Understanding Factors behind Regional Inequality in Education in Kazakhstan

Accepted version of an article published in *Central Asian Affairs*:
Kopeyeva, Aigerim. " Understanding Factors behind Regional Inequality in Education in Kazakhstan", Central Asian Affairs 7, 1 (2020): 38-79.

Aigerim Kopeyeva
King's College London
a.t.kopeyeva@gmail.com

Abstract

There are significant regional disparities in students' outcomes in Kazakhstan. Whilst there has been progress in the overall quality of secondary education, large-scale assessments demonstrate a gap in knowledge of several years between certain Southern and Western regions when compared to the top-performing city of Almaty. The author analyzed country data from TIMSS 2015 using the Learning-adjusted years of schooling (LAYS) measure developed by the World Bank along with an expert survey to understand the factors behind this disparity across the country. The author's analysis suggests that this situation can be caused by the lack of specific regional education development policies, the language of instruction in school, and the poor socioeconomic development of the region in the first place. There are also indications that students in the disadvantaged regions might be less motivated, which can affect their academic achievement. The author proposes a two-stage policy intervention to im- prove the chances for good childhood education across regions.

Keywords

education – Kazakhstan – inequality – assessment – human capital

"I do not see how one can look at figures like these without seeing them as representing possibilities. […] The consequences for human welfare involved in questions like these are simply staggering: once one starts to think about them, it is hard to think about anything else."

—Lucas, 1988

doi:10.30965/22142290-00701002

1 Introduction

In the fall of 2016, Kazakhstan was building momentum in the international educational arena. For the first time, the country's school students ranked in the top 10 internationally for their performance in math and science, according to the Trends in Mathematics and Science Study (TIMSS).[1] Kazakh fourth- and eighth-graders demonstrated knowledge comparable to their peers from countries like Finland, South Korea, and Singapore and outpaced students from Great Britain, the USA, and Australia.[2]

This was a great achievement for the country, and, to many, it indicated the rising quality of education at national level. Yet when disaggregated by region, language, or urban/rural residence, the data from TIMSS and other large-scale assessments paint a bleaker picture.

There is a knowledge and skill gap of several years between students from different regions of Kazakhstan. According to the results of the OECD's Programme for International Students Assessment (PISA), most recently administered in Kazakhstan in 2015, 15-year-olds in the West and South of the country (Atyrau, Mangystau, South Kazakhstan, and Almaty oblasts) are at least two years behind their peers in Almaty city in reading, math, and science. As national report on PISA results shows, half of 15-year-olds in Atyrau oblast are "functionally illiterate" in science,[3] while more than half of students in South Kazakhstan[4] and Mangystau oblasts are functionally illiterate in reading, meaning that they could not complete tasks of the first level of difficulty.

This seems like an unacceptable reality for a unitary state that is committed to the education of all citizens. As Lucas put it, if one considers the consequences for human welfare, it is hard to think about anything else.[5] Although

1 I. V. S. Mullis, M.O. Martin, P. Foy, and M. Hooper, "TIMSS 2015 International Results in Math- ematics," 2016, accessed July 6, 2019, http://TIMSSandPIRLS.bc.edu/TIMSS2015/international-re sults/TIMSS-2015/mathematics/student-achievement/.

2 AAP, "Education Minister Embarrassed by Australia's Declining Maths and Science Results," *9News*, November 30, 2016, https://www.9news.com.au/national/australian-students-still- falling-behind/b67b2f62-c07f-402d-b96f-b356971cc2fe.

3 Information-Analytic Centre, "Osnovnye rezultaty mezhdunarodnogo issledovaniia PISA- 2015: Natsional'nyi otchet," Astana, 2017, http://iac.kz/sites/default/files/nac_otchet_PISA-2015_final.pdf.

4 In 2019 South Kazakhstan oblast was split to Turkestan oblast and city of Shymkent, which gained 'republican significance' status. Since data for 2015 assessments is available only for South Kazakhstan as a whole, I refer to this old territorial division where applicable.

5 Robert E. Lucas, Jr., "On the Mechanics of Economic Development," *Journal of Monetary Economics* 22, no. 1 (1988): 3–42. doi: 10.1016/0304-3932(88)90168-7.

Lucas was talking about national-level performance, wondering if one country's positive economic experience might be applied to another, his words are staggeringly appropriate for the educational situation in Kazakhstan.

Once we start to analyze a country's economic performance, we inevitably circle back to the quality of education. Since school is—and will long remain—the single institution where citizens spends the longest period of their life, it has both the highest privilege and the biggest burden of responsibility for their "formation."

In this paper, I analyze *regional student achievement* in Kazakhstan from the basis that it is vital for regional and national human capital development and predetermines a country's potential for economic growth. In other words, education is the single most important factor in developing a nation's human capital and thus determining its economic growth. Thus, I argue that achieving positive change therefore requires understanding the factors behind the gaps in student achievement.

2 Theoretical Framework

2.1 *Education, Human Capital, and Economic Growth*

Human capital is generally understood as the set of skills and experiences that an individual, firm, or country possesses. The World Economic Forum (WEF) defines human capital as "knowledge and skills people possess that enable them to create value in the global economic system."6

In his seminal work "On the Mechanics of Economic Development," Lucas formulates human capital as the "skill level" of an individual, linking it directly to work productivity.7 The World Bank defines human capital as the "knowledge, skills, and health that people accumulate over their lives, enabling them to realize their potential as productive members of society."8

Today, there are several international surveys performed by major analytical institutions measuring the quality of human capital worldwide. These include the UNDP's Human Development Index (HDI), the World Economic Forum's Global Competitiveness Index (GCI), and the World Bank's Human

6 World Economic Forum, "The Global Human Capital Report 2017," 2017, http://www3.weforum.org/docs/WEF_Global_Human_Capital_Report_2017.pdf.

7 Lucas, "On the Mechanics of Economic Development."

8 World Bank Group, "Human Capital Index. Kazakhstan (2-Page Brief)," Washington, D.C., 2018, https://databank.worldbank.org/data/download/hci/HCI_2pager_KAZ.pdf.

Capital Index (HCI). In addition to rankings, such studies provide thorough analysis of human capital components and the trends in their development.

As World Bank experts note, "a country's human capital is critical for its economic success," comprising 64 percent of a nation's wealth.9 The notions of *human capital and economic growth* are tightly intertwined in policy and economic discourse, with studies showing a positive correlation between the two. Pelinescu found a positive relationship between a country's capacity to innovate and its GDP per capita.10 Barro compared the potential input of human and physical capital to economic outcomes, noting that a higher ratio of hu- man to physical capital "tends to generate higher economic growth" due to both a country's capacity to absorb technology and the fact that human capital is more difficult to adjust than physical capital.11 Therefore, "a country that starts with a high ratio of human to physical capital—such as in the aftermath of a war that destroys primarily physical capital—tends to grow rapidly by adjusting upward the quantity of physical capital."12

The OECD views education as central to human capital development, observing a correlation between education level, GDP per capita, and overall economic growth.13 Education is often used as a proxy for human capital in studies of the effect of human capital on economic growth. Blundell et al., for example, identify three main components of "human capital": early ability (acquired or innate); qualifications and knowledge acquired through formal education; and skills, competencies and expertise acquired through on-the-job training.14

Thus, there seems to be a strong sense that there is a direct relationship between education and the country's overall economic performance. In fact, education-related parameters are present in every major human capital index:

---

9 Harry Anthony Patrinos and Noam Angrist, "Global Dataset on Education Quality: A Review and Update (2000–2017)," World Bank Group, Washington, D.C., 2018, http://documents.worldbank.org/curated/en/390321538076747773/Global-Dataset-on-Education-Quality-A-Review-and-Update-2000–2017.

10 Elena Pelinescu, "The Impact of Human Capital on Economic Growth," *Procedia Economics and Finance* 22 (2015): 184–190. doi: 10.1016/s2212-5671(15)00258-0.

11 Robert J. Barro, "Education as a Determinant of Economic Growth," in *Education in the Twenty-First Century*, E. Lazear (ed) (Stanford, CA: Hoover Institution Press, 2002), 9–24, http://media.hoover.org/sites/default/files/documents/0817928928_9.pdf.

12 Ibid., 17.

13 Eric Hanushek and Ludger Woessmann, "The High Cost of Low Educational Performance: The Long-Run Economic Impact of Improving PISA Outcomes," OECD, Paris, 2010, https://www.oecd.org/PISA/44417824.pdf.

14 Richard Blundell, Lorraine Dearden, Costas Meghir, and Barbara Sianesi, "Human Capital Investment: The Returns from Education and Training to the Individual, the Firm and the Economy," *Fiscal Studies* 20, no. 1 (1999): 1–23. doi: 10.1111/j.1475-5890.1999.tb00001.x.

- "Expected Learning-Adjusted Years of School" is one of the three components of the Human Capital Index (along with "Survival" and "Health"). The component reflects the quantity and quality of education.15 The measures "adjusted years of schooling" and "harmonized test scores" have been developed by World Bank experts to better reflect the quality of schooling.16
- In its Global Human Capital report, the World Economic Forum placed knowledge and skills at the core of all four key elements of human capital.17 "Capacity" stands for the formal education level of the population, while "Development" measures the formal education and upskilling of the workforce and the next generation. "Deployment" and "Know-How" measure adults' application of their skills and the depth of specialized skills that labor market participants possess.
- The Global Competitiveness Index (GCI), an annual survey of cross-country competitiveness also performed by the WEF, analyzes countries' performance on 12 main pillars, including "skills."18

On all of these rankings, education is represented by two main indicators: the highest level of education obtained by the population (or years of schooling) and educational outcomes in math, science, and reading as measured by international large-scale assessments (ILSAS).

As OECD experts note, all economic growth theories "see education as having a positive effect on growth."19 Barro and Lee's database of international data on average years of schooling is often used as a point of reference when calculating the effect of education on economic outcomes like GDP per capita.20 Return on investment in education is normally calculated as the ratio

15 Aart C. Kraay, "Methodology for World Bank Human Capital Index (English)," World Bank Group, Washington, D.C., 2018, http://documents.worldbank.org/curated/en/300071537907028892/Methodology-for-a-World-Bank-Human-Capital-Index.

16 Noam Angrist, Simeon Djankov, Pinelopi Koujianou Goldberg, and Harry Anthony Patrinos, "Measuring Human Capital (English)," World Bank Group, Washington, D.C., 2019, http://documents.worldbank.org/curated/en/540801550153933986/Measuring-Human-Capital.

17 World Economic Forum, "The Global Human Capital Report 2017."

18 Klaus Schwab, "The Global Competitiveness Report 2018," World Economic Forum, Geneva, http://www3.weforum.org/docs/GCR2018/05FullReport/TheGlobalCompetitivenessReport2018.pdf.

19 Hanushek and Woessmann, "The High Cost of Low Educational Performance," 12.

20 Robert J. Barro and Jong-Wha Lee, "A New Data Set of Educational Attainment in the World, 1950–2010," *Journal of Development Economics*, 104 (2013): 184–198. doi: 10.1016/j.jdeveco.2012.10.001; Deon P. Filmer, F. Halsey Rogers, Noam Angrist, and Shwetlana Sabarwal, "Learning-Adjusted Years of Schooling (lays): Defining A New Macro Measure of

of costs incurred by a citizen or a state to the individual's earnings at the given moment.21

The effect of education on countries' economic performance has been confirmed by multiple studies, performed both by institutions like the World Bank and by individual researchers.22 In the United Kingdom, for example, it has been found that citizens with formal qualifications "have significantly larger returns than individuals with the same number of years of schooling but who completed no formal qualification."23

In their analysis of the determinants of economic development in 110 countries, Gennanioli et al. tested the effect of geography, education, institutions and culture, finding education to be the single most influential variable explaining variations in income level both between and within countries.24 The authors' analysis of data for over 1,500 subnational regions also showed that education is the only factor that explains a substantial share of regional variation.25

Thus, I do not plan to go into much detail on this aspect. It is, however, worth mentioning several major trends that can be observed from thesestudies:

- There is strong evidence that primary education brings a higher return on investment than secondary or higher education. This is due to the foundational quality of the first years of education, when an individual's cognitive abilities are formed. As the effect of education is cumulative, the returns on secondary or higher education (any additional year of training) tend to be smaller.26
- Return on investments in girls' education are higher than those on investments in educating boys. Blundell et al. have found that the average annual

---

Education (English)," World Bank Group, Washington, D.C., 2018, http://documents.worldbank.org/curated/en/243261538075151093/Learning-Adjusted-Years-of-Schooling-LAYS-Defining-A-New-Macro-Measure-of-Education.

21 George Psacharopoulos and Harry Anthony Patrinos, "Returns to Investment in Education: A Decennial Review of the Global Literature (English)," World Bank Group, Washington, D.C., 2018, http://documents.worldbank.org/curated/en/442521523465644318/ Returns-to-investment-in-education-a-decennial-review-of-the-global-literature.

22 See, for example, the decennial review of the literature on the returns to investments by Psacharopoulos and Patrinos, "Returns to Investment in Education."

23 Blundell et al., "Human Capital Investment," 4.

24 Nicola Gennaioli, Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer, "Human Capital and Regional Development," *The Quarterly Journal of Economics*, 128, no. 1 (2013): 105–164. doi: doi:10.1093/qje/qjs050.

25 Ibid., 152.

26 Psacharopoulos and Patrinos, "Returns to Investment in Education."

return for men with a first degree is almost two times less than for women.27

- Finally, less economically developed countries tend to enjoy higher rates of economic growth than developed ones (due to the diversity of needs and spending in more developed countries).28

Researchers often refer to large-scale studies like PISA (Programme for International Student Assessment), TIMSS (Trends in International Mathematics and Science Study), or PIRLS (Progress in International Reading Literacy Study) to calculate return on investment in education. These studies provide the most thorough and representative database on international academic performance.

There are plausible concerns about whether it is entirely appropriate to use tests to measure quality of schooling—that is, the extent to which absolute learning outcomes represent quality of schooling and the factors that impact overall academic success. The appropriateness of using "years of schooling" (normally the period of pre-school and school education) to measure human capital is also an issue. One of the main reservations is that such an approach automatically assumes that every country in the ranking (or every region in a country) delivers the same amount and quality of learning to every student in one year of schooling, which is undoubtedly not the case. According to the authors of the Human Capital Index, there is "a gap in human capital formation: students are in school but are not learning."29

However, given that these assessments remain the primary sources of in- sight into academic achievement in the international context, they will probably be utilized for human capital studies for a long time yet. Barro found that international test scores have strong explanatory power for economic growth and are more accurate in predicting it than years of schooling.30

2.2 *Factors Influencing Educational Outcomes*

Students' *socioeconomic status* (SES), mostly understood as their family background and exposure to learning resources, is the contextual factor most often seen to impact student achievement in academic research. Studies like PISA or TIMSS, along with other international databases, make it possible to study the effect of a particular variable on educational outcomes.

27 Blundell et al. (1999), "Human Capital Investment: The Returns from Education and Training to the Individual, the Firm and the Economy."

28 Psacharopoulos and Patrinos, "Returns to Investment in Education."

29 Angrist et al., "Measuring Human Capital (English)."

30 Barro, "Education as a Determinant of Economic Growth."

Harding et al. and Crede et al. studied the impact of parental education on student achievement.31 Parents' career level was also found to influence student achievement,32 as was a child's access to educational resources at home.33 Blundell cites local environment and the quality of schools in a student's neighborhood as factors affecting educational attainment.34

Interestingly, a number of recent studies have focused on—and demonstrated—the direct and indirect influence of a mother's human capital on the development of her child. Harding et al. constructed a framework demonstrating that a mother possesses a certain level of social, cultural, and human capital that she can transmit to her child.35 These modes of transmission may include choosing a better school, finding better educational opportunities, her implicit behavior, and even the "quality" of her immediate social circle (friends and colleagues).

However, a mother's commitment to work does not show a clear positive influence on the child's academic success or future earnings. Wilson found that having a mother who works full-time correlates negatively with a child's income level in his or her early twenties.36 Muller likewise found that children whose mothers work part-time achieve better results than their peers with mothers who are employed full-time.37

---

31 Jessica Harding, Pamela Morris, and Diana Hughes, "The Relationship between Maternal Education and Children's Academic Outcomes: A Theoretical Framework," *Journal of Marriage and Family* 77, no. 1 (2015): 60–76. doi: 10.1111/jomf.12156; Julia Crede, Linda Wirthwein, Nele McElvany, and Ricarda Steinmayr, "Adolescents' Academic Achievement and Life Satisfaction: The Role of Parents' Education," *Frontiers in Psychology*, 6 (2015). doi: 10.3389/fpsyg.2015.00052.

32 Susana Claroa, David Paunesku, and Carol Dweck, "Growth Mindset Tempers the Effects of Poverty on Academic Achievement," *Proceedings of the National Academy of Sciences* 113, no. 31 (2016): 8664–8668. doi: 10.1073/pnas.1608207113; Peter Mortimore, *The Road to Improvement: Reflections on School Effectiveness* (Abingdon: Swets and Zeitlinger, 1998), 299–315.

33 Jason D. Edgerton, Tracey Peter, and Lance W. Roberts, "Back to the Basics: Socio-Economic, Gender, and Regional Disparities in Canada's Educational System," *Canadian Journal of Education*, 31, no. 4 (2008): 861–888.

34 Blundell et al., "Human Capital Investment."

35 Harding, Morris, and Hughes, "The Relationship between Maternal Education and Children's Academic Outcomes."

36 Kathryn Wilson, "The Determinants of Educational Attainment: Modeling and Estimating the Human Capital Model and Education Production Functions," *Southern Economic Journal*, 67, no. 3 (2001): 518.

37 Chandra Muller and David Kerbow (2018), "Parent Involvement in the Home, School, and Community," in J. Coleman (ed), *Parents, Their Children, And Schools*, 1st ed (New York: Routledge), 192.

As yet, there is not much evidence or research on the possible influence of an *individual's values* on their academic performance and subsequent "success in life." Nevertheless, in this paper I place a certain amount of emphasis on this aspect, as there are indications that this might be the next most important impact factor behind a student's SES.

Wilson has found that both perceived economic returns and students' SES influence their educational attainment. The accomplishments of older individuals in their neighborhood who have a similar background influence students' perceptions of the value of education, perhaps prompting them to want to acquire higher education. In other words, "youths respond rationally to eco- nomic incentives in education."[38]

The more successful are those who have proceeded to higher education and are now working, the higher are the chances that a school graduate will follow their example. By contrast, if the costs of getting higher education (including the potential loss of income compared to being employed during this period) are too high in the eyes of a teenager or his/her parents, the young person might opt out of going to university. This calculus might also influence a student's interest in learning while still at school—if there is no point of going to university, then doing well in school also loses its value: as Edgerton et al. put it, "perceived penalties for underperforming academically may pose less of a deterrent to lower SES students who are not anticipating substantial return from continued formal education, while the cost of underperforming for higher SES students may be perceived more intensely."[39]

Regional development is another important factor influencing student achievement. Since the economy of the region is reflected in the quality of life of students' families and in their neighborhood, regional development is often seen as having an indirect impact on student achievement. Edgerton et al., for example, assert that "observed interprovincial differences in academic proficiency are in general consistent with long standing disparities between provinces in fiscal capacity."[40] This is echoed by Tesema and Braeken, who found in their research on the regional factors impacting education in Ethiopia that "whenever different regions within a country have major economic differences, it is likely that students from economically less developed regions are moredisadvantaged."[41]

38 Wilson, "The Determinants of Educational Attainment," 545.

39 Edgerton et al., "Back to the Basics," 877.

40 Ibid., 880.

41 Melaku Tesfa Tesema and Johan Braeken, "Regional Inequalities and Gender Differences in Academic Achievement as a Function of Educational Opportunities: Evidence from Ethiopia," *International Journal of Educational Development*, (2018): 51–59, 52.

Gennanioli et al. have tested the influence of intra-regional characteristics like geography (oil reserves, weather conditions, etc.), culture (mutual trust), institutions, and education (educational attainment) on human capital in more than 1,500 subnational regions in 110 countries.42 Interestingly, the authors found that oil reserves do not explain any significant income variation within or between countries. Quality of institutions, while accounting for 25 percent of inter-country income variation, likewise does not explain intra-country differences in per capita income.

Meanwhile, regional education explained 58 percent of inter-country and almost 40 percent of intra-country variation in per capita income. Thus, of the factors tested, "none come close to education in explaining within country variation in income per capita."43 The authors concluded that regional education was "a critical determinant of regional development, and the only such determinant that explains a substantial share of regional variation."44

Thus, there is strong evidence of the importance of socioeconomic factors for student achievement and for the contention that these factors may vary between regions of a country. The primary focus of the present paper is student achievement in Kazakhstan disaggregated to the regional (oblast)45 level. The data on Kazakhstan's performance in recent large-scale assessments is taken from official international and national reports.

Box 1. Regional Performance In Kazakhstan: Context

Variation in economic performance across Kazakhstani regions is not surprising given the country's large territory and the uneven distribution of its population. So far, regional performance in Kazakhstan appears to have been fairly understudied.

Below are some of the most recent available data on regional performance and education provided by international and national rankings, along with relevant statistics.

42 Gennanioli et al., "Human Capital and Regional Development."
43 Ibid., 129.
44 Ibid., 152.
45 Oblast: administrative and territorial division in Kazakhstan.

Image 1 Map of Kazakhstan, before 2019 (when South Kazakhstan region was divided to Turkestan oblast and Shymkent city)
Source: https://en.wikipedia.org/wiki/Regions_of_Kazakh stan EBRD Regional Capability Index (2015)

Whiteshield Partners made one attempt to study the tendencies in regional development in Kazakhstan in 2015 (funded by the EBRD and the Government of Kazakhstan). They used their Regional Capability Index to group the 16 administrative units of Kazakhstan into "winning," "stagnating," and "losing" clusters. The key criteria were economic complexity, diversity, and industrialization in the years leading up to 2014.

Table 1 **Regional performance, 2014**[46]

Winning	**Stagnating**	**Losing**
Almaty oblast	Almaty city	East Kazakhstan oblast
Zhambyl oblast	Aktobe oblast	South Kazakhstan oblast
North Kazakhstan oblast	Akmola oblast	West Kazakhstan oblast
	Astana city Kostanay oblast Karagandy oblastPavlodar oblast	

Source: Whiteshield Partners, "Diversification of Kazakhstan's Economy: A Capability-Based Approach," EBRD, Astana, 2015,https://www.ebrd.com/news/2015/new-study-urges-diversification-of-kazakhstans-economy.html.

46 The authors of the Whiteshield Partners study did not include Mangystau and Kyzylorda oblasts due to "lack of diversity."

Among the main factors influencing regional capability development, the authors cited business barriers and quality of governance, education, and institutions. Despite the fact that Almaty oblast and South Kazakhstan oblast are the two most populated areas and have "comparable economic structure[s]," the authors acknowledge that Almaty oblast is more diversified and thus more open to innovation, while South Kazakhstan specializes in more simple manufacturing.47

IAC Ranking of Regional Education Systems (2015–2017)

The Information-Analytic Centre under the Ministry of Education (IAC) publishes an annual National Report on Education ranking the regional educational systems. The ranking provides an aggregated index of regional performance across three levels of education (primary, secondary, and higher). The index groups regional education systems into those with "very high," "high," "average," and "low" effectiveness. In 2015–2017, none of the oblasts was classified as "very high" in effectiveness. Pavlodar oblast received the "highly effective" title in 2015 and 2016 and was the only education system to do so, but in 2017 none of the regions made it into that category.48

Table 2 Effectiveness of regional education systems index (IAC)

	2015		2016		2017	
	Index	**Rank**	**Index**	**Rank**	**Index**	**Rank**
Pavlodar oblast	0.741	1	0.725	1	0.643	2
East KZ oblast	0.68	2	0.602	5	0.572	8
Karagandy oblast	0.654	3	0.608	4	0.579	5
West Kazakhstan oblast	0.642	4	0.651	2	0.576	6
Astana city	0.634	5	0.592	6	0.573	7
North Kazakhstan oblast	0.61	6	0.575	9	0.621	3
Aktobe oblast	0.605	7	0.528	12	0.491	12

47 Whiteshield Partners, "Diversification of Kazakhstan's Economy: A capability-based approach," EBRD, Astana, 2015, https://www.ebrd.com/news/2015/new-study-urges-diversification-of-kazakhstans-economy.html.

48 Information-Analytic Centre, "Natsional'nyi doklad o sostoianii i razvitii sistemy obrazovaniia Respubliki Kazakhstan po itogam 2015 goda," Astana, 2016, http://iac.kz/sites/default/files/nd-2016_po_itogam_2015_goda_kratkaya_versiya_rus.yaz._iac_zashchita.pdf; Information-Analytic Centre, "Natsional'nyi doklad o sostoianii i razvitii sistemy

Table 2 Effectiveness of regional education systems index (iac) (*cont.*)

	2015		2016		2017	
	Index	**Rank**	**Index**	**Rank**	**Index**	**Rank**
Mangystau oblast	0.601	8	0.509	13	0.478	13
Akmola oblast	0.6	9	0.583	8	0.544	9
Almaty city	0.583	10	0.639	3	0.659	1
Zhambyl oblast	0.57	11	0.554	10	0.581	4
Kostanay oblast	0.57	12	0.535	11	0.53	11
Atyrau oblast	0.528	13	0.475	15	0.441	14
Kyzylorda oblast	0.517	14	0.587	7	0.531	10
South Kazakhstan oblast	0.502	15	0.408	16	0.361	16
Almaty oblast	0.485	16	0.639	14	0.432	15

Whereas the regions with education systems that fall into the "average effective- ness" cluster are typically from North, East, and Central Kazakhstan, those with "low" effectiveness are usually from the Southern and Western regions of the country. Kostanay (North) and Akmola (Central) oblasts also fell into the latter group in 2017. South Kazakhstan and Almaty oblasts are continuously ranked as the least effective in terms of education; Atyrau oblast is also usually found in the bottom part of the ranking.

National Statistics

– In 2018, the population of Kazakhstan reached 18 million people. The territorial distribution of the population has always been uneven. The most striking difference is between sparsely populated North and West Kazakhstan and the densely populated South. While Atyrau, Mangystau, Aktobe, and West Kazakhstan oblasts together account for 16% of the country's population, the southern part of Kazakhstan (Almaty, Zhambyl, Kyzylorda, South Kazakhstan oblasts) is home to 37% of the population.49 South Kazakhstan oblast alone

obrazovaniia Respubliki Kazakhstan (za gody Nezavistimosti Kazakhstana)," Astana, 2017, http://iac.kz/sites/default/files/nacdok-2017_ot_kgk_final_09.08.2017_10.00-ilovep- df-compressed.pdf; Information-Analytic Centre, "Natsional'nyi doklad o sostoianii i raz- vitii sistemy obrazovaniia Respubliki Kazakhstan po itogam 2017 goda," Astana, 2018, http://iac.kz/sites/default/files/nacionalnyy_doklad_za_2017_god_s_oblozhkami_dlya_ sayta.pdf.

49 Statistics Committee of Kazakhstan, "Regions of Kazakhstan in 2017," Astana, 2018, http:// stat.gov.kz.

has a population of 2.9 million people—16% of the country's total—and continues to grow.

- Accordingly, as can be seen from Figure 1, South Kazakhstan accounts for the highest share of the country's school-age population. Of the country's over 3 million school students, one-fifth live in Turkestan oblast and Shymkent city (former South Kazakhstan oblast), and a further 13 percent live in Almaty oblast.
- There are clear differences in terms of regional migration. South Kazakhstan region experiences the largest outflows—in Zhambyl oblast in 2016, the negative balance of migration doubled in comparison to 2015 to reach over 16,000 people, and over 17,000 in 2017. According to Statistics Committee, the negative outflow in South Kazakhstan oblast reached almost 30,000 people in 2016, while in 2015 and 2017 it totaled around 14,000 people. In contrast, both Astana and Almaty cities showed a positive balance of over 30,000 people in 2017. In the Western region, however, outbound migration is minimal, with Atyrau oblast even showing a positive balance of over one hundred people in 2017. Outside of the Southern region, the highest negative balance (close to 14,000 people in 2017) is observed in East Kazakhstan oblast.
- Of all Kazakhstanis, 43% live in rural areas. The largest share of the rural population is registered in Almaty oblast (77% in 2018). The variation in the size of the rural population in recent years is not significant (a decline of 2% in North, West, and East Kazakhstan oblasts compared to 2015, and a 4% in- crease in Mangystau oblast since 2015).

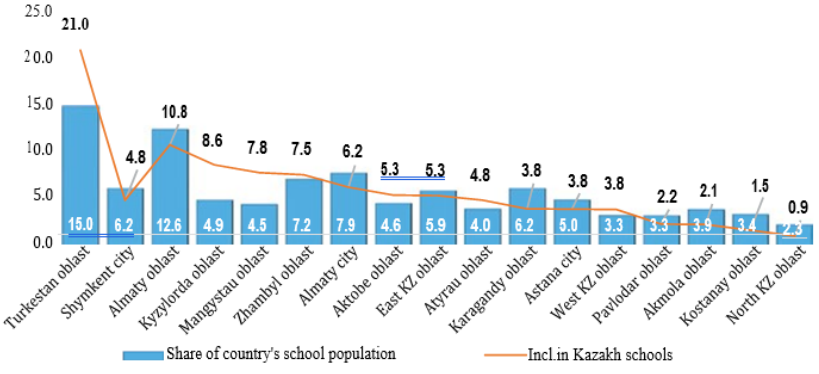


Figure 1 Distribution of school student population across Kazakhstan, 2018
Source: IAC (2019) 'Education system statistics in Republic of Kazakhstan,' national report

– In 2017, the average monthly wage in Kazakhstan was KZT 150,827 (approx. $454usd).50 Oil-producing Mangystau and Atyrau oblasts show the highest average monthly wage, over 70% higher than the national average. Meanwhile, the lowest monthly wage is observed in South Kazakhstan, North Kazakhstan, and Zhambyl oblasts, where it is around 30% lower than the national average.

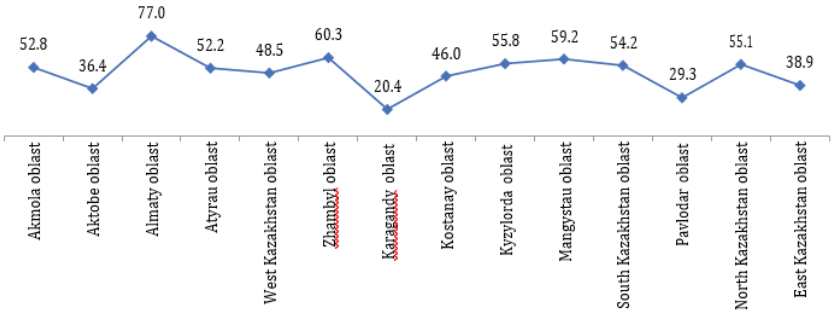


Figure 2 Rural population as a share of the regional total (%), 2018
Source: Statistics Committee, Ministry of National Economy (2019)

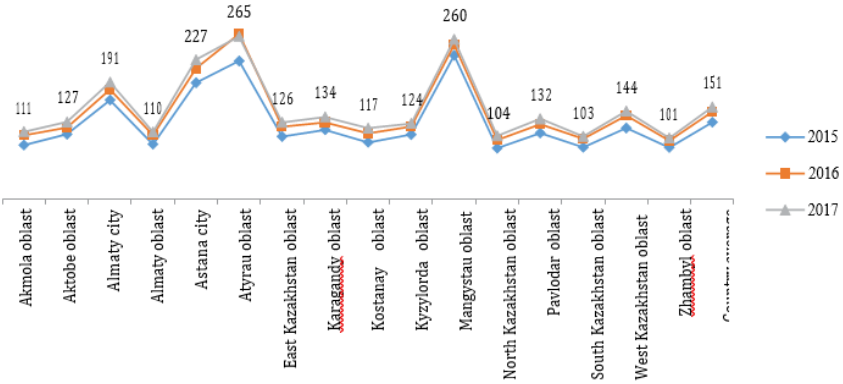


Figure 3 Average monthly wage in Kazakhstan (thousand KZT), 2015–2017
Source: Statistics Committee, Ministry of National Economy (2019)

50 In 2017, $1usd was equal (on average) to 332 KZT (see https://corner.kz/post/usdKZT-za-dekabr-i-ves-2017-god).

3 Methodology

To analyze gaps in student achievement between regions of Kazakhstan, I use TIMSS 2015 data. The choice of TIMSS over PISA is explained by the structure of the sample: TIMSS includes only school students, whereas PISA (being tied to age) allows college students to be included as well.51 Moreover, using TIMSS data makes it possible to follow the methodology of the World Bank's Human Capital Index, which likewise uses TIMSS data to calculate the achievement gap between countries.52 Finally, TIMSS is preferable to PISA due to the fact that the latter's 2015 data for Kazakhstan is incomplete.53

My particular focus is on South and West Kazakhstan. From the three major international large-scale comparative studies in which Kazakhstan has participated recently (PISA 2015, TIMSS 2015, and PIRLS 2016), it is evident that those regions have demonstrated the lowest student achievement. Moreover, it is possible to see that some oblasts are underperforming across all areas of assessment.

Table 3 shows the number of times that different oblasts have been ranked among the three with the lowest performance across all 8 assessment areas: math and science for fourth- and eighth-graders in TIMSS; math, science, and reading for 15-year-olds in PISA; and reading for fourth-graders in PIRLS.

All data on regional student achievement are taken from national reports issued by the Information-Analytic Centre, the national coordinating institution for international large-scale studies.

It is hard to ignore the fact that regardless of the area of study (science, math, or reading) or the age cohort (fourth-graders, eighth-graders, or 15-year-olds), certain regions tend to underperform. A striking example is Mangystau oblast, which was among the bottom three regions in seven of eight assessment areas. Students in another oil-producing region, Atyrau oblast, showed the lowest achievement in five assessment areas of the three studies (see Table 4).

Both South Kazakhstan and Almaty oblasts were ranked among the bottom three in terms of their performance on four out of eight assessment areas. Although three administrative units of Central Kazakhstan also show student

51 PISA assesses the functional literacy of 15-year-olds.
52 Angrist et al., "Measuring Human Capital (English)."
53 The international report on PISA 2015 results only includes Kazakhstan's results for closed-ended questions.

Table 3 Number of times oblasts were ranked in the bottom three on the eight assessment areas of recent ilsas

Region	Oblast	Appearance in bottom 6 (times)	Appearance in bottom 3 (times)
West Kazakhstan	West Kazakhstan oblast	1	0
South Kazakhstan	South Kazakhstan oblast	7	4
	Almaty oblast	6	4
West Kazakhstan	Atyrau oblast	8	6
	Mangystau oblast	8	7
North Kazakhstan	Kostanay oblast	6	2
West Kazakhstan	Aktobe oblast	3	0
Central Kazakhstan	Akmola oblast	6	1
Central Kazakhstan	Karagandy oblast	1	0
Central Kazakhstan	Astana city	2	0

achievement below the national average, only one of them performed in the bottom three (Akmola oblast in math).54

It would be reasonable to argue that it is inappropriate to draw conclusions about regional educational performance based solely on such a simplistic interpretation of rankings. The rankings may not fully represent the quality of secondary education; they may also be affected by out-of-school factors. Yet both objections are "features" of my argument rather than "bugs" in it: we need to understand exactly what lies behind regional variations in student achievement before we can treat these test results as indicators of educational quality in any particular region.

To be dramatic about it, the role, value, and status of school as an institution is at stake here, especially in regions with low achievement. Can we be sure

54 PISA 2015.

Table 4 Oblasts with the lowest results across three ilsas

	TIMSS 2015				PISA 2015			PIRLS 2016
Rank among 16 regions	**4th grade science**	**4th grade math**	**8th grade science**	**8th grade math**	**Science**	**Reading**	**Math**	**Reading**
11	West Kaz oblast	Atyrau oblast	South Kaz oblast	Astana city	Kostanay oblast	Akmola oblast	Aktobe oblast	Karagandy oblast
12	Akmola oblast	South Kaz oblast	Kostanay oblast	Akmola oblast	Akmola oblast	Almaty oblast	Mangystau oblast	Astana city
13	Atyrau oblast	Akmola oblast	Aktobe oblast	Almaty oblast	Aktobe oblast	Aktobe oblast	Kostanay oblast	South Kaz oblast
14	South Kaz oblast	Kostanay oblast	Almaty oblast	Kostanay oblast	Mangystau oblast	South Kaz oblast	Akmola oblast	Almaty oblast
15	Almaty oblast	Almaty oblast	Mangystau oblast	Atyrau oblast	South Kaz oblast	Mangystau oblast	South Kaz oblast	Mangystau oblast
16	Mangystau oblast	Mangystau oblast	Atyrau oblast	Mangystau oblast	Atyrau oblast	Atyrau oblast	Atyrau oblast	Atyrau oblast

Source: iac, National reports on Kazakhstan's results in TIMSS-2015, PISA-2015, PIRLS-2016

that test results are a fair reflection of the amount of work local teachers put in to get a failing student past the test threshold? Or perhaps the external factors in a region are so significant that a school's efforts merely scratch the surface— or worse, are made in vain?

Moreover, the answers to these questions have clear implications for educational policy. Any plans for strategic improvements or systemic interventions should be grounded in certainty that a good initiative will not have uneven regional effects due to varying conditions in the regions.

Figure 4 shows the results of the External Assessment of Learning Achievement (EALA) administered to ninth-graders in 2015. This national standardized test measured students' knowledge in math and science (physics, biology, geography, and chemistry). The national average score was 37 out of 80 points.

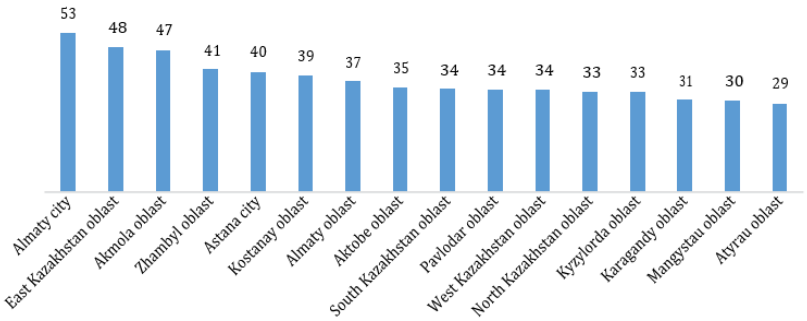


Figure 4 External Assessment of Learning Achievement (EALA), 201555

We can see that students achieved the lowest scores in Mangystau and Atyrau oblasts. In South Kazakhstan and Almaty oblasts, ninth-graders showed achievement close to the national average.

Since the age cohorts tested in TIMSS (eighth-graders) and EALA (ninth-graders), as well as in PISA (15-year-olds) and PIRLS (fourth-graders) are different (although there is a possible overlap between TIMSS, PISA, and EALA), I do not perform correlation analysis between these results.

3.1 *Calculating Learning-Adjusted Years of Schooling (LAYS) for 16Regions of Kazakhstan*56

The Learning-Adjusted Years of Schooling measure was recently developed by the World Bank to assess the quality of education under the Human Capital Index framework. As the authors of the measure note, the advantage of lays is that it reflects both the quantity and the quality of schooling.57

This approach was originally used to measure differences between countries. In this work, I apply it to calculate the difference in learning-adjusted years of schooling between 16 oblasts in Kazakhstan.

As the authors note, "schooling is not the same as learning."58 While educational attainment rates (highest level of education) are still widely used to

55 Information-Analytic Centre, "Analiz rezul'tatov vneshnei otsenki uchebnykh dostizhenii uchashchikhsia 9 klassov (voud-2015)," Astana, 2015, http://iac.kz/ru/analytics/ analiz-rezultatov-vneshney-ocenki-uchebnyh-dostizheniy-uchashchihsya-9-klassov- voud-2015.

56 I am analyzing data for sixteen regions instead of seventeen because TIMSS 2015 was administered *before* the division of South Kazakhstan. Thus, separate data for academic achievement of Shymkent city and Turkestan oblast, like data on their economic performance in 2015, are not available at present.

57 Filmer et al., "Learning-Adjusted Years of Schooling (LAYS)."

measure the quality of educational systems, it is also clear that countries (or regions) with the same expected years of schooling are hardly equal in academic achievement. Thus, combining quality and quantity of schooling is an important step toward making assessments of educational systems truer to life.

The overarching formula for lays is:

$$LAYSc = Sc * R_{\not\perp}$$

where

Sc is equal to average years of schooling in country *c*, and

$R_{\not\perp}$ is the measure of average learning for the relevant cohort and country relative to a benchmark country.[59]

For the purposes of my work, I use region-level data instead of country-level data and take Almaty city as a benchmark region, since it has the highest scores in all areas but one. I provide a detailed explanation of the World Bank's formula and include my adjustments in the Appendix.

3.2 *Limitations*

It is important to mention two possibly significant limitations relating to the calculation of lays in this work. First of all, since lays was originally designed to calculate country-level results, there is a possibility of significant standard error when comparing region-level data, which could affect the final calculations.

Broader concerns relate to the extent to which student achievement as reported by large-scale studies can represent both in-school processes and a student's family context. In other words, do these tests measure quality of actual schooling? While there is no ultimate answer to this question, as school effectiveness is a constantly developing movement in education science, I refer to the multiple previous studies that have employed PISA and TIMSS data as the most complete informational data set on countries' educational performance to date.

In the Kazakhstani context in particular, there are some concerns about the extent to which test tasks reflect the local school curriculum. However, these are not particularly troublesome. According to the national coordinating institution (Information-Analytic Centre), TIMSS is more focused on assessing students' academic knowledge of the curriculum than on determining their

58 Ibid, p. 3.

59 For a detailed explanation, see Filmer et al., "Learning-Adjusted Years of Schooling (lays)."

ability to apply it in real-life situations (as the OECD's PISA does). Thus, given the strong traditions of science and math teaching that are still present in Kazakh secondary schools, TIMSS data seem to reflect the Kazakh curriculum even more than does PISA.60

3.3 *Expert Survey*

To gain a better understanding of the scope of factors affecting student achievement in regions, I conducted a survey of 16 experts (see Table 5). The aim of the survey was twofold: a) to understand the level of general awareness of regional disparities in student achievement; and b) to gather a pool of professional opinions on what factors underpin low academic achievement in Kazakhstan'sregions.

For the aim of this survey I used purposive sampling, inviting 16 experts to share their professional opinions, 'on the basis of their possession of particular characteristics' (Cohen et al., 2011).61 This sampling of 'knowledgeable people' was compiled specifically to generate an informed theory (ibid.) concerning the question at hand—that of the factors can influence the gap in regional educational achievement in Kazakhstan.

The survey was conducted in the Russian language, in which all of the experts were proficient, and it was organized during my term as a fellow at the Central Asia Program (GWU, January–June, 2019). Due to the distance and time difference with Kazakhstan, the survey was organized online so as to be more convenient for the respondents.

The expert sample consisted of sixteen respondents, with 10 of them coming from education (including 3 researchers, 1 international NGO representative, 1 education consultant for international institution, 3 CEOs of local educational institutions, and 2 educators). Other 6 respondents are the experts in economics

Table 5 Expert sample

	E1*	**E2**	**E3**	**E4**	**E5**	**E6**	**E7**	**E8**	**E9**	**E10**	**E11**	**E12**	**E13**	**E14**	**E15**	**E16**
Gender, age	M, 56	F, 55	F, 26	F, 42	F, 70	M, 32	M, 50	M, 34	M, 35	M, 36	M, 29	F, 27	M, 34	M, 58	F, 36	M, 32

**E1, E2, etc. = Expert 1, expert 2, etc.*

60 Information-Analytic Centre, "National Report on the State and Development of Education System in Kazakhstan (during the years of independence)."

61 Cohen, L., Manion, L., and Morrison, K, *Research methods in education,* (London: Routledge, 2011).

(2), healthcare policy (1), or sociology (1), along with a local NGO founder (1) and a regional authority representative (1).

4 Data and Results

4.1 *lays Calculation Results*

Table 5 displays the results of lays calculations. These are presented by TIMSS discipline (science, math) and cohort tested (fourth- and eighth-graders). The first column shows each region's test score, while the lays column shows years of schooling adjusted for the "quality" of learning.

Almaty city receives a score of 11 in every lays column, as it acts as a benchmarking (*numeraire*) region. However, it is also three years behind the expected 14 years of schooling for the country.62 The calculations presented in Table 6 are made with an assumption that learning starts in kindergarten, leading to three years of learning in pre-primary education and 4 to 8 years in school. Calculations on the assumption that learning starts at school (first grade) can be found in the Appendix.

As can be observed from the table, the regions closest to Almaty city on the lays measure are Kyzylorda oblast (which even outperforms Almaty city on eighth-grade math), Zhambyl oblast, and East Kazakhstan oblast. The gap in learning-adjusted years of schooling between these regions and Almaty city is around half a year.

Thus, not the *entire* South Kazakhstan region lags significantly behind in academic achievement. However, *Almaty oblast is more than 2 years behind Almaty city*. This means that in eleven years of school, students there only cover knowledge equal to around 9 years of learning in the schools of Almaty city. From the map above, we can also observe that Mangystau oblast, though technically classified as a western region (it is also similar to Atyrau oblast in its oil-production economy), is geographically closer to the southern region of Kazakhstan. This fact was previously mentioned by Alimkhanova in her analysis of the NEET situation in South Kazakhstan.63

The results for West Kazakhstan as a whole are more homogeneous than those for the South. We can observe that both Atyrau and Mangystau oblasts are more than two years behind Almaty city in academic achievement. In their

62 World Bank Group (2018), "Kazakhstan" country brief, available at https://databank.worldbank.org/data/download/hci/HCI_2pager_KAZ.pdf.

63 Dinara Alimkhanova, "Understanding the Rising NEET Phenomenon in Southern Kazakhstan," *cap Paper* 206, George Washington University, Washington, D.C., June 2018, https://centralasiaprogram.org/archives/12460.

Table 6 Learning-adjusted years of schooling (LAYS) for regions of Kazakhstan

	TIMSS score 4th grade, science	LAYS	TIMSS score 4th grade, math	LAYS	TIMSS score 8th grade, science	LAYS	TIMSS score 8th grade, Math	LAYS
Almaty city	**623**	**11**	**608**	**11**	**591**	**11**	**575**	**11**
East Kazakhstan	588	10.2	582	10.4	574	10.6	560	10.6
Zhambyl	581	10.1	582	10.4	580	10.7	573	11.0
Kyzylorda	582	10.1	582	10.4	570	10.5	581	11.1
Pavlodar	573	9.9	561	9.9	556	10.2	544	10.2
North Kazakhstan	554	9.4	549	9.6	554	10.1	523	9.7
Aktobe	557	9.5	548	9.6	511	9.1	530	9.9
Karagandy	547	9.3	540	9.4	529	9.5	522	9.7
Astana city	544	9.2	536	9.3	530	9.6	515	9.5
West Kazakhstan	544	9.2	535	9.3	525	9.4	519	9.6
Atyrau	536	9.0	533	9.3	471	8.2	478	8.6
South Kazakhstan	530	8.9	533	9.3	522	9.4	522	9.7
Akmola	538	9.1	529	9.2	528	9.5	511	9.4
Kostanay	549	9.3	523	9.0	516	9.2	494	9.0
Almaty	519	8.7	511	8.8	507	9.0	504	9.3
Mangystau	504	8.3	508	8.7	473	8.2	476	8.6

Source: Author's calculation on the basis of TIMSS-2015 data for Kazakhstan

eleven years at school, eighth-graders in Atyrau and Mangystau oblasts are projected to cover an amount of learning equal to just 8–8.5 years in an Almaty city school (there is an almost three-year gap in science). For West Kazakhstan oblast, lays varies from 9.4 years in science to 9.6 in math, thus showing an approximate 1.5-year difference from Almaty city. Aktobe oblast is almost 2 years behind Almaty city in science and 1 year behind in math.

Another pattern worth mentioning can be seen across the Central Kazakhstan region. Karagandy and Akmola oblasts, as well as the capital city Astana (Nur-Sultan), all lag 1.5 years behind Almaty city in achievement.

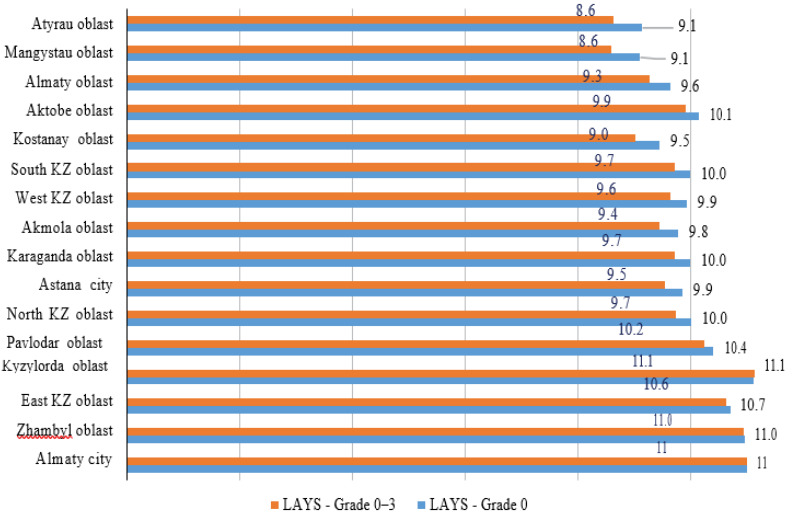


Figure 5 lays for regions of Kazakhstan (eighth-grade math)
Source: Author's calculations on the basis of TIMSS-2015 data for Kazakhstan

Figure 5 shows the results of lays calculations for eighth-graders' math scores, with learning starting at Grade 0 and Grade -3. This approach to calculation is offered by Filmer et al. to compare adjusted learning outcomes for different assumptions on when the learning starts—either at Grade 0 of school or 3 years before that, when a child goes to kindergarten.64 The *numeraire* region is Almaty city and the correlation between the two measures is 1.

Predictably, there is also a strong correlation between lays values for different subject areas (science and math)—.93 for eighth-grade scores.

4.2 *Expert Survey*

The ultimate goal of the expert survey was to serve as a preliminary foundation for a larger study on the reasons for educational underperformance in certain regions, providing a broad range of answers to exploratory questions and helping to develop an informed hypothesis.

64 Filmer et al., "Learning-Adjusted Years of Schooling (lays)."

Survey questions were clustered into three major subgroups: level of awareness about the issue; reasons for regional underperformance in secondary education; and what can be done to shift the situation.

4.2.1 Public awareness (is there a problem?)

Six of the experts surveyed consider secondary education to be of either low or "below average" quality in general. Some of their criticisms relate to the perceived overall "elitism" of secondary education, where a lot of attention is given to catering to talented and/or well-off students rather than to underperforming students. Other experts pointed to specific problems: a disparity in educational outcomes between urban and rural schools, regional differences, and a large gap in achievement between gifted and struggling students.

E11: *"There are schools that offer world-class education and schools where kids do not learn even basic skills."*

Only two respondents consider secondary education to be of "good quality" or to have made significant progress in recent years. These respondents also mentioned the development of institutions for gifted children (such as the positive impact of Nazarbayev Intellectual schools) in support of their argument, as well as increased financial support for the system as a whole.

Overall, among the majority of the experts there is a clear consensus that the quality of education cannot be generalized at the national level due to the heterogeneity of the schools in the system and their varying prerequisites.

Experts mentioned functional literacy (the ability to communicate and work with various types of information, the ability to apply knowledge to real life) and university enrollment or the competitiveness of graduates as the most important indicators of the quality of education. Equality of opportunity and inclusiveness was the second most frequently mentioned indicator, while only two experts mentioned parent, student, and teacher satisfaction as evidence of the system's quality.

E13: *"One of the key indicators of educational quality is reducing the gap in achievement between struggling and successful students."*

Experts held similar views regarding the level of social awareness of the achievements and pitfalls of the country's secondary education system. The majority believe that society is either completely unaware of or insufficiently informed about recent developments in secondary education.

E12: *"They [the public] are completely unaware. We need an effective communications campaign, although it is still not in the interests of the state apparatus to shed light on the real issues at hand."*

Experts were offered the chance to look at the results of three large-scale comparative studies (TIMSS, PISA, PIRLS) and asked whether they could draw any conclusions from that information.

Overall, there is a high level of trust in LSAS among the experts surveyed. Twelve of sixteen experts believe they can be used as reliable sources of information about the quality of secondary education. Among the four who answered this question in the negative, two referred to the need to integrate the data into a larger analysis with additional data in terms of the quantity of observations and other indicators such as university enrollment data. Two experts disregarded the international test results completely, expressing their distrust in the integrity of the data and the administration of the tests in Kazakhstan ingeneral.

On the other hand, as mentioned by one of the experts, since the methodology of a particular test is the same for all the regions, it provides a good starting point for further analysis, showing that particular regions have lower results across all three studies.

4.2.2 Reasons for regional underperformance

Before addressing specific regional underperformance, the experts were asked to answer a multiple-choice question regarding the influence of contextual factors (as opposed to features of schooling or happenings in school) on a child's academic achievement. As can be seen from Figure 6, the majority believe that family SES and the values system with which children are raised play a significant role in their academic success. Living standards in their neighbor- hood and school infrastructure come second in terms of their influence on academic achievement.

It is possible to identify *four main factors* which the experts consider to be the most influential in determining regional educational achievement:

- Regional SES (including the share of urban/rural population, education expenditure, school financing, and the poverty level in the region/ neighborhood);
- Quality of teaching (teachers' qualifications and professional development opportunities);
- Language (Kazakh versus Russian languages of instruction, share of Kazakh-speaking population in the region); and
- Values and traditions of local population (importance of education in regional strategic development, traditions and local views regarding the value of education).

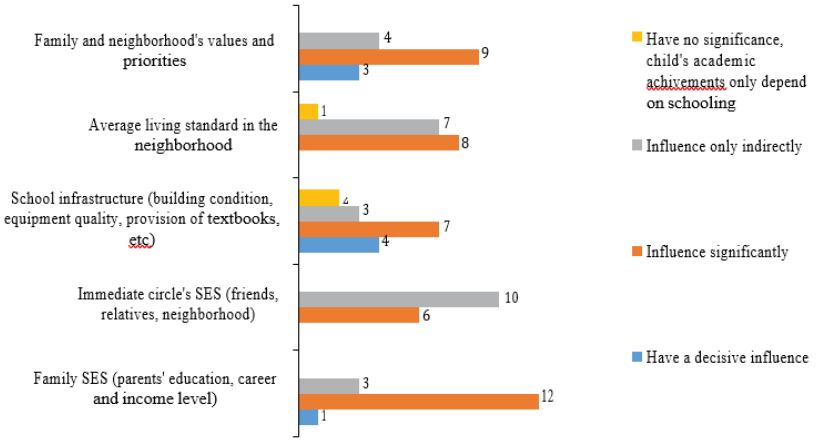


Figure 6 Role of contextual factors in determining academic achievement
Source: Compiled by the author on the basis of expert survey responses

E5: *"South Kazakhstan oblast is peculiar due to its high density of school students from various backgrounds; the population has a more traditional valuesystem in which education might occupy a firm position but not be a first priority."*
E6: *"...However sad or shameful it is to acknowledge this fact, [regional under-performance] might alsobe connected with the share of Russian-speaking population in the region, although this should change with time."*

4.2.3 What sort of change is required?

It is possible to disaggregate expert opinions here into several categories that emerged during the analysis: a) actor (who should author the change); b) character of change (type of interference required); and c) object of influence (what or whom the change should address). The measures suggested by the experts to reduce inequality in access to quality education ranged from additional funding to changing the structure of education system management at both national and regional levels.

4.3 *Actor*

As was to be expected, all experts link any potential change to the central government, represented by the Ministry of Education and other decision-making bodies. This is a fair perception in a centralized system, where decisions

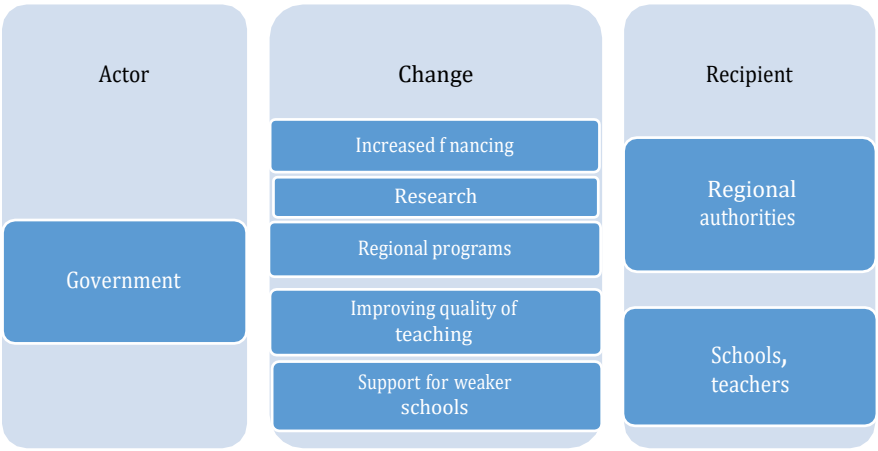


Figure 7 Actor, change, and object of change proposed by experts
Source: Compiled by the author on the basis of expert interviews

involving finance, infrastructure, and capacity-building are normally made only by higher authorities. This is also mostly true for region-level activities, especially in the field of education—regional activities in this sphere are planned on the basis of the State Program for Education Development, which states national and regional priorities. However, it also shows that the experts do not consider it likely that private institutions or entrepreneurs would contribute significantly to the regional education development, which could be indicative of somewhat embedded distrust towards the former.

4.4 *Type of Change*

The most important and urgent measure, according to the experts, is to increase financial support for the education system in general, as well as for the regional budgets. That includes raising teacher salaries and targeting financial aid to weak schools in disadvantaged neighborhoods.

There is a consensus among the majority of experts that measures to reduce the achievement gap should originate *from within each region*, based on the regional context and issues at hand. Two experts mentioned the need for research to understand the reasons for regions' poor performance prior to enacting new measures.

***E3**: "Before introducing any measures, we need to conduct deep research into the reasons for regional inequality in education. And after the reasons are clear, specific regional measures can be initiated."*

Improvements in teacher quality and status is another step that was often mentioned by the experts, who are alarmed by the poor quality of future teachers admitted to training programs at universities and the lack of teacher autonomy in Kazakhstan. Some experts view improving the status of teachers and reducing their workload as a vital part of the overall improvement of the quality of education in the regions.

Several experts suggested to facilitate the development of private schools and to roll back the educational reforms launched in the past five years, including trilingual education, which they see as possibly too big a burden on schools and teachers in particular. It is worth mentioning that there are certain indications of dissatisfaction with the curriculum and textbooks—one expert suggested replacing national textbooks with foreign editions, while another believes that the whole "Kazakhstani" model of secondary education is ineffective, suggesting that the example of developed countries should be followed instead.

4.5 *Object of Change*

As for what has to change, there are several areas which, in the experts' opinions, should be targeted to improve the quality of education both nationwide and regionally. As mentioned before, the quality of teachers is associated with the quality of education, which is why there are a number of recommendations relating to the provision of support for their continuous professional development and rethinking the enrollment policies of university teacher- training programs.

However, qualifications are not the only issue. Teachers' low wages were frequently mentioned as the main limiting factor. Teachers' welfare is also mentioned as an important condition for the holistic educational process and is associated with both compensation and the status of the profession.

Experts also express their concern about the top-down school management system, arguing that schools need more autonomy to be able to improve. An increase in the number of schools financed through per capita funding is also seen as a necessary step toward building a more sustainable school environment. Certain concerns and criticisms addressed the work of the regional educational authorities, including distrust in the transparency of their decision- making. Finally, there is skepticism about the recent reforms in secondary education, including trilingual education and the renewed curriculum, with some experts suggesting that they are having a detrimental effect on the quality of secondary education as a whole.

5 Discussion

> *"It is certainly true that schooling should be easier to influence than family, peer, or broader social and economic trends, but this does not invalidate their influence."*
>
> —Mortimore and Witty (1998, p.300)

Certain regions of Kazakhstan are clearly underperforming in secondary education, as can be seen from the results of the international large-scale assessments and the calculation of learning-adjusted years of schooling (lays).

According to the LAYS calculation, by the time they graduate from school, current fourth- and eighth-graders in Almaty and Mangystau oblasts will only have acquired knowledge equivalent to 8.5 years of schooling (out of an expected fourteen in preschool and school). Even bearing in mind the possible limitations of such calculations (e.g., the extent to which test results represent the actual learning happening in the classroom), this seems unacceptable in a state that is determined to provide every child with equal educational opportunities and equal quality of education.

Understanding what lies behind such drastic differences in academic achievement is vital for planning any interventions to change the situation for the better. As mentioned above, much of the data on academic achievement is explained by contextual factors, some of which were highlighted during the expert survey.

According to respondents, **a family's socioeconomic status, quality of teachers, a family's values, and language of instruction at school** all have a direct influence on the quality of education available to students in Kazakhstan. Yet it appears that most of these factors are not accounted for in educational planning at regional or national levels for a variety of reasons: lack of relevant data, the area being out of the reach of educational authorities, and so on.

Mortimore and Witty's rhetorical question "Should we ignore disadvantage in the hope that students themselves will find the necessary strengths to overcome their problems?" sums up the gist of the practical and ethical controversies around the issue.65 It is my belief, however, that (at least in the case of Kazakhstan) a large share of the contextual or other factors standing

65 Mortimore, *The Road to Improvement.*

in the way of a child's academic achievement can be—if not eliminated—compensated for. To bring this about, we need political will and a holistic strategy.

The main problem with the current policy on the issue of regional academic underperformance is that it is virtually non-existent. At least, there is no policy *specifically* aimed at reducing educational inequality across regions based on an understanding of the key impact factors. The two strategic documents out- lining educational policies and regional development priorities in Kazakhstan, as well as regional education development strategies, hardly take into account regions' socioeconomic context or local conditions.

For example, the State Program for Education Development (sped) out- lines strategic goals for the education system as a whole with clear numerical indicators. The State Program for Regional Development (SPRD),66 in turn, refers to the sped on all indicators concerning education. Regional education development strategies, too, are normally drafted in accordance with and on the basis of sped goals and indicators.

Under such a unified approach to educational development, it is not surprising that regions experience varying effects from the government's well-intentioned national initiatives. While regional inequality in education is continuously brought to attention in national reports and national analyses of the TIMSS and PISA results, there is still no specific strategy or action plan in place to reduce it. In short, Kazakhstan's education system "does not act as a social lift but rather increases social inequality."67

As one of the experts noted, low educational achievement in a region might not manifest itself right away in economic outcomes—but the effects will be- come more evident in the development of overall stagnation. In the expert's opinion, a low quality of education in the region

> *"... for a child, means zero opportunities in terms of employment and career; for the region, it is not so scary, since it is possible to make it attractive to qualified employees/the educated population using administrative resources. However, that requires [political] will and resources. Nevertheless, in a*

66 Ministry of Economy of Kazakhstan, "Programma razvitiia regionov do 2020 goda," http://economy.gov.kz/ru/pages/programma-razvitiya-regionov-do-2020-goda-1.

67 S. Irsaliyev (2017), "Kazakhstan in TIMSS and PISA 2015: Results and impact factors," presentation at the Collegial Meeting of the Ministry of Education and Science, http://iac.kz/ru/events/kazahstan-v-TIMSS-i-PISA-2015-rezultaty-i-faktory-vliyaniya-prezentaciya

> *stagnating situation, the low quality of education means continuing growthof poverty in the region and out-migration."*

An "unfair narrowing of the opportunities for sustainable development," as an- other expert put it, is the core ethical issue here, since a child can be deprived of basic educational resources just because of his or her geographical location.

Besides the legitimate concerns about out-migration in the south of the country, there is another issue—the rising number of NEET youth (those not in education, employment, or training). The share of NEET youth in Mangystau oblast is already 16%, and in South Kazakhstan oblast it is 10%.68 As a rule, this number is higher in rural areas, indicating young people's lack of interest in entering higher education or the job market—or their inability to do so. As Alimkhanova mentions, NEET youth mostly come from disadvantaged families and demonstrate low academic achievement.69 The implications of this phenomenon of youth disengagement are multiple, including increasing prospects of social tension in the regions and the issue of return on educational investment.

The perceived marginalization of Kazakhs born in the Western and South- ern regions is evident, perhaps now more than ever. As Koch and White's study shows, the "southerners," in particular, are perceived by other Kazakhstanis as "aggressive," "uncivilized," and "unintelligent," with a certain level of social re- sentment coming from the "urban" population of bigger cities in Central and North Kazakhstan.70

Moreover, as Koch and White find, Kazakhstani citizens consider Southern and Western regions the "least desirable" to live in, with economic opportunity cited as the most important reason for this. There is a common public perception that people from South Kazakhstan are corrupt.

In a country of inherent controversies, among which language and the opposition between traditional and modern mindsets are some of the most apparent, the signs of such alarming social segregation cannot be underestimated.

---

68 Alimkhanova, "The Rising NEET Phenomenon."

69 Ibid.

70 Natalie Koch and Kristopher White, "Cowboys, Gangsters, and Rural Bumpkins: Constructing the 'Other' in Kazakhstan's 'Texas,'" in *Kazakhstan in the Making: Legitimacy, Symbols, and Social Changes*, Marlene Laruelle (ed) (Lanham, MD: Lexington Books, 2016), 181–207.

As one expert notes, economically failing regions are no place for "intellectual" teachers and parents would also normally be of working class. It is imperative to take measures so that children do not become hostages of the socioeconomic or cultural issues of their neighborhoods.

Both the underpopulated oil-producing Atyrau and Mangystau oblasts, with the highest average salary and share of the country's GDP, as well as the densely populated and poor South Kazakhstan region (classified by Whiteshield Partners and EBRD in 2015 as "losing"), demonstrate the same staggering underperformance in education, a fact that calls for specific attention. If nothing else, this could mean that besides local educational institutions themselves, there are other major factors influencing the effectiveness of regional secondary education systems, and these factors may vary from region to region. Among these factors, one might, as experts have indicated, list language, the local system of values, and the socioeconomic situation.

5.1 *Language and values as determinants of academic achievement?*

There is clear evidence that in schools with Kazakh as the language of instruction, as well as in rural schools (and especially when these two overlap), students continue to show much lower achievement.

Yet it may be argued that strategic planning in regions does not control for poorer education in these schools. Regional strategic plans, for example, might only include generalized "measures to improve quality of education" and may not stipulate financial advantages or additional funds for poorer schools or Kazakh schools (which often overlap). The former South Kazakhstan oblast, for example, had the lowest expenses per student in 2015.

There is an intrinsic assumption that all policies and initiatives should work the same way across all mainstream schools in Kazakhstan. However, a drastic difference in academic performance between Kazakh- and Russian-language schools persists. Thus, the effect of any well-intentioned initiative (like trilingual education) is likely to be minimal in Kazakh schools, with students receiving less benefit in the end.

In 2018, 53% of all schools in Kazakhstan taught solely in Kazakh, accounting for 40% of the total school student population (1.3 million students).71 The distribution of Kazakh schools across the country reflects the density of the native language-speaking population. In Mangystau oblast, 86% of schools teach in Kazakh; in Kyzylorda oblast, another southern region, the figure is

71 iac (2018), "Education system statistics in Republic of Kazakhstan,'" national report.

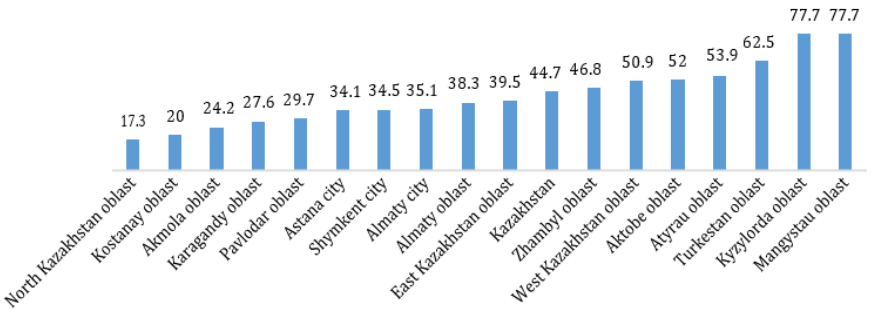


Figure 8 Share of students in Kazakh schools (of total regional school population)

89%. In the former South Kazakhstan oblast, there are over 1,000 Kazakh schools, comprising 72% of all regional schools and one-fifth of all Kazakh schools in the country. Kazakh schools represent a clear majority in the west, too, with such schools comprising over 65% of the total in Aktobe, Atyrau, and West Kazakhstan oblasts. South and West Kazakhstan account for the largest share of the country's student population studying in Kazakh.

The language-related disparity in academic achievement is somewhat unique to Kazakhstan and reflects national history. First of all, it is not speakers of the second or foreign language who are lagging behind but those of the state language—and the language of the ethnic majority. Also, as has been demonstrated by international assessments, bilinguals (those who speak both Kazakh and Russian at home) score higher than their monolingual peers.

Undoubtedly, the lower quality of education in Kazakh schools is due in part to the Soviet legacy of suppressing national languages and identities, a policy whose effects are perhaps more vivid in Kazakhstan than in any other post-Soviet state. To this day, Kazakh-language university faculties experience a lack of relevant materials, poorer labs, and lower-quality teaching staff.72

However, there are several examples showing that, given the right resources and curricula, either language can be turned to students' advantage. The experience of the Nazarbayev Intellectual schools and Kazakh–Turkish Lyceums, which practice trilingual education, has proved that it is possible to create learning environments in which place of origin or first language do not impact

72 Beles Centre for Strategy and Analysis, "Teachers of Kazakhstan: Why Young People Choose This Profession and Why They Stay in It," 2019, https://beles-cas.kz/images/teach er.pdf.

academic achievement, but even become a student's strengths. The graduates of these institutions are the most competitive in the country, often being accepted to top international universities even before graduation.

The problem is with the country's mainstream schools, which are typically underfunded in overpopulated areas and struggle to attract the best university graduates if—like 75% of the country's schools—they are in rural areas.

The impact of values, traditions, and priorities on academic achievement is fairly understudied and is even more difficult to measure and correlate with performance than the language factor.

In Kazakhstan's educational development programs, the closest proxy for values is the indicator of "satisfaction with educational reforms and policies/ quality of education." It is one of the target numbers that is set to improve every year.73 This indicator is isolated and probably not a good reflection of all education policies nor the overall quality of education. Yet it is fair to argue that satisfaction can and will appear only *after* the local population sees an improvement in the quality of education in their neighborhoods. Arguably, improvements in Astana (Nur-Sultan), Almaty, or Shymkent cities will not prove particularly comforting for a parent in newly established Turkestan oblast74 whose child studies in a class with forty classmates.

Values play an important role in understanding the quality of secondary education for girls. Women are an important part of the country's human capital. Several international studies and reports75 highlight the importance of quality education for women—both in terms of return on investment and in terms of social and cultural capital. Thus, making sure that every girl has a chance to get a higher education or otherwise earn a professional qualification enabling her to enter the labor market and further develop her abilities is extremely important for the nation. Not only does investment in women bring greater returns in the future,76 but women also transmit their potential and

73 Decree of the President of the Republic of Kazakhstan of March 1, 2016, "Ob utverzhdenii Gosudarstvennoi programmy razvitiia obrazovaniia i nauki Respubliki Kazakhstan na 2016–2019 gody," 2016, https://tengrinews.kz/zakon/prezident_respubliki_kazahstan/konstitutsionnyiy_stroy_i_osnovyi_gosudarstvennogo_upravleniya/id-U1600000205/.

74 In 2018, South Kazakhstan oblast was divided into the city of Shymkent, which now has the status of "republican importance," and Turkestan oblast, which has its administrative center in the city of Turkestan.

75 For example, Harding et al., 2015.

76 Richard Blundell, Lorraine Dearden, Alissa Goodman, and Howard Reed, "The Returns to Higher Education in Britain: Evidence From a British Cohort," *The Economic Journal*, 110, no. 461 (2000): F82-F99. doi: 10.1111/1468-0297.00508.

values to their children, both directly and through the subtle transmission of social and cultural preferences.77

Though almost 100% of school-age boys and girls are enrolled in secondary education in Kazakhstan, what happens to girls *after school* is an important factor as well.

Both South and West Kazakhstan are known for a tradition of "bride theft," which often happens against a young woman's wishes, leading to tragic consequences.78 These regions also feature frequent cases of early marriage. Women there often tend to be seen only as housewives and take no part in education or work. This is a direct result of the low value placed on education for women by local people, as well as of the lack of awareness of basic human rights statutes and policies. This also speaks to the need for specific programs at schools to educate both boys and girls about the immorality and illegality of bride theft, as well as to teach girls to raise their voices and advocate for themselves. Ignoring the poor quality of education in these regions would result in, among other things, a further deterioration of human rights.

The values system of the population is not something that exists in isolation. As Wilson notes, particularly for school-aged children, the value of obtaining a higher education or graduating from school might depend on the benefits associated with it.79 Thus, we circle back to the socioeconomic situation in which a child finds him- or herself—the amount and quality of educational resources available to the child and the career opportunities they associate with secondary or higher education.

Disbelief in being able to succeed in life when "living by the rules" may lead to conscious disengagement from education. This is especially likely to be the case in the atmosphere of failure that inevitably forms around a schoolchild in a disadvantaged area. One example is the rising NEET phenomenon in South Kazakhstan.

---

77 Harding, Morris, and Hughes, "The Relationship between Maternal Education and Children's Academic Outcomes."

78 "Krazhi nevest v Kazakhstane v poslednee vremia priobreli nebyvalyi razmakh," *Zakon. kz*, November 5, 2012, https://www.zakon.kz/4522455-krazhi-nevest-v-kazakhstane-v-poslednee.html; https://www.ktk.kz/ru/news/video/2013/12/03/25589/; "Krazha nevest v Kazakhstane—komu tragediia, komu schast'e," YouTube video, 7:19, posted by "Pervyi kanal Evraziia," November 19, 2017, https://www.youtube.com/watch?v=hj1w9jIMZSs; https://expressk.kz/news/ekspertiza/v_kyrgyzstane_za_krazhu_nevesty_teper_grozit_do_10_let_lisheniya_svobody_a_kak_u_nas-139372; "21-letnii paren' ukral nesovershen noletniuiu devushku v Mangistauskoi oblasti," *Karavan.kz*, June 15, 2018, https://www.caravan.kz/news/21letnijj-paren-ukral-nesovershennoletnyuyu-devushku-v-mangistaus kojj-oblasti-455015/.

79 Wilson, "The Determinants of Educational Attainment."

5.2 *SES of the Region and Family*

Socioeconomic status, as represented by parents' income and education and children's access to educational resources, is perhaps the trickiest impact factor to address from an educational perspective. As arguably the most influential factor in predicting a child's academic success, it therefore puts increased responsibility on schools in disadvantaged neighborhoods. These schools have *to compensate* for poorer educational opportunities and the family issues that a child often experiences at home. At the same time, they have to meet the national criteria prescribed by the unified national education development program and regional strategies.

Thus, we find a situation "where schooling may not automatically transform into human capital because of poor educational institutions, nor be channeled into productive use due to lack of institutional efficiency in the economy."80

"Quality" of education depends on a variety of "schooling" factors, including instruction, curriculum, teachers, school infrastructure, school governance, and the quality of management of the local educational authority. As both literature analysis and expert surveys show, other factors outside the school— like family ses and priorities—have a major impact on learning. Therefore, it seems that there is an inevitable policy dichotomy when it comes to raising a resilient, economically active, moral citizen.

While efforts in the education field might be focused on a student's IQ and EQ, the lack of complementary actions and policy implementation failures in other spheres (national economy, social development, healthcare, etc.) put educators in a difficult position.

First of all, there is increased responsibility. As schools "deal" with citizens for a longer period of time than any other single institution, society perceives them as responsible for students' "holistic development." This narrative is omnipresent in both official and media publications in Kazakhstan, where school is positioned as a major agent in the "formation of a citizen."

And then there is an unseen obligation to compensate for those other institutions and policies that fail to do their part in this very holistic development, the ones responsible for dealing with (for instance) issues of families with low SES, single mothers, families with children with special educational needs, and the lack of sports and cultural institutions in rural areas.

So when the other policy or economy spheres do not keep up, schools in disadvantaged areas are in a tricky, no-win situation. That is perhaps why we

80 Humna Ahsan and M. Emranul Haque, "Threshold effects of human capital: Schooling and economic growth," *Economics Letters*, no. 156 (2017): 48–52.

have devoted teachers with high anxiety levels and young teachers not willing to even start work after graduating from universities.81

What if the school itself is weak? As the data show, weak schools appear mostly in economically disadvantaged, rural, Kazakh-speaking communities. And if the quality of teaching is one of the most important factors in determining academic achievement, it is no surprise that weaker schools tend not to attract the best university graduates as teachers. Moreover, employment policies are vague at best: because very few young people decide to commit themselves to teaching in rural schools, the latter often employ TVET (vocational education) and school graduates.

In such a closed "vicious circle" environment, a school might fail to do its own part in forming an economically active individual—making it impossible for it to compensate for the shortcomings of other spheres.

Now, if one assumes there is *a large concentration of such schools* in a particular place, that could have a detrimental effect on the whole human capital potential of that region and its citizens. A failure to provide quality education seriously undermines not only a student's personal happiness and professional fulfillment but also the country's future economic welfare. That may seem too straightforward, yet often we fail to see this bigger picture—and to remember that *even in the case of a bad school, its being bad is not the primary problem.*

6 Conclusion and Recommendations

It is evident that the socioeconomic background of a family influences a child's academic achievement and future life prospects. In turn, the neighborhood and success or failure of a child's elders might also impact the child's educational choices, affecting their utility-maximizing perspective on education.

There is also evidence that, on the other hand, education is the single most important factor influencing regional economic performance. As the literature indicates, in line with my survey results, there are also other impact factors that might significantly impact average regional student achievement. These factors are rooted in each region and may vary from one to another.

Some of these impact factors are unique to the Kazakh context and need to be thoroughly studied. *Understanding the causes of things* is a key condition

81 See, for example, Beles Centre for Strategy and Analysis, "Teachers of Kazakhstan."

for planning effective change. Thus, it seems so far that it is vital to understand what factors exist that impact the quality of schooling and educational outcomes of students on a country level and in each particular region. It is also important to understand which issues are the prerogative of the main responsible governmental institutions—the Ministry of Education and regional authorities—and which are not, in order to plan for holistic positive change.

Drastic differences in both quality of life and quality of education in the regions of Kazakhstan call for a targeted, specific approach. If we want to provide equal educational opportunities to every child, producing isolated policies and initiatives solely in the education sphere and expecting them to work is not enough.

Yet before starting to work on reducing such a knowledge gap, the Ministry of Education and other governmental bodies need to have substantial data, which can only be obtained through rigorous regional research. Moreover, a holistic understanding of the scope of the problem is needed. As secondary education clearly is and will always be primarily the prerogative of the Ministry of Education, it is important to identify exactly what it can change in the "school territory" in a particular region, but only as part of a vision, strategy, and action plan for the whole region.

Thus, **a two-step policy initiative is proposed**: a nationwide study of the reasons for regional inequality in education followed by human capital development programs for all regions. The "human capital" idea rests on the assumption that changing the quality of secondary education and improving access to it in any region should be a priority of not one but all stakeholder institutions and government bodies.

Appendix. lays calculation

Step 1—calculating lays on the assumption that learning starts at school

To calculate region-level learning adjusted years of schooling (lays), I follow Filmer et al.'s formula:

$$LAYSc = Sc * R_{\not\perp}$$

Sc is "the average years of schooling acquired by relevant cohort of the population," and $R_{\not\perp}$ represents "a measure of learning for a relevant cohort of students in country *c*, relative to numeraire (benchmarking country)"—in other words,

learning productivity.82 It is calculated as the ratio of average learning happening per year in respective countries – $R_{it} = L_{it}$.

I adjust this formula to calculate region-level lays for Kazakhstan. I use mean years of schooling for Kazakhstan as calculated by Barro and Lee (originally used for lays measure),83 and I take Almaty city as a benchmarking region (Filmer et al. used Singapore's scores for international-level analysis).

Thus, expected years of schooling for Kazakhstan(*Sc*) is set at fourteen (eleven years of school plus 3 years of preschool). However, I also performed calculations on the assumption that learning starts at school (grade 1),84 thus getting the lays results for eleven years of schooling instead of fourteen.

TIMSS 2015 scores for eighth grade are used to calculate region's learning per year (*Lc*). For example, if Almaty's score in eighth-grade math is 575 and prior years of schooling equals 8, then its average learning per year is 71.2. To compare, Mangystau oblast's score is 476, which gives us 59.5 as the region's aver- age learning per year. Thus, R_{it} for Mangystau oblast would be 59.5/71.2=0.83, compared to 1 for Almaty city, which is the benchmarking region. This allows us to calculate lays for Mangystau oblast according to the formula above as equal to 9.1 years (see Table 5).

This means that by graduation, students in Mangystau oblast will have covered approximately 9.1 years of learning out of the expected 11.

These calculations are then modified to account for the years that take place prior to school.

Step 2—modifying lays on the assumption that learning starts 3 years prior to school.

In their explanation of the lays measure, Filmer et al. pay attention to the question of when learning actually starts and how this might impact the lays calculation.85 Above are the lays data I obtained on the assumption that learning starts at first grade (i.e., at school).

However, as the authors mention, "every child acquires some language, mathematical concepts, reasoning skills and socioemotional skills before arriving at school."86 To adjust the formula for the years of learning taking place

82 Filmer et al., "Learning-Adjusted Years of Schooling (lays)," 7.
83 Barro and Lee, "A New Data Set of Educational Attainment."
84 TIMSS 2015 was administered in Kazakh schools at the end of spring (the school year ends on May 25). Thus, at that stage, a child had completed 8 years of school education.
85 Filmer et al., "Learning-Adjusted Years of Schooling (lays)."
86 Ibid., 11.

Table 7 lays for regions of Kazakhstan (learning starts at school)

	TIMSS score 4th grade, science	LAYS	TIMSS score 4th grade, math	LAYS	TIMSS score 8th grade, science	LAYS	TIMSS score 8th grade, math	LAYS
Almaty city	**623**	**11**	**608**	**11**	**591**	**11**	**575**	**11**
East Kazakhstan oblast	588	10.4	582	10.5	574	10.7	560	10.7
Zhambyl oblast	581	10.3	582	10.5	580	10.8	573	11.0
Kyzylorda oblast	582	10.3	582	10.5	570	10.6	581	11.1
Pavlodar oblast	573	10.1	561	10.1	556	10.3	544	10.4
North Kazakhstan	554	9.8	549	9.9	554	10.3	523	10.0
Aktobe oblast	557	9.8	548	9.9	511	9.5	530	10.1
Karagandy oblast	547	9.7	540	9.8	529	9.8	522	10.0
Astana city	544	9.6	536	9.7	530	9.9	515	9.9
West Kazakhstan oblast	544	9.6	535	9.7	525	9.8	519	9.9
Atyrau oblast	536	9.5	533	9.6	471	8.8	478	9.1
South Kazakhstan oblast	530	9.4	533	9.6	522	9.7	522	10.0
Akmola oblast	538	9.5	529	9.6	528	9.8	511	9.8
Kostanay oblast	549	9.7	523	9.5	516	9.6	494	9.5
Almaty oblast	519	9.2	511	9.2	507	9.4	504	9.6
Mangystau oblast	504	8.9	508	9.2	473	8.8	476	9.1

prior to school, *Lc* is now calculated as the ratio of test score (*T*) to the sum of years of schooling prior to assessment and years of learning prior to school (3+8).

To come back to the example of Mangystau oblast, its *Lc* will now be equal to 43.2 (score of 476 divided by the sum 3+8). Almaty city's learning per year will be equal to 52.3. Thus, $R\frac{n}{c}$ (learning productivity) for Mangystau oblast will now be 0.82.

Therefore, the modified formula, accounting for 3 years of learning prior to school, will be:87

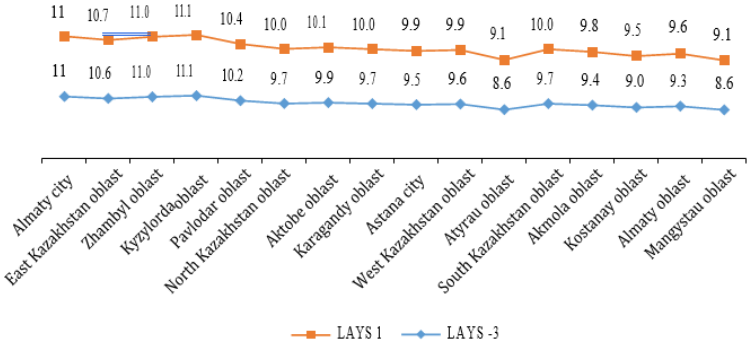
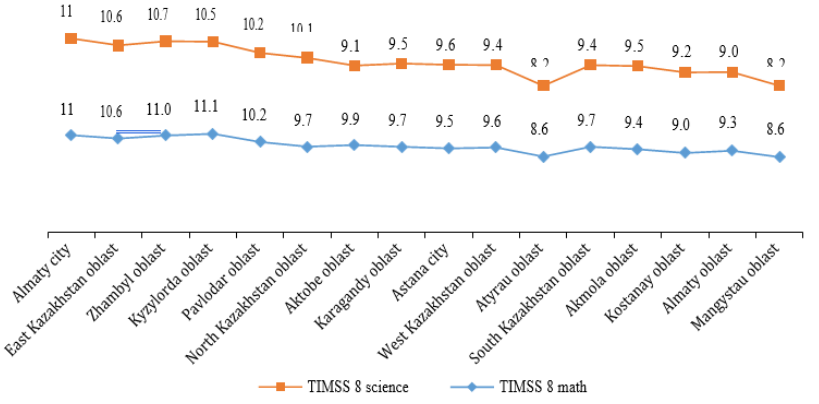
$$LAYSc = [Sc * R\frac{n}{c}] - [Y^p * (1 - R\frac{n}{c}]$$

87 See Filmer et al., "Learning-Adjusted Years of Schooling (lays)," 14.

It is clear that using this second assumption (as I did in my work) will result in lower lays scores. I assess that this approach is truer to life than the first assumption, i.e. that learning only starts at school.

Correlation between different lays calculations

a) Correlation between two LAYS measures for eighth-grade math (learning starts 3 years prior to school and learning starts at school in first grade)is **1.**



b) Correlation between two LAYS measures for TIMSS 2015 eighth-grade *science and math scores* is **0.93**.