

Policy Learning and Adaptation: Lessons from PISA for Educational Reform Worldwide

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This paper examines how insights from the Program for International Student Assessment (PISA) have shaped educational reforms across diverse countries, underscoring both achievements and persistent challenges. Through a comparative analysis of reforms in high-performing nations like Finland and Singapore, as well as emerging economies such as Thailand, Vietnam, and Brazil, the study investigates the adaptation of educational policies to different national contexts. Key reform areas include curriculum innovation, teacher training enhancement, and policies designed to foster equity in access to quality education, with particular focus on science, technology, engineering, and mathematics (STEM) disciplines. Each country's distinct sociocultural, economic, and institutional landscapes reflect notable variations in the prioritization and operationalization of these reforms, as highlighted by the findings.

The study identifies several critical barriers to effective policy transfer, such as cultural divergences, economic inequality, and differences in governance structures that impact the scalability of reforms. Furthermore, the study underscores the significance of employing context-sensitive methods to adjust policies and promote reforms that are not only in line with global standards but also tailored to local requirements and capabilities. Stakeholder involvement, particularly from educators, policymakers, and community members, emerges as essential in refining and sustaining reform efforts. This research underscores the dual role of PISA: while it provides a valuable framework for measuring educational success, it also requires adaptation and contextual awareness to inform meaningful and sustainable improvements. Ultimately, a flexible, inclusive approach to policy reform is critical for advancing educational quality and equity on a global scale.

Keywords: PISA, Educational Policy Adaptation, Comparative Education, Policy Learning, Equity in Education

INTRODUCTION

Widespread changes in workplace and job requirements in a globalized and interconnected world have defined a new urgency for educational reform as a top national priority. The growing demand on the part of policymakers to provide education offering local relevance but also to help their countries compete in a quickly changing world has fueled these forces. A prominent tool influencing these initiatives is the Program for International Student Assessment (PISA), which is overseen by the Organization for Economic Co-operation and Development (OECD). PISA has offered a special perspective on the outcome quality of education systems SM1 since, finally, it implemented the assessment of 15-year. The assessment, conducted approximately every three years, assesses the ability of 15-year-old students in reading, mathematics, and science. PISA offers international standardized data on student performance, allowing countries to assess their educational systems against one another, share their best policies, and learn from high-performing countries (OECD, 2023; Breakspear, 2012). Reforming Education: The Global Challenge of PISA As nations begin to turn to PISA for answers to their own questions-and points in the direction of where they hope to enhance students' performance and their nations' global competitiveness-this international frame has ushered in a new phase of educational reform.

PISA results have a strong influence on global educational policy, with many countries using its findings as the basis for creating and implementing reforms aimed at improving education outcomes. Finland, Singapore, and Japan are examples of countries and systems that others look to as exemplars of success in education (OECD, 2023). PISA data are utilized not just by policymakers to assess their performance, but also to identify good practices that might be adapted for local contexts. With its high performance and equitable outcomes, Finland's success has attracted worldwide attention to its practice, which provides greater autonomy to teachers, uses much fewer standardized assessments and is based on a student-centered philosophy (Sahlberg, 2021). Likewise, Singapore always fares high in these rankings and partly ascribed this to its tough curriculum, meritocracy, and quality teacher training programs that emphasize continuous professional development (Chey, 2024; Tan, et al., 2020). Such examples illustrate the global role of PISA in stimulating learning, and the need to contextualize.

But the question of whether educational policies are transferable across national boundaries is still complicated. Critics argue that ignoring contextual disparities when emulating policies from high-performing nations, commonly known as "policy borrowing," can lead to problematic outcomes. A nation's social, cultural, and economic contexts profoundly influence educational policies, and the unadopted transfer of these policies may result in ineffective or detrimental consequences (Phillips & Ochs, 2004; Steiner-Khamsi, 2024). Far

from being objective, success in PISA can create the fallacy of "PISA reasoning," in which the higher the PISA rank, the better the practices regardless of context, and suggests that the PISA winner's practices can be adopted intact elsewhere (Komatsu & Rappleye, 2017). In fact, recent research emphasizes that when it comes to policy implementation as a direct transfer, adaptation not imitation is the key to success as the ultimate effectiveness and efficiency of reforms depends on the fit of educational practices (Auld & Morris, 2019; Dobbins, et al., 2023). And therefore, bridging the gap between what international assessments provide in this case with PISA and the contextual understanding needed to ensure adaptations are relevant and viable, continue to be a real challenge for policymakers.

Even so, PISA insights have led on occasion to impactful shifts in education through careful local adaptation. PISA, therefore, has become shorthand for, among other things, where countries like Brazil should invest in teacher training and curricular reform to address performance gaps and produce quality changes in school performance (Carnoy, 2015). Also, Qatar is acting as if PISA is an engine of educational reform for PISA to wear its national priorities and to tightly bind its knowledge-based economy (Alkaabi, et al., 2022). These are examples of how PISA-teasers, with the right adjustments to serve specific country characteristics and ambitions, may help unleash major opportunities for elevating standards.

This investigation focuses on both successful and challenging examples of countries utilizing PISA data for policy learning and adaptation. This study addresses the challenges of cross-border policy transfer while identifying best practices for modifying international educational standards by examining a variety of cases, ranging from high-income countries to middle- and low-income countries. The study offers policymakers practical advice on how to apply PISA results to create educational systems that are sensitive to regional needs while simultaneously striving for international standards.

Building on recent literature, such as Breakspear's (2012) examination of PISA's impact on the establishment of a "global testing culture" and Lingard's (2016) examination of the role of metrics in policy formation ("policy as numbers"), this study provides a nuanced perspective on policy adaptation that goes beyond mere policy borrowing. Furthermore, the framework for "educational policy borrowing" developed by Phillips and Ochs (2004) offers a perspective on the adaptability and constraints of international benchmarks such as PISA in a variety of educational settings.

This study provides a comprehensive analysis of the successes and limitations of PISA-driven reforms, thereby contributing to our comprehension of the effective use of international data to inform and improve educational outcomes in countries. The following sections offer illustrative examples of how different countries have aligned PISA-inspired reforms with national reform priorities. We identify the associated challenges and issues and suggest lessons for policy learning in future. This holistic approach aims to demonstrate how

educational reforms that are more contextually relevant and sustainable, learnt from international indicators such as PISA, can be something other countries facing similar education challenges can refer to.

METHODOLOGY

This study employs a documentary research methodology to explore how countries adapt their educational policies in response to insights from the Program for International Student Assessment (PISA). By systematically analyzing an array of existing documents, including recent government reports, PISA publications, and contemporary academic studies, this research investigates the diverse approaches nations take to incorporate international assessment data into policy reform. Through this methodology, the study offers a structured, comparative perspective on how different educational systems, each with unique cultural and economic contexts, respond to global performance indicators. The research highlights patterns of policy adjustment, identifying commonalities and divergences in national responses to PISA findings. By mapping these trends, the study provides a comprehensive understanding of the global impact of PISA, revealing the extent to which it influences educational strategies worldwide. This approach not only underscores the adaptability of various educational systems but also uncovers the challenges faced by countries as they balance local needs with global benchmarks. In doing so, the study contributes valuable insights into the ways international assessments like PISA shape educational landscapes, offering implications for policymakers, educators, and researchers committed to informed and contextually responsive policy development.

RESEARCH DESIGN

This study employs a comparative case study design utilizing documentary research to examine educational systems in diverse socioeconomic, cultural, and governance contexts. This approach provides an in-depth analysis of how countries with varying backgrounds ranging from high- to middle-income levels and spanning both centralized and decentralized education systems adapt and learn from the data provided by the Programme for International Student Assessment (PISA). The study illuminates the diverse interpretations, prioritizations, and adaptations of educational policies across this spectrum, especially in relation to institutional capacities and constraints. Recent studies suggest that such diversity in educational policy responses reveals a more textured understanding of global educational trends and challenges (Alkaabi et al., 2022; Dobbins & Martens, 2012; OECD, 2023). Through this methodology, the study underscores how different contextual factors, such as economic resources, cultural

values, and governance structures, influence the feasibility and sustainability of policy responses. Furthermore, it underscores the potential impact of these factors on the meaningful integration of PISA data into national educational reforms. This approach contributes to a nuanced understanding of policy adaptation across various educational systems, emphasizing the importance of context in shaping effective educational strategies. The findings provide valuable insights for policymakers aiming to balance international benchmarking with local relevance, offering a foundation for sustainable, contextually appropriate reforms.

Case Selection

We discuss eight countries' policies changes in this study: educational reform towards Southeast Asian view and global sight. We sampled countries that are at very different stages in terms of economic development, governance and political structure and PISA performance, each of which involves a particular and interesting type of challenge in the process of policy adaptation. This provides an opportunity to test how different contexts influence responses to PISA results.

1. Finland: Sahlberg (2014) and the OECD (2019) claim they are a model of progressive, equity-based education with child-centered pedagogy, teacher autonomy, and low-stakes standardized testing.

2. Singapore: A perennial PISA top-performer, Singapore has a rigorous, meritocratic education system with strong emphasis on STEM education and high curriculum standards (Deng & Gopinathan, 2016; OECD, 2020).

3. Qatar: Qatar as a Gulf state which committed itself to develop knowledge-based economy is using PISA data to reform education sector with focus on STEM competences and critical thinking skills (Alkaabi, et al., 2022)

4. Brazil: In this Latin American middle-income country, reforms are centered on addressing inequality through the lens of PISA, which guides the most relevant reforms on improving literacy and numeracy outcomes. (Carnoy, 2015; World Bank, 2018)

5. Germany: Among all countries, Germany has undertaken some of the most extensive reforms in response to its PISA results, aiming to reduce regional disparities and tackle educational inequities stemming from its decentralized education system (Dobbins & Martens, 2012).

6. Thailand: A middle-income country in Southeast Asia, utilizes the PISA comparison to formulate its educational policy. Thailand, a middle-income country in Southeast Asia, is using PISA to inform their education policy, focusing on STEM skills and thinking skills (Office of the Basic Education Commission, 2021).

7. Vietnam: Although a country with limited resources, Vietnam's impressive PISA outcomes highlight the significance of efficient educational practices and the culture of education in Vietnam (Dang & Glewwe, 2020; World Bank, 2020).

8. Indonesia: Using PISA to guide policy debate about curriculum reform and equity with the goal of addressing education gaps in poorer areas (World Bank, 2020). Indonesia, as the largest economy in Southeast Asia, uses PISA to set the agenda on policy discussions related to curriculum reform and equity.

We highlight important commonalities but also local adaptations in the response to PISA, especially in Southeast Asia, where socioeconomic and cultural factors enable a very specific and favorable environment for adaptation of the policy.

Data Collection

We make use of data from three main sources for this study:

1. PISA Reports & OECD publications: PISA-related official documents providing country performance data (including tables with rankings), summary of findings & other in-depth analysis for each PISA cycle. As reference points, these reports inform national success and shortcomings in education, creating a baseline for cross-national comparisons and recognizing patterns of student knowledge and skills (OECD, 2023).

2. These include summative data and documents about national education reports, strategic plans and policy documents from Ministries of Education from each of the selected countries aimed at understanding the specific reforms and policy responses driven by PISA results. Together, these sources provide insight into the priorities of each country, as well as the challenges they are facing and the aspects of education that they are addressing, in a broader context of the country's strategy for education reform (Alkaabi, et al., 2022; Office of the Basic Education Commission, 2021).

3. Academic and Scholarly Publications: Academic journals, case studies, and evaluations of the effects of PISA data on national policies can be valuable evaluations of PISA impact. Such literature provides the background of how each of these countries tailored their policies upon reform but also what the implementation of those reforms looks like, for good and ill. And indeed, since much comparative work today suggests the difficulties of localizing global instruments, this makes evaluation of policy transfer and trajectories all the more problematized (Carnoy, 2015; Dobbins & Martens, 2012; Dang & Glewwe, 2020).

Data Analysis

We subject the data to thematic analysis, which enables the systematic identification and examination of recurring themes and patterns in policy adaptation. The comparative analysis of diverse policy responses to PISA data across various national contexts is particularly effective using this methodology.

The process involves four key steps:

1. **Coding of Policy Responses:** We classify policy responses into thematic categories that highlight specific strategies like STEM education, teacher preparation, curriculum reform, or equity-based policies. We categorize the countries according to their responses to the PISA data, specifically focusing on the issues they aim to tackle by implementing the PISA results and identifying the primary reform area in the PISA catalog (Dobbins & Martens, 2012; OECD, 2019).

2. **Identifying Trends and Differences:** This process involves comparing thematic codes across various cases to identify similarities and differences in policy responses. Thus, while Thailand and Singapore emphasize equity and support to address socioeconomic inequalities, Germany and Brazil focus on STEM (Alkaabi et al., 2022; Sahlberg, 2015). This comparison illustrates how countries adjust PISA information to align with their country-specific priorities and challenges.

3. **Liberal Domestic Adaptation:** In this section, we delve into the sociopolitical and economic context of each country, examining whether and to what degree this information influences policy adaptation. How did economic development, cultural values, and governance structures influence the development of unique reform approaches in these Southeast Asian states? This contextual analysis shows how countries with different resource endowments and cultural values take different paths based on similar PISA recommendations (Dang & Glewwe, 2020; OECD, 2018).

4. **Cross-case** We use cross-case synthesis to draw broader conclusions about the effectiveness of PISA-inspired reforms in specific contexts. This synthesis emphasizes the critical factors, common challenges, and best practices that are essential for successful adaptation. Comparative education studies (Breakspear, 2012; Phillips & Ochs, 2004) emphasize the distinction between universally applicable policy learning components and those that require significant modifications to suit local contexts.

Reliability and validity

We triangulate various sources, including government reports, the latest data from PISA, and the latest academic literature, to maximize the validity and reliability of this study. We use a triangulation strategy to ensure robust and well-founded interpretations of each country's reforms, enabling a multi-voiced and multimode comparative analysis. This study, drawing from multiple sources, establishes a robust foundation for comprehending the intricacies of policy responses in the wake of PISA, employing a diverse range of evidence. This improves the credibility of the results and their usefulness here and now in the discussions of education (OECD, 2023; Carnoy, 2015).

Limitations

The findings of this study are subject to certain constraints due to its dependence on secondary data, which is contingent upon the accuracy, completeness, and availability of published documents. Language barriers can impact the depth of analysis for specific cases, further restricting access to specific policy documents, particularly those published in non-English-speaking countries (Dobbins & Martens, 2012). Additionally, each case study is unique in terms of its social, economic, and cultural factors, despite the fact that this study identifies patterns that could inform global policy learning. Consequently, the results may have limited generalizability in other national contexts, underscoring the necessity of locally tailored policy adaptations (OECD, 2019; Carnoy, 2015).

FINDINGS

Policy Responses to PISA

Since its inception in 2000, the Organization for Economic Co-operation and Development (OECD) has positioned the Program for International Student Assessment (PISA) as a pivotal element in shaping global educational policy. By assessing the reading, mathematics, and science competencies of 15-year-olds every three years, PISA generates comparative data that prompts nations to reevaluate their educational systems. This benchmarking exercise serves to identify both strengths and weaknesses within education systems, leading to targeted policy responses. The following sections delineate how various countries have engaged with PISA results, revealing predominant themes in curriculum reform, teacher development, equity initiatives, and STEM education.

1. Finland: Prioritizing Equity and Holistic Education

Unofficially, Finland remains at the top in PISA because it applies the two-time-winning recipe i.e. equality and holistic education. Instead, Finnish policymakers use PISA data not as a spur to radical reforms but as confirmation of past policy choices, including strong teacher autonomy, low stakes standard-setting, and small classes (Sahlberg, 2015). Recent reforms have focused on enhancing teacher professionalism and updating the curriculum to emphasize interdisciplinary learning, thereby fostering adaptability and critical thinking among students (OECD, 2019). This approach resonates with the lifelong learning objectives of PISA, reinforcing Finland's dedication to both educational quality and social equity (Niemi et al., 2016). Phillips and Ochs (2004) say that high-performing models might not be directly transferable because of different cultural and contextual factors.

Finland's experience shows one important lesson, however: the need for local fit in policy of policies grounded in local values. Although the literature on

emulating successful systems suggest that policy borrowing can often be ineffective, Finland show us that top ranked international benchmarks can serve as a reference with success, but never applicable with a dismantlement of local identity and cross-national education philosophy. This case illustrates the complex relationship between international educational assessments and local educational policies, suggesting that the implementation mix is dependent on understanding and respecting local educational landscapes.

2. Singapore: Rigorous public education system and professional preparation for teachers

The rigorously structured, meritocratic Singapore education system allows it to excel in PISA, where the prioritization of S.T.E.M. education occurs alongside the nurturing of 21st century skills. Recent curriculum reforms have shifted towards aligning with the skill sets in the PISA competencies and the evolving needs of the global context, emphasizing skills such as critical thinking, collaboration, and problem-solving abilities (Deng & Gopinathan, 2016). The Ministry of Education carefully adjusts the curriculum to align with these tendencies and fit into these competencies.

Singapore's model demonstrates an individualized solution that respects the cultural and socioeconomic characteristics of the diverse student body, in contrast to claims from other high-achieving countries that attribute educational reforms to absolute system uniformity.

While Finland grants teachers considerable freedom from standardized testing (Sahlberg, 2021), Singapore's educational success is rooted in strong accountability measures and high standards (Friedman, 2014). This contrast highlights the significance of adapting educational principles to local contexts, emphasizing that although certain aspects of quality education may be universally applicable, their implementation must be tailored to fit specific cultural and institutional realities.

In addition, Singapore has invested heavily in training and professional development so that teachers can deliver such a student-centered learning methodology. This emphasis on ongoing professional development sets Singapore apart from the critiques of teacher preparation practices elsewhere, where uneven preparation can produce disparities in educational outcomes (Tan et al., 2020). While inexorably to a universal level of instruction, the enduring point of view that fits neither the nearby instruction nor the universal one is what gives Singapore training a special place remaining in the full world.

In summary, there is no universally applicable model for effective education reform, and Singapore's model is not a one-size-fits-all solution. While international benchmarks like PISA provide valuable insights and can serve as a foundation for identifying areas of improvement, their recommendations must be

adapted to fit the distinct cultural, social, and economic contexts of each education system. Education systems that attempt to replicate high-performing models without customization risk overlooking critical local factors that impact learning outcomes. Flexibility is therefore essential, not only to address unique challenges within different settings but also to support diverse student needs and foster inclusive learning environments that resonate with each community's values and aspirations.

3. Germany: Deutsche Schock: Recovering from the PISA Shock

Particularly in the initial rounds of testing with PISA assessments (OECD, 2019), we observed a correlation between students' socioeconomic backgrounds and their performance, a phenomenon known as the 'PISA shock' in Germany after its initial participation. Following this, Germany implemented reforms that included promoting national curricula standardization among its federal states, focusing on equity, investing in early childhood education, and targeting support for disadvantaged students (Dobbins & Martens, 2012; Swank & Betz, 2003; Brooks & Manza, 2006).

At that time, there was an expanding corpus of literature revealing the links between social class and educational attainment, which informed these reforms. For instance, Riphahn & Sauer (2023) contend that in Germany, despite persistent inequality in opportunities, the incremental reforms have yielded noticeable improvements in equity and performance. Dobbins & Martens (2012), in their earlier research, argued that systemic reform in a decentralized education system could lead to fragmented outcomes, potentially impeding progress towards nationally uniform change across normalized states.

Finally, the German case highlights the double face of PISA as a driver of education reform as well as an evaluation tool. Despite the criticism of PISA-driven reforms for prioritizing narrow performance measures over broader educational goals (Carnoy, 2015), Germany exemplifies the adaptation of selected PISA aspects to initiate significant system-level reforms.

Ultimately, Germany's experience underscores that a deep commitment to equity and a productive local understanding of context are essential for meeting the policy challenge of responding to a global stimulus like PISA. The evolution in Germany is another example to show how powerful PISA can be as a driver of systemic reform when integrated with approaches that take due account of the social and economic context in which they operate.

4. Qatar: A New Approach to Education for a Knowledge-Based Economy

Qatar uses PISA data as a tool to advance their educational reforms as they strive toward a knowledge economy. These reforms have focused on incorporating critical thinking and problem-solving skills as part of the curriculum

to address the needs of a global workforce since the 1990s (Alkaabi et al., 2022). This approach is consistent with prior literature that emphasizes the role of systemic educational frameworks in adapting to local economic requirements. For instance, Alkaabi et al. (2022) discusses the evolution of educational reforms in Qatar, aimed at developing competencies crucial for economic development a perspective that aligns with our findings.

However, while previous studies shed light on structural changes in educational policy, our research findings offer a more profound comprehension of the practical obstacles in implementing these changes within this specific context. For instance, while Qatar has successfully persuaded many of its supporters of the effectiveness of flipped classrooms, cultural attitudes toward schooling and deeply ingrained teaching practices have presented challenges to the adaptation process. This differs from previous literature, such as Dobbins and Martens (2012), which focused on policy formulation but failed to adequately capture the challenges of contextual adaptation in implementation.

Finally, the 'documented case for reform' demonstrates Qatar's efforts to align educational effectiveness with its economic goals, a hallmark of high-performing systems (OECD/CERI, 2010). However, we suggest that the absence of stakeholder engagement and a supporting system-level infrastructure may hinder the success of these reforms. Contrary to literature that often presents policy adaptations in new settings as uniformly successful and broadly beneficial—a view that oversimplifies the complexity involved—this gap highlights a nuanced challenge: understanding the localized dynamics of policy adaptation and accommodation.

In conclusion, while Qatar exemplifies the initial goal of leveraging PISA results to accelerate reform, our findings suggest that we need to focus more on the role of context and stakeholders in implementing these initiatives to fulfill their potential to significantly enhance schooling quality. It adds to the literature but also opens a line of inquiry concerning the interaction between different types of policy frameworks and the local contexts in which education takes place.

5. Brazil: Tackling Inequality and Curriculum Reinforcement

This development enabled Brazil to become a sort of prime case for the study of educational reform in line with international benchmarks, and Brazil was an early player in that game, engaging with PISA over an extended period. PISA results have exposed the large socio-economic inequalities that are entrenched in Brazil and lead to inequality of educational outcomes across the country (Carnoy, 2015). Similarly, widespread research supports the conclusion that socio-economic factors play a determinative role in educational outcomes, even when international studies such as PISA and TIMSS suggest changes in educational

policy (Dobbins & Martens, 2012:219), but systemic inequities appear to impede the realization of goals formulated by international test-based comparisons.

After a perceived poor performance, Brazilian policymakers responded by reformulating the national curriculum to raise both literacy and mathematics standards, especially in disadvantaged areas (Carnoy, 2015). This revising of curriculum aligns with the findings of Auld & Morris (2019a; 2019b), who draw attention to the significance of aligning local contexts in which education policymaking is carried out whilst recognizing the danger that comes from superficial policy borrowing. Since PISA data provided evidence on how to tackle educational inequality, Brazil has also focused on boosting its investment in teacher training and resources in public schools (OECD, 2022).

However, the commitment to these reforms has been uneven by region, illustrating an imbalance of resources and support, which complicates the widespread adoption of policy change. Improvements have certainly happened, as shown by urban centers performing better for students, but rural exists as well, where local context is neglected and the complementarity of reforms limited to spreading fruitlessly, like the World Bank (2020) has found.

Hence, although Brazil's approach proves a timely and actually responsive reaction to what PISA data highlight, it also remains in it the expression of important tensions between what is intended by policy and the reality of implementation, suggesting that a future agenda for research has to rest on the concrete articulation between policy intention and socio-economic and educational local conditions. This lends support to the claim that successful adaptation of diverse assessments like PISA is dependent on a clear understanding of the socio-cultural environment; as has been reported in the literature, unless assessments are contextualized, they may not achieve their intended impact (Phillips & Ochs, 2004).

6. Thailand: A Focus on Teacher Training and STEM Curriculum Enhancement

PISA results from the past decade show that Thailand's performance levels, particularly in reading and mathematics, have remained mixed, but there have been excellent opportunities for growth. To address these issues, the Ministry of Education has taken steps toward reforms that gradually embed critical and analytical skills into STEM curriculum (Office of the Basic Education Commission, 2021; Yangjeen et al., 2021; Tangpornpaiboon, 2022; Pholphirul et al., 2023).

This approach aligns with international trends where countries emphasize STEM education to enhance student competencies (Deng & Gopinathan, 2016; Sahlberg, 2021). However, unlike high-performing nations such as Singapore, which has implemented rigorous and structured STEM frameworks, Thailand's

reforms appear more incremental and adaptive to local contexts, reflecting a cautious approach to educational change (Chey, 2024).

Furthermore, Thailand has prioritized the quality of teachers through professional development schemes, in addition to training. Initiatives to equip teachers with the necessary training to meet regional and global education needs also reflect this dedication. Thailand's approach contextualizes professional development less as teacher improvement and more to foster a self-reflective educational ecosystem, in contrast to much of the existing literature on national-level reform success and the centrality of teacher quality (Carnoy, 2015; Dobbins & Martens, 2012).

These small changes show that Thailand continuously applied PISA data to improve the quality of the education system. Radicalism describes the "quick" approach, such as the actions we see in Finland, whose reform strategies are radically taking the paradigm in a different direction soon after countries are proving certain changes do or do not work (Sahlberg, 2014). Hence, although Thailand is moving towards a more internationally oriented system of education, the speed and style of reforms epitomize how difficult and context-specific policy learning is.

7. Vietnam: Renovation in Accessing Towards New Heights and Making Renewals in Some Policies

Given Vietnam's status as a developing nation and its recent economic crisis, it has garnered more international attention due to its remarkable PISA scores. Given that the country provides less education compared to the top-performing countries, this achievement holds significant importance. Specifically, the Vietnamese government has implemented reforms aimed at enhancing students' skill sets and abilities, particularly in mathematics and science, as part of a strategy that emphasizes logic and problem-solving skills (Dang & Glewwe, 2020).

While these initiatives align with the efforts of other top-performing nations that utilize PISA as a tool to inform educational gains, Vietnam's approach differs significantly. Specifically, following Sahlberg (2014), although Finland spends its time and efforts on building equity and students' well-being with a relatively loose and less standardized system, Vietnam, on the other hand, has always been engaged in having a well-performed, rigorous curriculum based on high expectations. This distinction indirectly underscores the apparent conflict between seeking quality and facilitating equitable access to quality education.

Finally, government efforts to develop strategies to retain and train teachers have resulted in better teacher quality, which addresses a crucial element found in other studies that proves that most reforms are not sustainable unless they relate to professional development (Deng & Gopinathan, 2016). However, compared to

decentralized models like Germany, where local authorities enjoy more autonomy in educational policy, the Vietnamese model of implementing these options is much more centralized (Dobbins & Martens, 2012).

Such policy diversification expresses how Vietnam interprets PISA results and strives to improve its education system while managing difficulties particular to its socioeconomic context. Vietnam offers a more nuanced view of how economies in transition can successfully leverage PISA as part of an education reform agenda focused on achieving high standards for academic excellence at the expense of equity in terms that may not always appeal to better performing counterparts.

8. Indonesia: Curriculum Reform and Equity Initiatives

The PISA results for Indonesia revealed a significant literacy gap, with equity tending to deteriorate, indicating wide disparities from class to class and grade to grade. As a response to this, the Indonesian government has embarked on an ambitious revamping of the curriculum, which will put more emphasis on basic literacies and numeracies (World Bank, 2020). This is significant not only because equity-focused programs, like targeted teacher professional development and additional funding for remote and disadvantaged schools, will accompany the entire range of proposed reforms, signaling a commitment to better quality and equity of education as outlined in the Partnership for Education program completion report, but also because of the experience of other countries to date.

Such adaptive strategies are consistent with lessons from literature (Carnoy, 2015) that emphasize the importance of context in educational change. Countries such as Finland and Singapore, having reached reasonable heights, use PISA data for micro fitting of their high-performing systems, whereas Indonesia's example shows the need for radical reforms to address centuries-old practices of differences and underperformance. Unlike high-achieving nations that implement incremental improvements, Indonesia's reforms are more foundational, aiming to create a robust educational framework that addresses both structural and systemic challenges.

While Germany, Qatar, and Brazil implement comprehensive and systematic reforms to address all aspects of the education system in response to PISA, Indonesia adopts a different approach, focusing on systematic and targeted efforts to address the immediate needs of the education system. While Babar is part of the Brazilian-oriented equity, the socio-economic issues of Indonesia still have less relevance to other countries that need this solution in a more particular way. This agreement with pre-existing research illustrates the importance of understanding adaptations of policy as set out by Phillips and Ochs (2004), who note that effective policy borrowing must take into consideration the context in which it is taking place.

Thus far, these examples demonstrate how different countries respond to PISA, with Indonesia's reforms serving as an example of a critical response to the national context. PISA, not a policy tool but a benchmarking instrument, can adapt to various context-specific forms, thereby paving the way for global educational improvement. This variety of reactions not only enriches the discourse on education reform, but also underscores the crucial necessity of considering each context when implementing meaningful change.

Challenges in Policy Adaptation

The modification of educational policies in accordance with international assessments, such as PISA, is intrinsically intricate. Although PISA offers valuable benchmarks for assessing student performance and pinpointing areas for improvement, the conversion of these insights into effective policies necessitates the negotiation of a variety of contextual obstacles. Each educational system operates within distinct cultural, economic, and political frameworks that influence the feasibility and impact of policy adaptations. This section emphasizes the primary obstacles associated with modifying policies according to the results of the PISA survey. These challenges include the risks of superficial policy borrowing, governance structures, culture differences, and socioeconomic disparities.

1. The differences in cultures and some ideas of education

Cultural influence explains the failure of many PISA-inspired policies in various countries, as cultural context plays a crucial role in education, and education practices and priorities cannot achieve complete effectiveness without cultural fit. Every country has a cultural values system that significantly influences its education system, establishing expectations for student behavior, the teacher's role, and parental involvement. Strong familial and societal support highly values education in countries like South Korea and Vietnam, significantly contributing to students' academic success (Dang & Glewwe, 2020). Policies based on similar societal expectations may not be as effective in nations that do not place the same level of importance on education or restrict external support.

Cultural factors also influence the acceptance and implementation of educational reforms. For example, Finland's policies prioritize equity and student well-being, which necessitates the reduction of standardized testing and the promotion of high teacher autonomy (Sahlberg, 2015). Stakeholders focused on academic achievement rather than comprehensive student growth might oppose efforts to adopt Finland's educational model within more examination-oriented and structured systems. Komatsu and Rappleye (2017) highlight that these situations emphasize the importance of aligning policies with the educational philosophies and cultural values unique to each country.

2. Socioeconomic Inequalities

These differences make it very difficult to adopt the educational policies that follow the PISA results. Countries differ in how readily they embrace educational reforms, which is a function of resources. But while countries like Finland and Singapore have the money to spend on infrastructure, technology, and teacher training, creating a better education system is a much more complex process. In contrast, countries with a middle- and low-income status, such as Indonesia and Brazil, frequently encounter financial constraints that limit their ability to implement significant changes (Carnoy, 2015).

Income disparities within a country can also diminish the efficacy of adapted policies. In countries with substantial socioeconomic segregation, the proximity of policies to improve learning outcomes for disadvantaged students may be farther away. Despite the implementation of policy efforts, reforms taken by the Germans to increase equity in the classrooms after the "PISA shock" have struggled, as long-standing socioeconomic divisions continue to influence the performance of students (Dobbins & Martens, 2012). Effective solutions to tackle such inequalities require not only curriculum reform but also support systems and the ability to overcome socioeconomic realities that contribute to lower educational achievement.

3. Governance and Decentralization

Governance structures significantly influence the implementation of policies, posing distinct challenges for centralized and decentralized education systems. In centralized systems like Singapore and Qatar facilitate the uniform and quick introduction of reforms, thereby aligning national educational strategies with PISA results (This centralized framework ensures consistent policy implementation and simplifies compliance monitoring.

By contrast, the presence of powerful regional governments makes hard-to-implement changes in national systems more complex, as they can in a decentralized system such as the US or Germany. Different levels of priority, resources, and approaches to policy implementation in each region may lead to inconsistencies in the adaptation of PISA-inspired policies. Germany's education policy is under the jurisdiction of the individual federal states, so it is hard to implement reforms uniformly across the country (OECD, 2015). Decentralized systems can also slow the reform process and dilute national educational improvement policies as different governing bodies must coordinate and negotiate (Wiseman & Anderson, 2013a; 2013b).

4. The Dangers of Shallow Policy Borrowing

Even though policy adaptation to PISA involves huge risk based on the propensity of shallow policy borrowing, where countries copy policies from high-performing countries without sufficient contextualization, our trajectory over the last years in adopting specific aspects of the PISA framework continues. The relationship between educational systems and social contexts is so interconnected that the replication of policies without adequate consideration of local needs is likely to produce ineffective and even counterproductive effects. In collaboration with Phillips and Ochs (2004), we contend that a thorough understanding of the context, its rationale, and the policy's success in the home context is essential for effective adaptation of such a policy to another context.

Singapore has performed well on PISA, in part thanks to its high-stakes exam system. The results may differ, given that different societal contexts surrounding the role of exams influence the implementation of similar tests. If we fail to carefully consider the extensive cultural and systemic support that often accompanies these policies, they could potentially exacerbate stress or dissatisfaction among students and teachers in Singapore. This policy, which often implies that success in one place will necessarily transfer to another, overlooks the need for tailored adaptations that reflect the relative strengths and problems of each nation (Komatsu & Rappleye, 2017a; 2017b).

5. Limitations on resources and infrastructure

Even if policymakers want to, infrastructure and resource constraints limit the extent to which they depend on PISA-based policies. Higher achievers often benefit from well-developed educational infrastructures, including technology, trained teachers, and high-quality learning materials. On the other hand, countries with low incomes, like Indonesia, will find it hard to push reforms that require high investment in these sectors (World Bank, 2020). Countries with limited resources find it most difficult to pursue PISA-linked initiatives, like reforming STEM curriculum or expanding digital literacy programs.

In response to these constraints, poorer countries emphasize small-scale reforms that will be in keeping with the resources they can command. So, rather than deploying a nation-wide STEM program, a country will pilot certain regional efforts that then can be scaled up. While this incremental approach allows for progress with scarce financial resources, it may slow down the marginal reform process more than in countries with relatively larger financial resources.

Ultimately, grappling with complexities that vary nationally is a second crucial aspect of aligning educational reform with PISA results. Governance structures, resource rationing, cultural contexts, and socioeconomic inequality simultaneously constrain and condition the plausibility and effectiveness of PISA-inspired policies. In addition, the risk of cosmetic policy borrowing when importing successful models from other countries highlights the need for careful

contextualization. It highlights the fact that a careful approach is needed focusing on gradual and sustainable improvements, specific to the context of each country. By identifying and managing these challenges well, countries will make better use of PISA as a tool for designing reforms in ways that are both effective and sensitive to local conditions.

Best Practices for Policy Learning

Countries worldwide have adopted specific best practices to enhance their educational systems by utilizing PISA data. These practices underscore the significance of not only implementing policies but also adapting, contextualizing, and continuously evaluating them to guarantee their sustainable impact. The following section outlines the primary best practices in policy learning that PISA has influenced. These practices encompass equity-focused policies, stakeholder engagement, data-driven decision-making, incremental reform, contextual adaptation, and investment in teacher quality.

1. Contextual Policy Adaptation

Contextual adaptation is essential for effective policy learning. Directly replicating strategies from high-performing countries without considering local conditions often results in wasted reform efforts. Instead, a deep understanding of a policy's core mechanisms, paired with adjustments to fit a country's specific social, economic, and cultural context, is critical for successful implementation. For example, Finland's focus on equity and student well-being—a major contributor to its outstanding performance on PISA—can inspire other countries to adopt similar principles. However, practical modifications, such as providing targeted support for disadvantaged students or reducing class sizes, may better align with local needs (Sahlberg, 2015).

Thailand's curriculum has undergone incremental revisions to prioritize critical thinking and problem-solving abilities while simultaneously maintaining its traditional hierarchical educational structure, as an example of effective contextual adaptation. This approach also honors local cultural values by incorporating components that foster cognitive development and student engagement (Office of the Basic Education Commission, 2021). Contextual adaptation ensures that policies are consistent with national priorities, thereby enhancing their probability of success and ensuring their long-term impact.

2. Implementing incremental and scalable reforms

An additional best practice in policy learning is to apply incremental and gradual reforms. Incremental policies allow for progressive modification and assessment of outcomes, unlike sweeping changes to systems that may deplete

resources and invite backlash. It allows for improving reforms and ensuring they are responding to real needs while being financially sustainable.

As noted above, Brazil is famous for incremental reform, first focusing on reforming basic literacy and numeracy through pilot schemes in the worst performing areas before rolling these programs out nationally. The incremental implementation facilitated policymakers in optimizing the impact and conserving resources by evaluating and modifying programs in response to feedback (Carnoy, 2015). In particular, incremental reforms are advantageous for low- and middle-income countries, as they allow them to make sustainable progress within their financial and structural constraints.

3. Investing in teacher professional development and training

No serious reform of education ignores the need to invest in quality teaching—universal quality teaching. In contrast, nations with strong performance even by global standards, for example Finland and Singapore, provide high-level initial teacher education, continuous professional development, and well-paid and prestigious roles for teachers, signaling that a key strategy for high educational achievement is improving standards of teaching (Deng & Gopinathan, 2016). Prioritizing teacher quality in policies allows educators to modify the curriculum and cultivate the critical thinking and problem-solving skills that PISA evaluates, thereby fostering enduring improvements.

Qatar's reforms, informed by PISA, offer a compelling illustration of this dynamic: the origins of the reform have significantly influenced, at least indirectly, the teacher's strategy. Qatar has improved teaching quality in classrooms through holistic professional development programs focused on updating pedagogical skills and including STEM education (Alkaabi et al., 2022). By investing in the quality of their teachers, nations can develop a skilled and prepared workforce that meets national standards and PISA competencies.

4. Engaging critical stakeholders in the reform process

For the successful implementation of reforms and the acquisition of widespread support, it is essential to engage stakeholders, including educators, parents, and community members. Engaging stakeholders cultivates a sense of ownership and provides critical insights into practical obstacles, thereby increasing the likelihood of sustained success.

Germany's response to "PISA shock" at the start of the new millennium underscored the importance of involving stakeholders. In Germany, national and federal state policymakers collaborated with schools and communities to customize reforms to address regional educational inequities (Dobbins & Martens, 2012). The collaborative process bolstered support for curriculum and resource distribution changes, ensuring their consistent implementation across all regions.

Involving stakeholders allows us to react positively to reforms and adapt them according to those closest to action in the education system.

5. Ongoing monitoring and evidence-based decision-making

One of the most basic policy learning best practices is drawing on data to make decisions and assess outcomes of reforms. Countries that do respond well to PISA data have set up systems to gather and analyze information about student performance, effective teachers, and the distribution of resources and then respond accordingly. Policymakers use data-driven decision-making to understand what is effective, what requires improvement, and the optimal allocation of resources to achieve maximum impact.

Singapore regularly uses assessment data to refine its curriculum and pedagogy, aligning it to both national goals and international standards. The MOE meticulously monitors student performance using various metrics to tailor help to individual needs and promptly implement any necessary intervention (Deng & Gopinathan, 2016). Finland continuously refines policies based on national assessment data to align them with the evolving needs of students (OECD, 2019). Because these policies are data-driven, they prove to be significantly more effective than conjecture, and their data-driven nature allows for adaptability in response to changing circumstances.

6. Prioritizing Equity and Inclusivity in Reforms

The establishment of inclusive and equitable educational systems increasingly recognizes the need for policies that prioritize equity. Socioeconomic status disparities frequently surface in the PISA data, prompting countries to implement reforms aimed at reducing these inequalities.

That is why equity-centered reforms are both the right thing to do and the smart thing to do: they maximize the number of students with access to quality learning, regardless of circumstance.

Germany and Brazil are examples of countries that have previously only offered equity-based reforms. In response to PISA, Germany augments financial resources in schools with high concentrations of disadvantaged students and introduces support measures for immigrant students, indicating its efforts to address achievement gaps (OECD, 2015). Likewise in Brazil, reform policies focus on the most underfunded schools, giving better support for low-income students (Carnoy, 2015). Equity and inclusivity play a crucial role in improving educational outcomes. When systems prioritize the needs of the most disadvantaged, they reorient testing to include a wider range of students. This, in turn, rewards better teaching approaches, as beneficial pedagogy is inherently inclusive of a wider range of groups.

In conclusion, PISA's best practices in policy learning clearly indicate the need for gradual implementation of changes, the need to enhance teacher quality, the importance of stakeholders in the solution, the necessity of data for decision-making, the need for context-specific and not universally applicable reforms. By focusing on these strategic approaches, nations can transform PISA wisdom into transformative, generation-advancing education reforms. These practices ensure that policy changes are grounded in evidence and tailored to each national education system, thereby enhancing the relevance, effectiveness, and inclusivity of national education policies.

Possible Actions Going Forward

With the persistence of PISA among education system reformers around the world, relevant, evidence-based, and adaptive system policies are on their way. While some of the standards offered by PISA have proven useful in comparing and contrasting educational quality, any future approach should focus on making more precise adjustments based on national necessities and cultural diversity. This Directive provides some suggestions for future research and policy action that could make the influence of PISA-related reforms more effective and relevant.

1. Widening the scope of contextualized policy research

Future research should prioritize studies that investigate the ability to adapt PISA data to local contexts with greater specificity rather than relying on superficial policy borrowing. Comparative studies conducted in regions with comparable socioeconomic conditions, such as Sub-Saharan Africa, Latin America, or Southeast Asia, may indicate strategies for policy adaptation that are sensitive to the cultural and economic realities of the local community. Therefore, longitudinal studies measuring the impact of policies, which need to adapt to different contexts over time, would be useful in identifying the most effective and durable adaptations. This would provide other countries experiencing comparable development challenges with valuable knowledge.

2. Advocating educational reforms that center equity

Equity remains, however, a major challenge in countries with marked socioeconomic divides. There are glaring inequities that remain in our educational systems; future policies need to favor inclusive educational models that ensure all have access to quality education. Direct the study of focused efforts that might gain traction in efforts to equalize achievement between needy students (especially low-income students and their peers) and other groups of students if they also seem to buffer gains in achievement that fall short to those served by these programs. Data on the long-run effects of equity-oriented policies on

economic outputs and social mobility would add to evidence of how inclusive schooling shapes society.

3. Integrating socio-emotional learning and wellness

PISA, which initially aimed to evaluate cognitive skills in reading, mathematics, and science, could potentially transform to prioritize student well-being and socio-emotional learning (SEL). An expanding body of research agrees that social and emotional skills, such as self-regulation, teamwork, and resilience, are critical components of a successful education for today and tomorrow. These skills not only contribute to academic achievement but also equip students to face complex, real-world challenges, promoting adaptability and mental well-being. Policymakers should consider embedding Social and Emotional Learning (SEL) across national curricula, making it an integral part of educational goals rather than a supplementary or isolated strategy. Integrating SEL into mainstream education can foster environments where students develop holistically, balancing academic and personal growth. Future PISA rounds are expected to assess socio-emotional competencies, which could offer a more comprehensive benchmark for comparing countries. By doing so, PISA could help highlight the value of these competencies globally, encouraging a more holistic approach to education reform.

4. Provide additional opportunities for professional development and teacher training

The retention of high-quality and motivated teachers is a key consideration and a major challenge for many countries, as evidenced by the comprehensive review of the literature in the aforementioned OECD report. More work will be required to build capacity in the teaching workforce through higher-quality professional development and training opportunities, alongside the PISA competencies in critical thinking and problem-solving. Countries may improve the quality of their teaching workforce through research on effective and scalable professional development models, particularly those adaptable to low-resource settings. Additionally, we could employ a research-based methodology to examine the long-term effects of continuous professional development on student outcomes, providing a solid foundation for enhancing teacher training.

5. Encouraging policy experimentation through data

The future could be brighter with data-informed policy experimentation. Using PISA data, countries can pilot innovative programs on a small scale to gauge how their outcomes might work and thereby make evidence-based adjustments to them before their rollout on a nationwide basis. Such a data-informed approach, sometimes referred to as "evidence-based policymaking," lends itself to providing a nimbler educational system capable of responding to

new challenges that are at hand. Research institutes and international agencies could collaborate to create pilot programs that use more rigorous data-driven approaches, such as randomized control trials, to test new approaches to curriculum design, delivery, and resource distribution.

6. Specifically, investigate the role of technology integration and digital literacy

It focuses on educating students to be engaged and effective digital citizens in a digital and technology-oriented world. Understand this: while PISA has initiated testing in areas such as global competence and collaborative problem-solving, an increased emphasis on technology and digital literacy is essential to equip students for future labor market demands. Policymakers in technology and teacher training might consider significant investments in digital literacy, solidifying it as a foundational pillar in national curricula. This shift would enable countries to cultivate sustainable, practice-based digital education models that can adapt to evolving technological landscapes. Moreover, digital literacy can enhance students' resilience and adaptability, skills that are increasingly valuable in a dynamic workforce. Additionally, researching the effectiveness of technology-enabled learning across diverse educational contexts becomes vital. By examining how these models function in different environments, educators and policymakers can identify best practices and optimize digital education approaches, ensuring they not only align with current demands but also remain relevant for future innovations.

7. Supporting policy learning across regions

Enhanced regional collaboration could lay a strong foundation for the progressive evolution of education policy. Neighboring countries within the same geographical or economic region—such as the African Union or ASEAN countries in Southeast Asia—often encounter similar educational challenges. Establishing regional networks to exchange best practices and policy insights can facilitate unified efforts to address these shared issues, such as enhancing teacher quality, improving literacy rates, and strengthening STEM education. Additionally, implementing regional PISA assessments, similar to the PISA for Development initiative, could yield context-specific data, offering a deeper understanding of the strengths and weaknesses within education systems across different regions of the world.

8. Extending the range of PISA assessments

Future PISA assessments could broaden the range of competencies evaluated to reflect evolving educational priorities. While literacy, mathematics, and science remain foundational, adding areas like global citizenship, digital and financial literacy, and creative problem-solving would provide a more holistic view of

students' readiness for an increasingly complex world. This expanded assessment scope could support countries in aligning their policy frameworks with Target 4.7 of the United Nations Sustainable Development Goals, which aims to ensure that by 2030, all learners acquire the knowledge and skills needed to promote sustainable development, including education for sustainable development, human rights, gender equality, and global citizenship. Given the current lack of detail around the specific goals, outcomes, and skills emphasized in global citizenship education, research into these broader competencies may also guide the alignment of national curricula with development standards in a way that is both feasible and impactful.

Conflicts of Interest

The authors declare no conflict of interest.

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