Chapter 15
Understanding the Policy Influence of International Large-Scale Assessments in Education

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Abstract  International large-scale assessments (ILSAs) require national governments to invest significant resources in both time and money. With such investment, national governments expect the results of ILSAs to provide policy and research communities with evaluative information on their educational system. Armed with this evaluative information, policymakers in many participating countries have used the results to stimulate reform. However, systematically tracking this influence and judging the validity of the claims has proven difficult for both the policy and research communities. There can be an erroneous expectation in the wider education community, and sometimes amongst policymakers themselves, that ILSA data automatically suggests policy solutions. Because of this error, a means for better systematizing the policymaking process responding to ILSA results is required. The model developed here can assist the policy and research community to better understand whether ILSAs are providing valid evidence to support their use in policy formation enactment and can be used to analyze ongoing consequences of that influence. Two worked examples demonstrate the utility of the model.

Keywords  Evaluation · Large-scale assessment · Policy impact · Policy influence
15.1 Introduction

Countries and educational systems participate in international large-scale assessments (ILSAs) for a variety of reasons, including educational system monitoring and comparison. As taking part in an ILSA requires the investment of significant money and time (Engel and Rutkowski 2018), it is important that countries derive value and use from their participation. One way to justify participation is to demonstrate the ways in which ILSA results are used (or are claimed to be used) as a lever for policy formulation and as a means to change policy trajectories in order to improve educational outcomes. That is, successfully attributing policy changes to ILSA results can be seen as a rationale for continued participation, building a case for the further outlay of time and money. It makes sense that testing organizations want to argue to their stakeholders that the resources spent on their assessment tools are worthwhile. However, demonstrating how ILSAs impact systems and nations remains difficult. First, this is because policymaking itself is an emotive and politicized domain informed more by what can be sold to the public for electoral success than what research might suggest could be the best direction (see for example Barber et al.’s (2010) concept of “Deliverology”). Second, even if an association is identified, it remains challenging to establish the direction of the relationship or the amount of influence ILSAs had in any policy change that resulted. In other words, it is difficult to prove the counterfactual that the policy change would not have occurred in the absence of the ILSA. Third, evidence of the influence of ILSAs on policy can be inflated or misleading. For example, there are a number of cases demonstrating that governments made use of ILSA results simply to justify policy reforms that were already set to be implemented (Gür et al. 2012; Rautalin and Alasuutari 2009; Takayama 2008).

In this chapter, we explore how participation in ILSAs, and the subsequent results, could reasonably be said to “influence” policy. In other words, how can ILSA results, or any proposed policy attributed to those results, be shown to be the reason that a policy or policies change? In complex systems the attribution of singular causes that can explain an altered state of affairs is always difficult because of the multiple forces at work in that system. Further, few would argue that the ILSA-policy nexus is easy to understand given: (1) the complex social, cultural, historical, economic and political realities within each system; (2) the complexities between systems; and (3) the limitations of what the tests themselves can measure on any given topic and the difficulty in measuring policy change. This, then, leads to a key problem that confronts policymaking communities; how can system leaders properly understand and manage ILSAs’ influence on their system?

A second question that drives this chapter asks what are the overall consequences of participating in an ILSA? This question works from the premise that there are always intended and unintended consequences when an ILSA has influence at the national level. When ILSA results are used to set policy goals or are the impetus for educational change this creates the conditions for a range of consequences. For example, implementing a particular kind of science curriculum as the result
of middling science performance on an ILSA will have consequences that might include money spent training teachers and abandoning other teaching approaches, and so on. Correspondingly, where a system’s leaders become convinced that doing well on rankings will lead to better educational outcomes, a variety of perverse incentives can emerge, resulting in attempts by a range of stakeholders to “game” the test. This is evidenced through the multitude of high stakes testing cheating that took place in the USA (Amrein-Beardsley et al. 2010; Nichols and Berliner 2007) and the fact that some countries participating in ILSAs are removed from the results for “data irregularities,” including being too lenient when marking open-ended questions, which resulted in higher than expected scores (OECD [Organisation for Economic Co-operation and Development] 2017). Stakes at the student and school level may remain low; however, at the national level there is growing evidence that the stakes of participation are high.

One challenge in the ILSA-policy nexus that encompasses both understanding ILSA influence and the consequences of that influence is that there is rarely, if ever, systematic analysis undertaken of the data in the context of the whole system. When ILSA data is released media, policymakers, and other stakeholders tend to sensationalize and react, often quickly, without a full accounting of the evidence (Sellar and Lingard 2013). To underline this problem, we present two cases that highlight the problem of simply claiming ILSA “influence.” Subsequently, we describe a model as a means for better systematizing how influence ought to be attributed to policy processes as a result of participation in ILSAs and the publication of subsequent results. This model that can assist the policy and research communities to better understand whether ILSAs are providing valid evidence to warrant their influence on educational policy formation and debates and to analyze the consequences of that influence.

15.2 Impact, Influence, and Education Policy

To understand influence, we first differentiate between what we view as ILSA’s impact on policy (which is hard to demonstrate) and ILSA’s influence on policy (a concept that is still difficult but easier to demonstrate than impact). For the purposes of this chapter, we define impact as a difference in kind while influence is defined as a difference in degree. To show policy impact, we would have to isolate an ILSA result and proved that this caused a significant shift in a policy platform. We should expect to see clear evidence that there was a rupture, such as a new national policy direction being caused by ILSA data. However, making causal claims such as ILSA X caused Policy Y requires a methodological framework that may simply not be possible because of the complexity of most national systems. Moreover, many of the claims made in reports that attribute impact to an ILSA result exemplify what Loughland and Thompson (2016) saw as a post hoc fallacy at work rather than identifying a causal mechanism. They explained that, “when an assumption is made based on the sequence of events—so the assumption is made that because one thing occurs after
another, it must be caused by it” (Loughland and Thompson 2016, pp. 125–126). This is particularly true of ILSA results where the data often appear to be used to maintain current policy directions in the interests of political expediency, even where the data suggests this may be having unhelpful consequences. Finally, impact is notoriously difficult to demonstrate because education policy agendas are often politically rather than rationally decided (Rizvi and Lingard 2009). As such, even if ILSAs provided perfect information they will only be one factor among many that influence policymaking. For these reasons, when ILSAs are mentioned together with policy impact, we suspect that it would be better to frame this in terms of evaluating the influence that ILSAs have on policy agendas and trajectories within given contexts.

Policy influence can be viewed as the use of ILSA results to buttress or tweak policy settings that already exist. However, establishing exactly what constitutes influence remains difficult for a number of reasons. For example, similar to impact, much of the policy literature fails to define influence (Betsill and Corell 2008). The lack of a clear definition in the literature leads to (at least) three problems. First, without an established definition for influence, it is difficult to determine the type of evidence needed to demonstrate influence. This is a particular problem, as ILSA literature tends to report evidence of influence on the basis of the particular case at hand without consideration of wider application and with a pro-influence bias, rarely examining evidence to the contrary (e.g., Breakspear 2012; Schwippert and Lenkeit 2012). Second, to make a strong case that ILSAs influence policy, some consensus as to what data should be collected to mount a sufficient argument is needed. Finally, this lack of definition makes cross-case comparisons potentially unstable because different stakeholders risk measuring different things and claiming them as demonstrating influence. In other words, if each claimant develops their own ideas around influence and collects data accordingly, they may simply end up comparing different things.

In this chapter we borrow from Cox and Jacobson (1973), who defined influence as the “modification of one actor’s behavior by that of another” (p. 3). With this definition we take a broad view and define ILSAs as policy actors that are as involved in creating meaning in a variety of contexts as much as they are created artefacts of organizations or groups of countries. As an actor, an ILSA represents multiple interests and ambitions, and intervenes in social spaces in a variety of ways. For example, in the case of OECD’s Programme for International Student Assessment (PISA) study, the results are intended to serve at the behest of the OECD’s and member countries’ policy agendas (OECD 2018). However, the declared explicit use of ILSAs for policy modifications are less clear for the International Association for the Evaluation of Educational Achievement’s (IEA) Trends in International Mathematics and Science Study (TIMSS) and Progress in International Reading Literacy Study (PIRLS), perhaps because of the IEA’s history as a research rather than policy focused organization (Purves 1987). That said, ILSAs are evaluative tools partly sold to “clients” such as nation states with an assumption that the assessment will help judge the merit and worth of a system by measuring performance. Demonstrating positive impact and/or influence to those jurisdictions who have paid to have the
tests administered would make commercial sense regardless of the methodological concerns outlined above. Rightly so, testing organizations and countries alike want to know whether the tests they design and administer are having a positive influence on systems, at least partly because organizations then have a compelling narrative to sell to other potential participants and countries have a legitimate reason for participating.

We do not, however, want to ground our discussion of ILSA influence on policy in a naive caricature of ILSAs as authoritarian tools thrust onto nations by some evil council of neoliberals such that nations have little choice but to participate (the critical ILSA literature is full of this). In most cases, nations willingly sign up to testing regimes because they have come to believe that ILSAs offer their systems something that they either do not have or should have more of. If coercion is “the ability to get others to do what they otherwise would not” (Keohane and Nye 1998, p. 83), then “influence is seen as an emergent property that derives from the relationship between actors” (Betsill and Corell 2008, p. 22). Influence differs from coercion. There are obvious power imbalances in regards to intergovernmental organizations like the OECD, where more powerful countries have larger voices; however, that does not always result in coercive leverage towards less powerful actors. In other words, ILSAs may have the potential to be leveraged over educational systems to compel actor behavior, but that is not always the case and most national systems choose to participate, as evidenced by the growing number of participants that are self-electing to join the studies.

Here we present two cases that illustrate the policy influence of ILSAs. We chose these cases because they demonstrate possible overclaiming that ILSA results influenced change and evidence of ILSA influence that resulted in an unusual policy.

15.3 Policy Influence?

15.3.1 Case 1: PISA Shocks and Influence

Given the explicit goal of the OECD to inform national policy of member nations there is a considerable amount of research concerning the policy influence and impact of its flagship educational assessment PISA (Baird et al. 2011; Best et al. 2013; Breakspear 2012; Grek 2009; Hoplins et al. 2008; Kamens et al. 2013). PISA-inspired debates have resulted in a range of reforms including re-envisioning educational structures, promoting support for disadvantaged students (Ertl 2006) and developing new national standards aligned to PISA results (Engel and Rutkowski 2014), to name a few. The term “PISA shock” is now commonly used to highlight participating countries that were surprised by their sub-par PISA results and subsequently implemented educational policy reforms. Perhaps the most notable of these shocks occurred in Germany after its initial participation in PISA 2000. In response to lower than expected PISA scores, both federal and state systems in Germany implemented significant educational reforms (Ertl 2006; Gruber 2006; Waldow 2009). However,
Germany was not alone, and other countries, including Japan (Ninomiya and Urabe 2011) and Norway (Baird et al. 2011), experienced PISA shocks of their own.

In general, “shocks” attributed to ILSAs tend to be focused on PISA results rather than other studies. Notably, Germany, Norway, and Japan participated in the TIMSS assessment five years prior with similar results (in terms of relative rankings) to PISA (Beaton et al. 1996), yet this resulted in significantly less public discourse and little policy action. Of course, the perceived lack of a TIMSS shock could be for a variety of reasons. First, it is possible that the IEA simply does not have the appetite and/or political muscle to influence policy debates, leaving any discussions of results to academic circles. Second, the idea of a PISA shock may be misleading, representing an engineered discourse rather than a true social phenomenon. For example, Pons (2017) contended that much of the academic literature claiming that there is a PISA shock is biased because it contributes to a particular representation of what effect PISA “is expected to produce in conformity with the strategy of soft power implemented by the OECD” (p. 133). Further, similar to our discussion of the term influence, PISA shock is never fully conceptualized in the literature, making it difficult to compare and assess within and across systems. Pons (2017) further contended that assessing the effects of PISA on education governance and policy is difficult because the scientific literature on PISA effects are heterogeneous and fueled by various disciplines and traditions that ultimately lead to findings corresponding to those traditions.

15.3.2 Case 2: An Australian Example, Top Five by 2025

In 2012, the Australian Federal Government announced hearings into the Education Act 2012, which was subsequently passed and enacted on the January 1, 2014 (The Parliament of the Commonwealth of Australia 2012). This referred specifically to five agendas that were linked to school reform. These five reform directions were “quality teaching; quality learning; empowered school leadership; transparency and accountability; and meeting student need”. These five reform directions were to improve school quality and underline the commitment of the Federal Government to have a system that was both high quality and high equity. The Act went on to outline that the third goal was:

“...for Australia to be ranked, by 2025, as one of the top 5 highest performing countries based on the performance of Australian school students in reading, mathematics and science, and based on the quality and equity of Australian schooling” (The Parliament of the Commonwealth of Australia 2012, p. 3)

The Explanatory Memorandum that accompanies this Act includes in brackets, “(These rankings are based on Australia’s performance in the Programme for International Student Assessment, or PISA.)” There are a number of curious things about this legislation that binds the Australian education system to be “top 5 by 2025.” The first of these is that it shows, in the Australian context, that PISA and no doubt other
ILSAs have had an influence on policymakers. But the nature of the influence remains problematic, focused more on national rankings outcomes rather than considering what PISA tells Australia about its system and the policy decisions that have been made. While generic references to quality teaching and so on might work as political slogans, the reality is that they contain no specific direction or material that could ever be considered as a policy intervention or apparatus.

Second, it is curious that Australia legislated for a rank rather than a score or another indicator of the type that PISA provides such as some goal regarding resilient students. This would seem to suggest that this is how PISA is understood by policymakers in Australia, as a competitive national ranking system of achievement in mathematics, science, and reading. It would be easy to lay this solely at the feet of the policymaker, but it is probably not helped by the way that the OECD itself presents PISA as rankings to its member nations. Third, it seems fairly obvious that this use of ILSAs opens a system up to perverse incentives.

In the case of being “Top 5 by 2025,” the influence of ILSAs falls short because it lacks intentionality. It also shows that those who are charged with making policy do not understand the data that they see paradoxically as: (1) determining a lack of quality and equity, and (2) clearly indicating what needs to be done as a result. In other words, without identifying what policy agendas in specific contexts could best respond to highlighted problems, ILSA data is often left to speak for itself as regards to what must be done within systems. The Education Act 2012 points to the impact and influence of PISA on Australian policymakers, yet paradoxically that impact and influence comes at the cost of policymaking itself.

Demonstrating the impact and influence of ILSAs on national policymaking is not the same as demonstrating that ILSAs are having a positive, or beneficial, impact or influence on policymaking. Legislating to be “Top 5 by 2025” is a prime demonstration of impact on policy that consequently opens the test up to perverse incentives. It is an absurd example, but should New Zealand outperform Australia on PISA, then invading them and taking over their country necessarily brings Australia closer to its goal. This neatly illustrates the problem of influence: how can society think about making the influence that ILSAs are having more useful than an obsession with rankings? This begins by considering how ILSAs might be used to hold policymaking to account, particularly at a time where “top down” accountability in most contexts seems to be about protecting policymakers from repercussions based on their policy decisions (see Lingard et al. 2015).

These two cases are illustrative in two ways. The first case of “PISA shock” shows that while influence is easy to claim, it is invariably linked to pre-existing interpretations and expectations. In other words, it appears that ILSAs are often used to buttress the preconceived policy frames rather than interrogating them. The second case shows that even where influence can be demonstrated, this does not necessarily improve policymaking nor does it improve the understanding that policymakers have regarding their system. Both cases exemplify the problem of influence. ILSAs may or may not influence change in systems and, where they do, the resultant change may be artificial, superficial, or downright silly. What is needed, then, are better tools to inform decision making through understanding, predicting, and evaluating influence.
This may go some way to help policymakers become more purposive in their use of ILSAs as evaluative tools.

### 15.4 A Model for Evaluating Influence

Oliveri et al. (2018) developed a model to assist countries in purposeful, intentional ILSA participation. Although the model was originally designed as a means for countries to evaluate whether their educational aims can be met by what an ILSA can deliver, it is generalizable for other uses. The model encourages intentionality by carefully considering whether claims that are made about what an ILSA can reasonably be expected to do are valid in a given country. Further, it helps establish a set of more valid interpretations of ILSA data for policymakers to use in their decision making. In our retooling of Oliveri et al.’s model, we use the same general structure (Fig. 15.1).

Using the model begins with a matching exercise between the influence attributed to ILSA results and what evidence the ILSA in question can provide to motivate changes that are said to be directly caused by ILSA results. In this step, the national system or other stakeholder must clearly articulate all the ways ILSAs have influenced or are anticipated to influence their educational system and the policy process. As an example, assume that country X scores lower than desirable results on the TIMSS grade 8 science assessment and that, as a consequence, policymakers in country X propose a policy that requires all science teachers to obtain an advanced degree.
(e.g., master’s degree) by some set date. The matching analysis involves querying whether this policy can be attributed to TIMSS results. One line of argument might go like this: TIMSS provides results in science and teachers are asked about their level of education. Thus, initially, TIMSS appears to show evidence that science teachers with master’s degrees on average teach classes with higher performance. This causal claim, then, is said to be initially consistent with the evidence that TIMSS can provide, setting aside formal causality arguments.

The next step in the process is a formal logic argument. The logic model (Fig. 15.2) is a derivative of Toulmin’s (2003) presumptive method of reasoning. The process involves a claim supported by a warrant and additional evidence, which is often provided through a backing statement. In contrast, rebuttals provide counterevidence against the claim. The process allows for an informed decision to be made on whether and to what degree an ILSA can be reasonably said to have influenced a proposed or enacted policy. In the case of requiring master’s degrees, the logic argument could proceed as follows. TIMSS was said to influence policymakers’ decision that all science teachers should have a master’s degree. The warrant for this decision is that better educated teachers produce higher average student achievement. The backing could be that in country X (and maybe other countries), teachers with master’s degrees teach in classrooms with higher average TIMSS science achievement. Then, a possible rebuttal could be multifold. First, TIMSS does not use an experimental design. In the current example, teachers are not randomly assigned to treatment (master’s degree) and control groups (education less than a master’s degree). Thus, assuming that the teacher sample is strong enough to support the claim, a plausible explanation for this difference in country X is that teachers with master’s degrees command a higher salary and only well-resourced schools can afford to pay the master’s premium. A second plausible explanation is that only very highly motivated seek a master’s degree, which, rather than serving as an objective qualification is instead a signal of a highly motivated and driven teacher. A final decision might be that, given the observed associations (e.g., more educated teachers are associated with higher performance), country X decides to pursue the policy, thereby ignoring the evidence in the rebuttal.

![Logic model for evaluating plausibility of influence](image-url)
Returning to our model (Fig. 15.1), an analyst could conclude that, in spite of alternative explanations for the observed achievement differences between classes taught by teachers with different education levels, TIMSS results influenced policymakers’ decision to enact a policy requiring all science teachers to have a master’s degree. As noted, this conclusion could be by degrees and the analyst should include the warrant and rebuttal as the basis for this conclusion. The final, and perhaps most important step in the process is to consider the consequences of attributing influence and enacting a policy change based on ILSA results. This is in the form of a conditional consequential statement (CCS). Again, considering the TIMSS example, the CCS might be as follows: if country X requires science teachers to have a master’s degree, then the educational systems in country X can expect mixed achievement results, given that attributing influence to TIMSS results is not fully supported. Of course, there could be other consequences (i.e., medium-term teacher shortages, overwhelming demand for teacher training programs, and so on). However, it is important to delineate these consequences from those that are directly attributable to the influence of the ILSA in the given setting. To highlight this point, imagine that TIMSS did use an experimental design that randomly assigned teachers to different training levels. Further imagine that the TIMSS results showed that teachers with master’s degrees taught classes that consistently outperformed classes taught by teachers with bachelor’s degrees. Then, without going through the full exercise, assume that the decision from the logic argument is that the ILSA influence is fully supported. Then, a different CCS could be that if country X requires science teachers to have master’s degrees, country X can expect higher average achievement in science on future TIMSS cycles.

**15.4.1 Case 1: Worked Example**

Norway had lower than expected PISA 2000 results and one resultant policy change was to implement a national quality assessment system (Baird et al. 2011). In fact, the OECD’s report *Reviews of Evaluation and Assessment in Education: Norway* explained that poor PISA results spurred Norwegian policymakers to “focus attention on the monitoring of quality in education” (Nusche et al. 2011, p. 18). Using our model, a supporting analysis might proceed as follows. The first step is a matching analysis. That is, can PISA reasonably provide the necessary evidence to drive an expansion of a national evaluation system? Norwegian policymakers used PISA data, which showed that Norwegian students were lower performing than other peer industrialized nations, even though spending per child was one of the highest in the world. Initially, this claim might be regarded as consistent. This, then, triggers an analysis through the logic model. PISA is regarded by the OECD as a yield study (OECD 2019), measuring literacy and skills accumulated over the lifespan. It takes place at one point in time, when sampled students are 15 years old. Assuming this OECD claim is reasonable, PISA outcomes are attributable to a lifetime of learning. Then, the warrant for implementing a national assessment system could be that PISA performance was low relative to industrialized peers, and a national assessment
system will help Norwegian policymakers understand why. The backing is that PISA measures the accumulated learning through to the age of 15 and underachievement can be linked to learning deficiencies at some point between birth and age 15. A rebuttal to this argument, however, is that PISA does not explicitly measure schooling or curriculum, but rather, the totality of learning, both inside and outside of school. A national assessment that is (and should be) linked to the national curriculum will not fully align to PISA and risks missing the source of the learning deficiencies that lead to underperformance. The original argument also relies on the assumption that lower than desirable performance in the 2000 PISA cohort will be stable in future cohorts.

A CCS in this case might be: given that PISA showed Norway’s achievement was lower than its industrialized peers and that PISA is a yield study, implementing a comprehensive national assessment system could reasonably be attributed to PISA results. But the fact that PISA does not measure curriculum imposes challenges in assessing the educational system and improving PISA outcomes. Thus, Norway can expect mixed results in future PISA cycles from enacting a policy that dictates a national assessment system. Here, a fairly simple but systematic analysis indicates that PISA is a mediocre evidentiary basis from which to enact such a policy and, although speculative, Norway might have used PISA as justification for a policy that they already wanted to initiate. This claim is substantiated to some degree by the fact that Norway’s performance in TIMSS in 1995 was also relatively low; however, no similar policy reforms were enacted.

### 15.4.2 Case 2: Worked Example

The “Top 5 by 2025” case can be used to illustrate another worked example. PISA results clearly influenced Australian policymakers’ desire to climb the ranks in the PISA league tables. Here, then, is a clear consistency; Australia’s ranking in PISA drove a desire to improve on that position. The logic model becomes a somewhat trivial exercise where the warrant is that PISA rankings show the relative ordering of Australia’s 15-year-olds in mathematics, science, and reading. The backing, again somewhat trivial, is the evidence that higher scores map onto better achievement in these domains. A plausible rebuttal is that simple rank ordering changes are somewhat meaningless without considering measures of uncertainty. For example, if Australia moves up two or three places in the league table, this change might not be statistically significant. Nevertheless, the decision is relatively straightforward: PISA results can reasonably be attributed to influencing the decision to seek a top five position in the PISA league tables. However, a desire for improvement, as understood by a position on a ranking (top five) within a timeframe (by 2025), does little to demonstrate improved decision making or better understanding of policy settings and their impact. A desire for improved rankings is the opposite of influencing policy; in fact it may act as a barrier for making policy changes necessary for that improved ranking.
Then, a conditional consequential statement (CCS) might be: if Australia uses PISA results to influence a decision to move up the league table, then Australian schools can expect initiatives intended to drive improvement in mathematics, science, and reading. Certainly, as with any CCS, there is no guarantee that these consequences will happen. Perhaps policymakers will take no concrete action to realize the gains necessary to move into the top five. Further, downstream consequences also become important in this example. If initiatives to improve mathematics, science, and reading come at the cost of other content areas (e.g., art, civics, or history), second order consequences might involve narrowing of the curriculum or teaching to the test. Depending on the incentives that policymakers use to achieve the top five goal, there might be undue pressure to succeed, raising the risk of cheating or otherwise gaming the system (e.g., manipulating exclusion rates or urging low performers to stay home on test day). Clearly, this is not a full analysis of the potential consequences of such a policy; however, this and the previous examples demonstrate one means of using the model to systematically evaluate whether ILSA results can reasonably influence a policy decision and what sort of consequences can be expected.

15.5 Discussion and Conclusions

Ensuring that ILSAs do not have undue influence on national systems requires active engagement from the policy community to include an examination of the intended and unintended consequences of participation. Thus, while ILSAs can be an important piece of evidence for evaluating an educational system, resultant claims should be limited to and commensurate with what the assessment and resulting data can support. It is imperative to recognize that ILSAs are tasked to evaluate specific agreed upon aspects of educational systems by testing a representative sample of students. For example, PISA generally assesses what the OECD and its member countries agree that 15-year-olds enrolled in school should know and do in order to operate in a free market economy. To do this, they measure the target population in mathematics, science, and reading. Importantly, PISA does not measure curriculum, nor does it measure constructs such as history, civics, philosophy, or art. Other assessments such as TIMSS have a closer connection to national curricula. Nevertheless, even TIMSS is at best only a snapshot of an educational system taken every four years. As such, inferences can be made but only provide a cross-sectional perspective of a narrowly defined population regarding its performance on a narrowly defined set of topics. Although the majority of ILSA data is collected based on rigorous technical standards and is generally of good quality, it is not perfect and includes error, some of which is reported and some of which is not.

Given the high stakes of ILSA results in many participating countries, it is not surprising that there are both promoters and detractors of the assessments. For example, in the academic literature there exists a strong critical arm arguing that some of the most prominent ILSAs do more harm than good to educational systems (Berliner 2011; Pons 2017; Sjøberg 2015). Questions around the value of ILSAs have
also been posed by major teacher unions (Alberta Teachers’ Association 2016) and in
the popular press (Guardian 2014) and, with a specific focus on PISA, by the director
of the US Institute of Education Sciences (Schneider 2019). Importantly, the USA
is one of the largest state funders of the most popular ILSAs (Engel and Rutkowski
2018). In the face of these and other criticisms, promotors of ILSAs contend that
the tests have important information to offer and have had a positive influence on
educational systems over time (Mullis et al. 2016; Schleicher 2013). Yet, as we have
argued in this chapter, demonstrating the specific influence that ILSAs have had on
educational systems is not always straightforward given the differing definitions of
influence in the literature, along with the inherent complexity of isolating influence
in large, complex national educational systems.

Once a definition of influence is established, as we have done in this chapter,
it is possible to demonstrate instances when ILSAs clearly have an influence. Our
two examples are both problematic for a number of reasons. First, both examples
misuse ILSA results in order to encourage and implement policy change. In the case
of Norway, poor results on PISA changed how their entire educational system is
evaluated. In the case of Australia, policymakers set unrealistic goals and failed to
explain how a norm referenced moving goal is justifiable as the ultimate benchmark
of educational success, superseding the more common goals a citizenry and its leaders
have for its education system. We contend that both cases demonstrate how, without
a clear purpose and active management, ILSAs can influence policy in ways that
were never intended by the designers.

Although admittedly not foolproof, we argue that one way to properly manage
ILSA influence on educational systems is for participating systems to purposefully
nominate their reasons for participation and forecast possible intended and unin-
tended consequences of their own participation. Our proposed model depends on an
empirical exercise with an assumption that it is possible to establish direct relation-
ships in a complex, multifaceted policy world. We accept this criticism, but note that
this is, in many ways, what ILSAs are attempting to do by collecting empirical data
on large educational systems. Just like ILSAs, we do not contend that results from
our empirical exercise will fully represent the ILSA/policy interaction. However,
results from the model should provide more information than is currently available
to countries and provide them with: (1) a better understanding of how participa-
tion may influence or be influencing their educational systems; and (2) what valid
interpretations and uses of ILSA data can and should be made.

We realize that this is a serious endeavor fraught with difficulty but, without
a clear purpose and plan for participation in ILSAs, those who understand what
claims can and cannot be supported by the data are often sidelined once the mass
hysteria of ILSA results enter the public sphere. As such, we developed our model
as tool for those who fund participation in ILSAs to be more purposeful concerning
the process. We realize the suggested model will require most systems to engage
in additional work, but we maintain that systematically evaluating the degree to
which ILSA results can serve as the basis for implementing policy changes will help
prevent misuse of results. Further, documenting the process provides transparency
surrounding what national governments expect from the data and enables testing
organizations to better explain to their clients what valid information the ILSAs can provide. Outside of education, similar forecasting models are well established in the policy literature and common practice in many governmental projects around the world (Dunn 2011, p. 118). Given the high stakes of ILSA results, anticipating or forecasting consequences from the perspective of what ILSAs can and cannot do is a step toward better informing policymakers in their decision making. Our model can also be used to link the influence of ILSAs to any proposed or enacted policy. In other words, the model can work as a tool to understand whether the results from ILSAs are an adequate evidentiary basis to support or inform the policy. We recognize our model will not prevent all misuse or unintended influence of ILSAs, but it invites a more purposeful process.

Educational systems and policies designed to guide and improve them are extremely complex. We are not so naive as to believe that it will ever be possible to document or even understand exactly how ILSAs influence or impact participating educational systems. However, that does not mean that the endeavor is fruitless. We contend that defining terms and participating in an intentional process are two important ways toward understanding how ILSAs influence policy and holding policymakers and testing organizations accountable in how they promote and use the assessments.

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IEA Research for Education

A Series of In-depth Analyses Based on Data of the International Association for the Evaluation of Educational Achievement (IEA)

Volume 10

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The International Association for the Evaluation of Educational Achievement (IEA) is an independent nongovernmental nonprofit cooperative of national research institutions and governmental research agencies that originated in Hamburg, Germany in 1958. For over 60 years, IEA has developed and conducted high-quality, large-scale comparative studies in education to support countries’ efforts to engage in national strategies for educational monitoring and improvement.

IEA continues to promote capacity building and knowledge sharing to foster innovation and quality in education, proudly uniting more than 60 member institutions, with studies conducted in more than 100 countries worldwide.

IEA’s comprehensive data provide an unparalleled longitudinal resource for researchers, and this series of in-depth peer-reviewed thematic reports can be used to shed light on critical questions concerning educational policies and educational research. The goal is to encourage international dialogue focusing on policy matters and technical evaluation procedures. The resulting debate integrates powerful conceptual frameworks, comprehensive datasets and rigorous analysis, thus enhancing understanding of diverse education systems worldwide.

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Reliability and Validity of International Large-Scale Assessment

Understanding IEA’s Comparative Studies of Student Achievement
Foreword

Founded in 1958, IEA (International Association for the Evaluation of Educational Achievement) pioneered international large-scale assessments in education (ILSAs). IEA today is an international cooperative of national research institutions and governmental research agencies representing more than 60 countries, working together with scholars and analysts to research, understand, and improve education worldwide. Over 100 education systems participate in IEA studies. IEA has conducted more than 30 international large-scale assessments.

There are four core IEA studies. The Trends in International Mathematics and Science Study (TIMSS) has assessed grade 4 and grade 8 students’ achievement in mathematics and science every four years since 1995, while IEA’s Progress in International Reading Literacy Study (PIRLS) has investigated grade 4 students’ reading abilities every five years since 2001. The International Civic and Citizenship Education Study (ICCS) reports on grade 8 students’ knowledge and understanding of concepts and issues related to civics and citizenship, as well as their beliefs, attitudes, and behaviors with respect to this domain. Lastly, the International Computer and Information Literacy Study (ICILS) researches grade 8 students’ ability to use computers to investigate, create, and communicate in order to participate effectively at home, at school, in the workplace, and in the community. All these studies also collect rich background information from the assessed students and their teachers, school principals, and, in case of grade 4 student assessments, also from the assessed students’ parents.

Over the last 60 years, IEA studies have not only seen an increase in the number of countries participating but have also attracted growing interest from both policymakers and the general public. An increasing number of researchers from many different fields are using data from IEA studies to inform their inquiries and micro-level data from all IEA studies can be downloaded freely from the IEA website (https://www.iea.nl/data-tools/repository). The data includes thorough documentation and dedicated software that enables researchers to analyze the data correctly (https://www.iea.nl/data-tools/tools). In the early years of ILSAs, the data
was used mostly by the researchers involved in the studies, but, as the studies have become established and the utility of the data better understood, interest has extended beyond those involved in the design and implementation of these studies and more and more researchers are making use of the data, a development that is highly appreciated by all of us involved with IEA. But, although there is thorough documentation of the data and extensive reports explaining how each study is conducted, it is essential to ensure that IEA’s procedures are transparent to researchers not directly involved in these studies and to others who might be generally interested in how ILSAs work.

This book aims to shed more light on various aspects of IEA studies. It outlines how IEA studies are conducted, from developing the research questions to constructing study frameworks, to designing the instruments (assessment materials, background questionnaires, and manuals), establishing the important aspects when conducting a study, and reporting on the results. This book shows the rigor of these scientific endeavors and the quality control mechanisms that are required to ensure high quality data and high quality study reports.

This book also reveals how ILSAs have evolved. From an outside perspective, ILSAs may seem to have a well-established formula, with data collected in the same way over years and for decades to come; however, as this book explains, this is a misunderstanding. Procedures developed based on previous experiences and especially in response to developments in the digital world offer new opportunities but also pose new challenges to this field of science. I am certain that this book will provide a wealth of relevant information for anyone interested in ILSAs.

As with every IEA project, this book is the result of a strong collaborative effort. I am most grateful to Hans Wagemaker for his willingness to organize this book, bringing together a team of distinguished experts to share their knowledge and experiences. Editing a book with so many authors is always a challenging task, and I heartily congratulate Hans for creating such a coherent and informative volume to grace this series.

I also must thank the authors of all the chapters for their willingness to contribute both their time and knowledge to support this endeavor. All have excellent reputations in their respective fields and extensive demands on their time, and thus I truly appreciate their enthusiastic responses to the invitation to contribute to this book, given all additional work this entailed.

No acknowledgment would be complete without also recognizing IEA’s study centers and all the researchers involved in our studies not only for their work on the studies but also for their continuous efforts to improve IEA studies further.

I especially thank IEA’s Publications and Editorial Committee for ensuring the quality of this book, as they do for all IEA publications, and in particular, I am grateful to Valena Plisko, who, because the series editors and many committee colleagues were already involved as authors, coordinated the independent peer
review process for this special volume. My final thanks go to the IEA staff who helped in coordinating, editing, and publishing this book, in particular Gillian Wilson, IEA’s Senior Publications Officer.

Hamburg, Germany

Dirk Hastedt
IEA Executive Director
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About the Editor

Dr. Hans Wagemaker was the executive director of the International Association for the Evaluation of Educational Achievement (IEA) for 17 years, responsible for the management of all IEA international research and assessment projects and activities. He helped develop IEA’s Progress in International Reading Literacy Study (PIRLS) and oversaw the development and expansion of IEA’s training and capacity building activities in low to middle income countries, and IEA’s educational consultancy services. Together with Educational Testing Services (ETS), he established the IEA-ETS Research Institute (IERI), where he continues to serve as a Board member.

Dr. Wagemaker was a Senior Manager Research and International with the Ministry of Education, New Zealand, and represented New Zealand’s interests in the APEC Education Forum, UNESCO’s commissions, and the OECD, CERI, and the Education Governing Board. He has consulted for the Inter American Development Bank and UNESCO and worked extensively with the World Bank to advance a common interest in the uses of assessment for improving educational systems in developing countries. Most recently Dr. Wagemaker served as an advisor to the Minister of Education for the Sultanate of Oman. He is also a member of the Advisory Board for the Center for Education Statistics and Evaluation (CESE) for the government of New South Wales, Australia, the H Institute, Beirut, Lebanon, and continues in an advisory role with IEA.

Dr. Wagemaker holds BA and MA degrees from the University of Otago, New Zealand, and a PhD from the University of Illinois, where he was awarded a University Fellowship and, in 2009, the College of Education’s Distinguished Alumni Award.
Reliability and Validity of International Large-Scale Assessment

Understanding IEA’s Comparative Studies of Student Achievement

Series: IEA Research for Education

- This open access book describes the evolution of the methodologies used in large-scale assessments in education
- Examines the challenges posed in designing international large-scale assessments
- Addresses issues related to the reliability and validity of the international comparisons conducted by IEA
- Provides a guide to understanding and interpreting international large-scale assessments
- Assesses the broad availability of international large-scale assessment data and associated analytical software tools

This open access book describes and reviews the development of the quality control mechanisms and methodologies associated with IEA's extensive program of educational research. A group of renowned international researchers, directly involved in the design and execution of IEA's international large-scale assessments (ILSAs), describe the operational and quality control procedures that are employed to address the challenges associated with providing high-quality, comparable data. Throughout the now considerable history of IEA's international large-scale assessments, establishing the quality of the data has been paramount. Research in the complex multinational context in which IEA studies operate imposes significant burdens and challenges in terms of the methodologies and technologies that have been developed to achieve the stated study goals. The demands of the twin imperatives of validity and reliability must be satisfied in the context of multiple and diverse cultures, languages, orthographies, educational structures, educational histories, and traditions. Readers will learn about IEA's approach to such challenges, and the methods used to ensure that the quality of the data provided to policymakers and researchers can be trusted.
Chapter 1
Introduction to Reliability and Validity of International Large-Scale Assessment

Hans Wagemaker

Abstract Although international large-scale assessment of education is now a well-established science, non-practitioners and many users often substantially misunderstand how large-scale assessments are conducted, what questions and challenges they are designed to address, and how technologies have evolved to achieve their stated goals. This book focuses on the work of the International Association for the Evaluation of Educational Achievement (IEA), with a particular emphasis on the methodologies and technologies that IEA employs to address issues related to the validity and reliability (quality) of its data. The context in which large-scale assessments operate has changed significantly since the early 1960s when IEA first developed its program of research. The last 60 years has seen an increase in the number of countries participating, with a concomitant expansion in the cultural, socioeconomic, and linguistic heterogeneity of participants. These quantitative and qualitative changes mean that the methodologies and assessment strategies have to evolve continuously to ensure the quality of data is not compromised. This chapter provides an introductory overview of the chronology and development of IEA’s international large-scale assessments.

Keywords International Association for the Evaluation of Educational Achievement (IEA) · International large-scale assessment (ILSA) · Large-scale comparative assessment

1.1 Introduction

Since its founding in 1958, IEA has conducted a significant program of research on understanding student achievement in an international context. Its large-scale, comparative studies of education systems are firmly embedded in the educational policy landscape in many countries and sub-national educational jurisdictions. These
studies of education and schooling have made a significant contribution, not only to advancing understanding of learning outcomes and their antecedents but also to the development of the methodologies that have advanced the science of this field. Furthermore, in keeping with its stated aims, IEA has contributed significantly to the development of the wider research community and to capacity building, particularly with regard to those nations, institutions, and individuals charged with and committed to enhancing the performance of educational systems (Aggarwala 2004; Elley 2005; Gilmore 2005; Lockheed and Wagemaker 2013; Wagemaker 2011, 2013, 2014).

Throughout what is now the considerable history of IEA’s international large-scale assessments (ILSAs), a constant concern has been to provide data of the highest possible quality. Researching the complex multi-national context in which IEA studies operate imposes significant burdens and challenges in terms of the methodologies and technologies that are required to achieve the stated study goals to a standard where analysts and policymakers alike can be confident of the interpretations and comparisons that may be made. The demands of the twin imperatives of validity and reliability, tempered by a concern for fairness, must be satisfied in the context of multiple, and diverse cultures, languages, scripts, educational structures, educational histories, and traditions.

Furthermore, as data become more generally accessible and the use of published analyses become more intimately woven into the fabric of the educational reform and policy process, greater attention needs to be paid to more nuanced interpretations of study outcomes.

Each stage of the development and execution of ILSAs, from the framework development that outlines the fundamental research questions to be addressed and the parameters of the study in question (subject, population, and design), to the methodologies used in the conduct of the study (sampling, field operations, quality control, and analysis), to reporting, raise important challenges and questions with respect to ensuring the ultimate reliability and validity of the assessment.

### 1.2 Outline of This Book

This book offers a comprehensive analysis of the science underpinning all IEA’s ILSAs. The content bridges gaps in the general knowledge of consumers of reported outcomes of IEA studies, providing readers with the understanding necessary to properly interpret the results as well as critical insight into the way in which IEA, through its expressed methodologies, has addressed concerns related to quality, with particular reference to issues of reliability and validity.

To a large extent, the chapters that follow reflect the chronology of the development and execution of a large-scale assessment and provide a thorough overview of some of the key challenges that confront developers of IEA assessments and the strategies adopted to address them. While the issues and strategies outlined may also be common to other ILSAs, the focus of this volume is on the work of IEA; the chapters present examples that reflect some of the problems common to
most ILSAs, but include those that are unique to particular IEA studies. As it is not possible to cover every aspect of every study, readers interested in the detail of a particular study are encouraged to consult the related technical reports and documentation that are available on the IEA website (see www.iea.nl).

Following this introductory chapter, Chap. 2 discusses the related concepts of reliability and validity, and provides an overview of the research landscape as it applies to the work of IEA. It reflects on the continued evolution of the research landscape in terms of its magnitude and complexity and how these changes have impacted the process associated with the conduct of IEA’s assessments.

The starting point of all assessment is the assessment framework, and Chap. 3 describes the purpose and rationale for developing assessment frameworks for large-scale assessments. As well as differentiating the different types of frameworks, Chap. 3 identifies the steps required for framework development, examining their coverage, publication, and dissemination, and how, procedurally, input from both participants and experts informs their development.

The way in which assessment frameworks are realized in terms of test content is the focus of Chap. 4. Issues related to construct validity, appropriateness of stimulus material in an international context (content), item format, item types, fairness, ability to be translated, sourcing items, and item review processes are considered. Elements like field testing, scorer training, and ultimately, the interpretation of field test outcomes and item adjudication are also addressed.

Chapter 5 embraces the various issues and aspects driving the development of background questionnaires. As for the cognitive tests, item formats, development of indicators, item response coding, measurement of latent constructs, quality control procedures, delivery format options, and future developments are all addressed in this section.

In the multicultural, multilingual, multi-ethnic environment in which ILSAs operate, issues related to translation from the source language to the national test language(s) have fundamental effects on validity and reliability. Chapter 6 addresses the procedures and approaches that IEA has adopted to secure high-quality test instruments in the participants’ language of instruction.

For each study, IEA aims to derive reliable and valid population estimates that take into account the complex sample and assessment designs that characterize most studies. Chapter 7 addresses the sampling, weighting, and variance estimation strategies that IEA has developed to take into account and minimize potential sources of error in the calculation of such things as country rankings and subpopulation differences, describing the quality control and adjudication procedures that are key to the construction of validity arguments.

While Chap. 7 focuses on the processes associated with the population definitions and sampling, Chap. 8 focuses on the methodological concerns related to data collection, examining the perspectives of the national study centers for each participating country as well as the views of the international study center. The challenges of monitoring and ensuring data quality are fundamental to ensuring the overall quality of study outcomes and satisfying the imperatives of reliability and validity.
Concerns about data quality are not confined to the methods used to capture data in the field, but extend to the scoring of test booklets and the processing of the questionnaire data. Chapter 9 outlines some of the challenges of quality control, examining issues of comparability and describing the reliability checks that IEA employs to ensure data quality.

New e-technologies for assessment and data collection play an increasingly important role in ILSAs. Chapter 10 examines how those technologies are used to enhance the quality of assessments, their potential for improving measurement and data collection, and the advent of the new knowledge and skill domains related to information technology. In addition to establishing what is best practice in contemporary IEA studies, Chap. 10 explores not only the challenges of developing and delivering technology-based assessments in an international comparative context but also reflects on the potential that e-technologies offer in solving some of the ongoing challenges surrounding ILSA.

Chapter 11 explores the statistical foundations of ILSA and provides an explanation of how the methodologies adopted by the IEA can be used to describe and model individual and system level differences in performance in large-scale surveys of learning outcomes. Beginning with a brief historical overview of the development of latent variable models, this chapter stitches together a critical component of the validity argument as it relates to measurement and analysis in ILSA.

Whereas Chaps. 2 through 11 are intended to address and establish the reliability and validity of the data from a technical point of view, Chaps. 12 through 15 are concerned with aspects related to the issue of consequential validity, namely, the steps taken to enhance impact and mitigate the worst excesses related to misinterpretation, or overinterpretation of IEA’s data.

Chapter 12 provides a brief overview of IEA’s publication and dissemination strategy, including the quality control procedures for IEA publications. Chapter 13 describes the training and capacity building opportunities that IEA provides to study participants and interested researchers. IEA’s investment in skill development aims to provide researchers with sufficient understanding to define good research questions and produce analyses that address issues of interest that are both methodologically and analytically defensible. In keeping with this theme of consequential validity, Chap. 14 provides a case study of best practice from Singapore, demonstrating how data from ILSAs can be used to inform educational policy development and reform.

Finally, Chap. 15 explores the limits and possibilities of using ILSA data to inform that policy process, reminding readers of the need for continual development of the science and proposing a novel way forward in the search for enhancing impact.

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