Schleicher, Andreas

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*Tertium comparationis 23 (2017) 1, S. 113-124*

*Tertium Comparationis*
*Journal für International und Interkulturell*
*Vergleichende Erziehungswissenschaft*
*Vol. 23, No.1, pp. 113–124, 2017*


# The future of PISA

*Andreas Schleicher*

*OECD Paris*

*Abstract*

This article sets out how PISA has and continues to evolve to reflect the evolution of the demand for knowledge and skills in societies and the possibilities that new assessments offer to provide more relevant and granular information about what students know and can do.

## 1. New demands on assessments

Tests influence policies and practices in many ways by signaling priorities for curriculum and instruction, and tests can focus the content of instruction when school administrators and teachers pay attention to what is tested and adapt curriculum and teaching accordingly. Successful reforms of curricula and instructional systems will therefore hinge on redesigning assessment systems.

There has never been greater urgency and also greater opportunity to move the assessment agenda forward from providing signals of what students can do, to actually improve what students can do.

The demands on learners and thus tests are evolving fast. In the past, education was about teaching people something. Now, it is about making sure that students develop a reliable compass and the navigation skills to find their own way through an increasingly uncertain, volatile and ambiguous world. These days, we no longer know exactly how things will unfold, often we are surprised and need to learn from the extraordinary, and sometimes we make mistakes along the way. It will often be the mistakes and failures, when properly understood, that create the context for learning and growth. A generation ago, teachers could expect that what they taught would last for a lifetime of their students. Today, teachers need to prepare students for more rapid economic and social change than ever before, for jobs that have not

yet been created, to use technologies that have not yet been invented, and to solve social problems which we do not know about yet.

The dilemma for educators is that the kind of skills that are easiest to teach and easiest to test, tend to be also the skills that are easiest to digitise, automate and outsource. There is no question that state of the art disciplinary knowledge will always remain the foundation. Innovative or creative people generally have specialised skills in a field of knowledge or a practice. As much as 'learning to learn' skills are important, we always learn by learning something, but one can solve large parts of today's school tests in seconds with the help of a smartphone. If children are to be smarter than a smartphone, then tests need to look beyond whether students can reproduce what they learned to see whether they can extrapolate from what they know and use their knowledge creatively in novel situations. Put simply, the world no longer rewards people just for what they know – Google knows everything – but for what they can do with what they know. Today, most tests will not allow students to connect with the web for fear they might find the answers to the questions there. The test of truth for future assessments is whether they can encourage them to do so without jeopardising the validity and reliability of results.

Conventionally our approach to problems in schooling is to break them down into manageable bits and pieces, and then to test students whether they know the techniques to solve these bits. However, today individuals create value by synthesising the disparate bits. This is about curiosity, open-mindedness, making connections between ideas that previously seemed unrelated, which requires being familiar with and receptive to knowledge in other fields than our own. If we spend our whole life in a silo of a single discipline, we will not gain the imaginative skills to connect the dots where the next invention will come from. The challenge for the future will be to develop tests that can capture truly creative thinking.

Perhaps most importantly, in today's schools, students typically learn individually and at the end of the school year, we certify their individual achievements. However, the more interdependent the world becomes, the more we rely on great collaborators and orchestrators who are able to join others in life, work and citizenship. Innovation, too, is now rarely the product of individuals working in isolation but an outcome of how we mobilise, share and link knowledge. Future tests should not disqualify students for collaborating with other test-takers, but encourage them to do so, and assess collaborative skills.

Recent developments in assessment methodologies enable us also to bridge the gap between summative and formative assessments which has traditionally divided educators into two opposing camps. It is now possible to create coherent multilayered real-time assessment systems that extend from students to classrooms to schools to regional to national and even international levels; and that provide dy-

namic task contexts in which prior actions stimulate unpredictable reactions that in turn influence subsequent strategies and options. Such tests can provide a window into students' understandings and the conceptual strategies a student uses to solve a problem; and they can add value for teaching and learning, particularly when tasks incorporate transfer and authentic applications and provide opportunities for students to organise and deepen their understanding through explanation and use of multiple representations. Not least, tests can now feed results back to learners and educators in real time, so that data become a powerful instrument to improve student learning outcomes. Teachers can understand what the assessment reveals about students' thinking. Furthermore, school administrators, policymakers, and teachers can use this information to create better opportunities for student learning.

## 2. Excursus: How PISA works

OECD member states and other partner governments established PISA in the late 1990s to compare the quality, equity and efficiency of their school systems on a regular basis. It assessed students towards the end of compulsory schooling. The heart of PISA is an internationally agreed set of tests in maths, reading and science that are administered to representative samples of school students in the participating countries. The age of 15 years was chosen as the point of comparison because it represents the last point at which schooling is still largely universal. PISA is closely aligned with the *Programme for the International Assessment of Adult Competencies* (PIAAC), OECD's assessment of adult competencies, which begins at age 16, where PISA ends, and extends to the age of 65 years. While PISA is looking backwards to observe how effectively school systems establish the foundations for success in life, PIAAC is looking forward to how initial skills feed into further learning and important economic, employment and social outcomes.

Some general principles were agreed among countries to guide the development and use of PISA:

PISA is policy-oriented. It focuses on providing data and analysis that can help guide decisions on education policy. By linking data on students' learning outcomes with data on key factors that shape learning in and out of school, PISA highlights differences in performance patterns and identifies features common to high-performing students, schools and education systems.

PISA is carried out every three years to enable countries to monitor their progress in meeting key learning objectives. The basic survey design has remained constant to allow for comparability from one PISA assessment to the next and thus to allow countries to relate policy changes to improvements in education outcomes.

PISA assesses both subject matter content knowledge, on the one hand, and the capacity of individuals to apply that knowledge creatively, including in unfamiliar contexts, on the other.

PISA is designed to provide comparable data across a wide range of countries, currently comprising over 80 education systems that cover over 80 % of the world economy. Considerable efforts are devoted to achieving cultural and linguistic breadth and balance in assessment materials. Stringent quality-assurance mechanisms are applied in the test design, translation, sampling and data collection.

An age-based rather than a grade-based target population is used to ensure valid international comparisons of educational performance.

The *PISA for Development* project, that provides support to the least developed countries, is an effort aimed at enhancing the PISA instruments so as to make them available and more relevant for countries that have thus far been excluded from global educational comparisons.

The PISA-based test for schools allows individual schools to assess where they stand among the world's most successful schools.

PISA is a collaborative effort. Decisions about the scope and nature of the PISA assessments and the background information collected are undertaken by leading experts in participating countries. Governments oversee these decisions based on shared, policy-driven interests. For the latest results from PISA see OECD, 2016a, 2016b.

## 3. New demands on PISA

In an interconnected world in which the benchmark for educational success is no longer improvement by national standards alone, but the best performing education systems internationally, there has been growing interest in international comparative assessments as well. Assessments like PISA provide an opportunity for education systems to look outwards and facilitate peer-learning across cultural and national boundaries. They can facilitate a better understanding of what is possible in education, which in turn has created a demand for even better and more sensitive indicators of learning outcomes; so in one way, PISA has educated policy makers and educators alike in what it is possible to achieve through education, at least in terms of learning outcomes and skills and fuelled more demand for more and better measures.

While the results from PISA have no immediate stakes for students, teachers or schools, PISA is viewed as an important metric for the success of school systems and it is therefore important for PISA to lead educational reform and not being constrained with a too limited range of metrics. There is considerable debate among

the countries taking part in PISA at both policy and scientific levels to what extent PISA can and should evolve. Some say that if PISA is to measure progress and change in education, it cannot change its measures. However, not changing these measures will mean that PISA will evaluate students by what was important for our past, not for their future.

To stand the test of time, PISA may need to evolve in at least three ways:

- First, and perhaps most importantly, PISA will need to embrace a wider range of competencies that respond to the changing skill needs that I discussed above.
- Second, to be useful for educators and policy-makers, PISA will need to provide more, better and more tangible insights on what helps students to learn better, teachers to teach better and schools to be more effective. This involves both improving the contextual information that PISA collects from students, teachers, parents, school principals and system leaders and enhancing the granularity of the data at school and local levels.
- Third, to fulfil its potential as a global measure of learning, PISA needs to become more accessible and relevant to middle and low income countries.

### 3.1 Broadening the range of competencies that are covered

The development of computer-delivered assessment for PISA has opened up new possibilities to widen the range of competencies that are amenable to large-scale assessment, with increasing emphasis being placed on creative competencies. More challenging will be the development of measures of social and emotional skills. In the past, we often thought that these types of skills could not be successfully quantified, but OECD's report *Skills for social progress* (OECD, 2015) demonstrated that they can be measured meaningfully, within cultural and linguistic boundaries.

PISA began its assessments in 2000 with an in-depth assessment of reading literacy skills, defined as understanding, using, reflecting on and engaging with written texts that was developed by an international group of experts (OECD, 2016d). This concept deliberately went beyond the traditional notion of decoding information and literal interpretation of what is written, and encompassed a range of situations in which people read, the different ways written texts are presented through different media, and the variety of ways that readers approach and use texts, from the functional and finite, such as finding a particular piece of practical information, to the deep and far-reaching, such as understanding other ways of doing, thinking and being. Since 2000, the PISA reading assessments have evolved considerably, reflecting in large parts the changes in the nature of reading with the advent of digital technologies. In the past, teachers could tell students to look information they were missing up in an encyclopaedia, and to rely on that infor-

mation generally being accurate and true. Nowadays, digital texts require students to manage non-linear information structures, to build their own mental representation of information as they find their way through hypertext on the internet, and to deal with ambiguity and to interpret and resolve conflicting information which they find somewhere on the web. Indeed, the more content knowledge digital technologies allow student to search and access, the more important becomes the capacity to make sense out of this content, and the capacity of students to question or seek to improve the accepted knowledge and practices of their time.

In 2003, the focus of PISA turned to assessing mathematics, defined as students' capacity to formulate, employ and interpret mathematics in a variety of contexts (OECD, 2016d). The assessment was about reasoning mathematically and using mathematical concepts, procedures, facts, and tools to describe, explain and predict phenomena. Students were also asked to demonstrate that they could recognise the role that mathematics plays in the world and to make the well-founded judgements and decisions needed by constructive, engaged and reflective citizens. This approach asserts the importance of mathematics for full participation in society and it stipulates that this importance arises from the way in which mathematics can be used to describe, explain and predict phenomena of many types. PISA has established a set of fundamental mathematical capabilities that underpin performance in the PISA mathematics assessments: (1) Communication is both receptive and expressive. Reading, decoding and interpreting statements, questions, tasks or objects enables the individual to form a mental model of the situation. Later, the problem-solver may need to present or explain the solution. (2) Mathematising involves moving between the real world and the mathematical world in two ways: formulating and interpreting. Formulating a problem as a mathematical problem can include structuring, conceptualising, making assumptions and/or constructing a model. Interpreting involves determining whether and how the results of mathematical work are related to the original problem and judging their adequacy. (3) Representation entails selecting, interpreting, translating between and using a variety of representations to capture a situation, interact with a problem, or present one's work. (4) Reasoning and argument is required throughout the different stages and activities associated with mathematical literacy. This capability involves thought processes rooted in logic that explore and link problem elements so as to be able to make inferences from them, check a justification that is given, or provide a justification of statements or solutions to problems. (5) Devising strategies for solving problems is characterised as selecting or devising a plan or strategy to use mathematics to solve problems arising from a task or context, and guiding and monitoring its implementation. (6) Using symbolic, formal and technical language and operations involves understanding, interpreting, manipulating and making use of

symbolic and arithmetic expressions and operations, using formal constructs based on definitions, rules and formal systems, and using algorithms with these entities. Finally, (7) using mathematical tools involves knowing about and being able to use various tools (physical or digital) that may assist mathematical activity, and knowing about the limitations of such tools.

In 2006, the focus of PISA shifted to science, defined as the ability of students to engage with science-related issues, and with the ideas of science, as a reflective citizen (OECD, 2016d). To do well on the PISA science test, students need to be willing to engage in reasoned discourse about science and technology. This requires the competencies to (1) explain phenomena scientifically (which implies the ability to recognise, offer and evaluate explanations for a range of natural and technological phenomena), (2) evaluate and design scientific enquiry (which implies the ability to describe and appraise scientific investigations and propose ways of addressing questions scientifically) and (3) to interpret data and evidence scientifically (which implies the ability to analyse and evaluate data, claims and arguments in a variety of representations and draw appropriate scientific conclusion). Explaining scientific and technological phenomena, demands knowledge of the content of science. The second and third competencies, however, require more than knowledge of what we know. Rather, they depend on an understanding of how scientific knowledge is established and the degree of confidence with which it is held. Recognising and identifying the features that characterise scientific enquiry requires knowledge of the procedures that are the foundation of the diverse methods and practices used to establish scientific knowledge – referred to here as procedural knowledge. Finally, the competencies require epistemic knowledge – an understanding of the rationale for the common practices of scientific enquiry, the status of the knowledge claims that are generated, and the meaning of foundational terms such as theory, hypothesis and data. To do well on PISA, students have to demonstrate that they can 'think like a scientist'.

While continuing with the assessment of reading, mathematics and science as key foundation skills, PISA is now progressively incorporating also some of the broader cognitive, social and emotional competencies discussed above. The assessment of social competencies became a priority in 2015. As noted before, young individuals, entering into the workforce and public life, need the skills and attitudes to collaborate and effectively solve problems, increasingly in situations where members of the group are geographically dispersed, working in different time zones, and connected through technology. Societies expect them to have the capacity to resolve problems and provide solutions collaboratively through the pooling of knowledge, skills, and effort. As a first step, PISA introduced in 2015 an assessment of collaborative problem solving skills (OECD, 2016d), which assesses stu-

dents according to three core competencies: (1) establishing and maintaining shared understanding; (2) taking appropriate actions to solve problems; and (3) establishing and maintaining team organisation. To facilitate this, individual students are required to interact and collaborate with computer-generated team member(s) in controlled situations to solve a particular problem. This process necessitates students determining their own role and responsibilities in regards to other agents, monitoring aspects of group organisation, and facilitating adjustments and changes that are needed when communication breaks down, when new obstacles appear, or when opportunities for performance optimisation arise.

For its next assessment in 2018, PISA is taking the challenge of assessing *Global Competencies* (OECD, 2016e). PISA defines global competence as the capacity to examine global and intercultural issues, to take multiple perspectives, to engage in open, appropriate and effective interactions with people from different cultures and to act for collective well-being and sustainable development. *Global Competence* in this sense is a multifaceted cognitive, socio-emotional and civic learning construct, involving four core dimensions: (1) students' capacity to examine issues and situations of local, global and cultural significance (e.g. poverty, economic interdependence, migration, inequality, environmental risks, conflicts, exchanges across cultures and cultural stereotypes); (2) the capacity to value and take different perspectives as long as they do not violate core human rights (human dignity); (3) the ability to establish positive interactions with people of different national, social, ethnic, religious backgrounds or gender; and (4) the attitudes and capacities to take motivated and constructive action toward sustainable development and well-being. The four dimensions overlap significantly and people at all ages need to simultaneously address them to develop global competence. For example, effective and respectful action to solve an intercultural misunderstanding requires that the individual is capable of examining the context in which the incident takes place, understanding and addressing the communication problems that might lie behind the misunderstanding, and that he/she values and utilises the different cultural perspectives represented in the situation.

The OECD sees *Global Competence* as the centrepiece of a broader vision for 21st-century education. That vision is shaped by three principles: equity, cohesion and sustainability. Today, all three principles are at risk.

*Equity*. The increased inequality of income and opportunities, along with the fact that poor kids receive poor education, puts the issue of equity and inclusive growth high on the global agenda. The digital economy is hollowing out jobs consisting of routine tasks and radically altering the nature of employment. For many, this is liberating and exciting: it is a great moment to be a 20-something entrepre-

neur with a disruptive internet business model, but for others, it means the end of a livelihood.

*Cohesion*. In all parts of the world, we are seeing unprecedented movements of people, with the most dramatic flows coming from countries mired in poverty and war. How can receiving countries integrate diverse groups of people and avoid rising extremism and fundamentalism?

*Sustainability*. Delivering on the UN *Sustainable Development Goals* is a priority in the international community. The goal declared by the Brundtland Commission almost 30 years ago – development that meets the needs of the present without compromising the ability of future generations to meet their own needs – is more relevant today than ever before, in the face of environmental degradation, climate change, overconsumption and population growth.

### 3.2 Developing meaningful feedback for schools

Big data is a foundation on which education can reinvent its business model and build the coalition of governments, businesses, and social entrepreneurs that can bring together the evidence, innovation and resources to make lifelong learning a reality for all. The next educational superpower might be the one that can combine the hierarchy of institutions with the power of collaborative information flows and social networks. This is not just about improved transparency and public accountability in education. Putting education data out into the public space does not automatically change the ways in which students learn, teachers teach and schools operate. It does not lead to people doing anything with that data and transforming education in ways that will actually change education practice. On the contrary, it may even result in adversarial relationships between civil society and government over the control and ownership of information.

The prerequisite for using big data as a catalyst to change education practice is to get out of the 'read-only' mode in our societies. This is about combining transparency with collaboration. Big data can lead to big trust if we make that data available, train civic innovators, experiment, create a maker culture. Collaborative consumption provides an example. These days, people share their cars and even their apartments with strangers. Collaborative consumption has made people micro-entrepreneurs – and its driving engine is building trust between strangers. In the business world, we have evolved from trusting people to provide information, to willingly handing over credit card data, to connecting trustworthy strangers in all sorts of marketplaces. We are light years away from that when it comes to data about education and the use of outcomes from assessments.

PISA's developers need to think hard how they can obtain the most relevant contextual information from students, teachers, parents and school administrators

that can help explain performance differences and lead to powerful insights for how to help students learn better, teachers to teach better and schools to become more effective. Equally important will be to build the tools and apps that will help researchers and citizens to access, use and analyse these data for their purposes rather than just read through pre-fabricated interpretations.

PISA has helped to change the balance of power in education by making public policy in the field of education more transparent and more efficient. However, at the micro-level, there are still a lot of sceptics: teachers sometimes think that PISA is just another layer of accountability through which governments wanted to control them. To address that, PISA has developed open-source PISA instruments that schools can use to obtain their own PISA scores. This new PISA-based test for schools provides comparisons with other schools anywhere else in the world, schools that are similar to them or schools that are very different. Schools are beginning to use that data. Ten schools in Fairfax County in Virginia in the United States, for example, have started a year-long discussion among principals and teachers based on the results of the first reports. With the help of district offices (and the OECD), they will be conducting secondary analyses to dig deeper into their data and understand how their schools compare with each other and with other schools around the world. Those principals and teachers are beginning to see themselves as teammates – not just spectators – on a global playing field. In other words, in Fairfax County, big data is building big trust.

### 3.3 Making PISA meaningful beyond the industrialised world

As the number of countries joining PISA keeps rising, it becomes apparent that the design and implementation models for PISA need to evolve to successfully cater to a larger and more diverse set of countries, including a growing number of middle-income and low-income countries who want to participate in the assessment.

While demand for participation in PISA among middle- and low-income countries is increasing, these countries face both financial and technical obstacles to participating, including the need to translate and manage the assessment, and code student responses. The political, regulatory, and cultural environment of these countries can also affect whether, and how easily, the assessment can be conducted. To maximise the benefits of participating in PISA, the assessment will need to:

- adjust the PISA test instruments to better measure differences between the highest- and lowest-performing students and, in particular, distinguish performance differences at the lowest levels of proficiency;
- revise the contextual questionnaires so they are more relevant to low-income country contexts and policy issues;

- evaluate the impact of PISA participation on middle-income countries' capacity to conduct international assessments;
- tackle financial and technical challenges through partnerships with donors and through capacity building; and
- extend outreach to local stakeholders in these countries.

Action is already being taken on these recommendations through the *PISA for Development* initiative (OECD, 2016f). This project is already piloting ways to enhance the PISA instruments and will undertake field trials in seven developing countries. The results of these pilots, which are expected in 2018, will provide policy makers with new evidence to diagnose shortcomings in their education systems and inform new policies. In the meantime, the *PISA for Development* countries will benefit from peer-to-peer exchanges with other members of the PISA global community. The enhanced PISA instruments will be made available to all countries for the 2021 cycle of the assessment.

For the first time, the assessments will include an out-of-school component that will shed light on the knowledge of skills of 15-year-olds who are not enrolled in school. In many countries, this is the majority of children and they are often forgotten because they are not accounted for in school data and national reports. PISA will help to ensure that these children receive the attention by public policy they deserve.

The OECD remains committed to working with the World Bank and other partners in maintaining and developing PISA as a global yardstick for measuring success in education. This is especially relevant in the context of the recently adopted *Sustainable Development Goal*s as PISA provides valuable information about the level and distribution of quality and equity within a country's education system.

Together, we will continue to contribute our expertise and platforms to encourage international collaboration on education through the PISA surveys, and to assist policymakers and practitioners throughout the world to use them more productively.

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