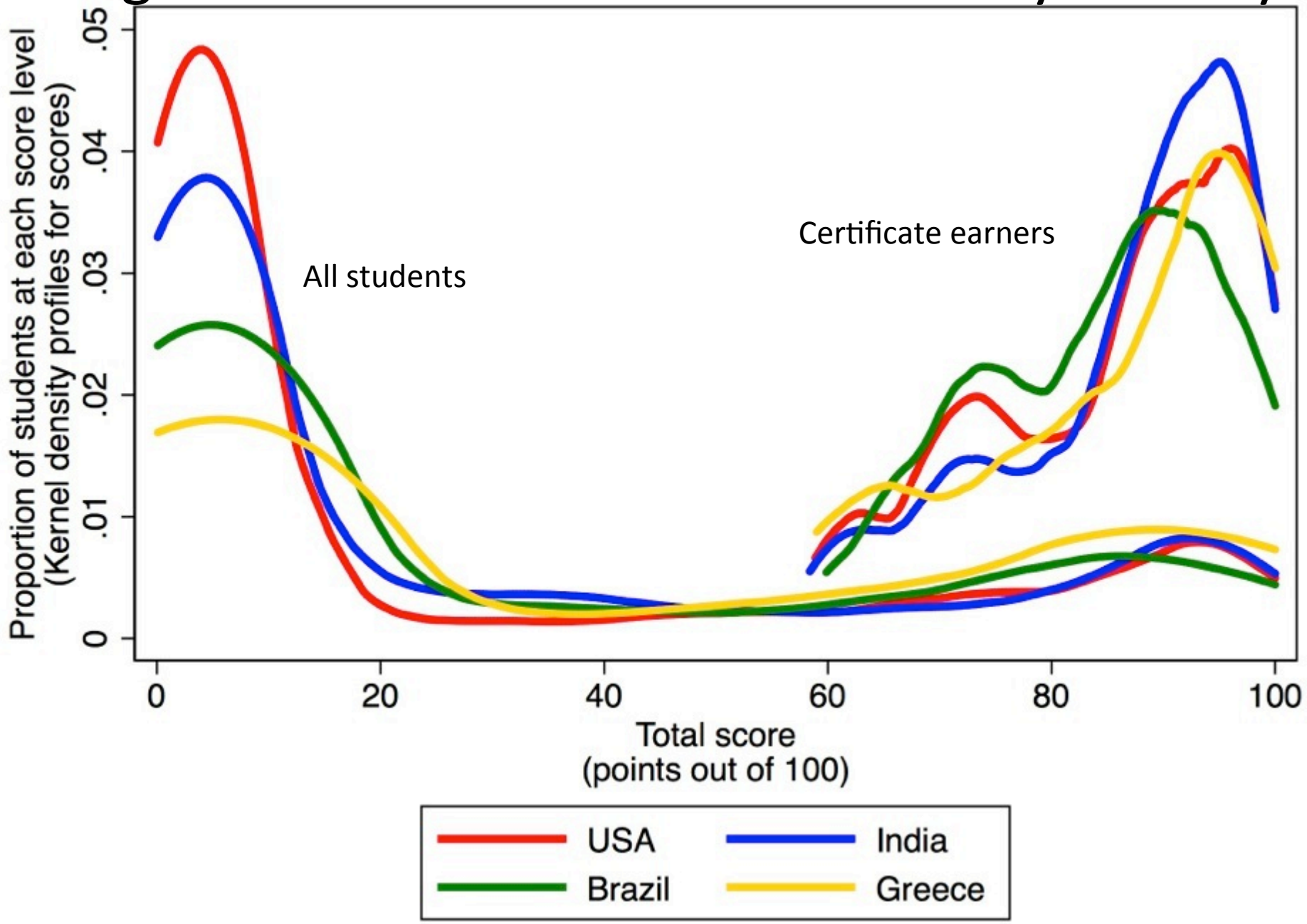
- Country factors:
  - Language
  - National income level/inequality
  - Internet penetration
- Individual factors
  - Language
  - Urbanicity
  - Use of site resources

Multi-level model analyzing which individual and group factors mattered

Predictive modeling

Distributional differences

Significant differences in variance by country



Variance in performance

Variance in performance

Less than 10% shared within country groups

Predicting grade based on national and individual characteristics

Summary of predictive findings

- Both individual behaviors and national characteristics significantly predict achievement
  - Predominant language important, especially wrt individual language
  - Time spent on materials such as homework assignments important
- Some variance shared by students within countries, but most is between individuals

Implications for development

- Students in unique country contexts demonstrate unique behaviors.
- Still an access issue

  Are educational technologies widening the gap?
- Context-specific platforms, context-specific courses

Implications for development

- Assessment, M&E

- Continuing education

Questions or follow-up

jdeboer@mit.edu

tll.mit.edu