*Beyond performance: do 15 year old urban students perceive science issues differently than their non-urban peers?*

**Objectives and Motivation**

In most countries and economies, students who attend schools in urban areas tend to perform at higher levels than students in non-urban areas (OECD 2013). Using data from the Program for International Student Assessment (PISA), this analysis examines differences in student science performance by school community (urban versus non-urban) across PISA countries over four separate cycles (2006, 2009, 2012, and 2015).

Using PISA 2015 data on student attitudes toward learning science, this analysis also examines (1) students’ awareness of environmental issues, (2) students’ optimism about environmental issues, and (3) students’ beliefs about scientific epistemology and how these three outcomes vary across urban and non-urban schools. Existing research has not studied these areas as much as science performance.

Measuring average academic performance across countries can mask inequities by subgroups such as school location. Understanding how variables that are connected to students’ perception and beliefs about science and science issues will provide insight into how to improve overall learning environments.

**Research Methods**

This paper uses the school location variable of the PISA school questionnaire, which asks principals in what kind of community their school is located. An urban school is defined as a school located in a community of more than 100,000 people (OECD 2013). All other schools are defined as non-urban.

Students’ awareness of environmental issues is collected by students’ responses to a question about how informed students are about the following issues: the increase of greenhouse gases in the atmosphere, the use of genetically modified organisms, nuclear waste, the consequences of clearing forests for other land use, air pollution, extinction of plants and animals, and water storage (OECD 2016).

Results show the percentages of students who *have never heard about this,* and *have heard about this but would not be able to explain what it is really about*. Students who select these two responses are considered to be “unfamiliar.” Students who select that they *know something about this and could explain the general issue* or that they are *familiar with this and would be able to explain this well* are considered to be “familiar.”

Students’ optimism about environmental issues concerns the same seven topics as the awareness question, and students’ are classified into three groups: whether the students think the issues will *improve*, *stay about the same*, or *get worse*. For binary analyses, the response *improve* is coded as “optimism” and *get worse* and *stay about the same* are considered as “less optimistic” responses.

Beliefs about scientific epistemology are collected by students’ responses on a four-point Likert scale to six statements about scientific epistemology (OECD 2016). The scale is converted into a two-point scale (agree vs. disagree) for the binary analyses.

Statistical *t*-tests are performed for the comparison of achievement scores and percentage of students’ responses to the aforementioned questions. Linear, logit, and probit regression analyses are used to control for performance when using the non-cognitive variables as outcomes.

**Preliminary Results**

In 2006, urban students performed better than their non-urban peers in 62% of PISA countries. In 2009, this percentage was 67%, in 2012 it was 62%, and in 2015 urban students performed better than their non-urban peers in 78% of countries.

Urban students are generally more familiar but less optimistic about environmental issues. For example, on the topic of air pollution, in 47% of countries urban students were more familiar with the issue than non-urban students; only in 3% of countries were urban students less familiar with the issue. In only one country did a greater percentage of urban students than non-urban students consider air pollution to improve in the next 20 years.

A similar pattern was seen with issues of deforestation, extinction, GMOs, greenhouse gases, nuclear waste, and water shortages. The percentage of countries whose urban students were more familiar with these issues than non-urban students was 42%, 40%, 32%, 42%, 18%, and 33%, respectively. Only in 7%, 1%, 3%, 4%, 3%, and 1% of countries were urban students less familiar with these respective issues. In only 5%, 3%, 11%, 3%, 4%, and 5% of countries were urban students more optimistic about these issues, respectively.

Urban students disagreed with statements on scientific epistemology in an average of 2% of countries.

**Significance**

This paper provides a cross-national picture of student performance in science and explores how student awareness of environmental issues, optimism about environmental issues, and approaches to scientific epistemology varies by school location. Preliminary results show that in most countries, based on the PISA variables, urban students are more aware of environmental issues, but less optimistic about the future with regard to these issues, and agree with epistemic questions of science. These are all variables that are generally correlated with performance on the science section of PISA.

**References**

Organisation for Economic Co-operation and Development (2013), "What Makes Urban Schools Different?" *PISA in Focus*, No. 28, OECD Publishing, Paris.

OECD (2016), “Science performance among 15-year-olds”, in *PISA 2015 Results (Volume I): Excellence and Equity in Education*, OECD Publishing, Paris.