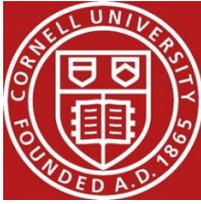


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# PROFESSIONAL REPORT

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Cornell Institute for Public Affairs  
Cornell University



Department of Strategy  
The Ministry of Education and Science  
of the Republic of Kazakhstan

## THE IMPROVEMENT OF THE QUALITY OF PRIMARY AND SECONDARY EDUCATION IN KAZAKHSTAN

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## **I. EXECUTIVE SUMMARY**

One of the Sustainable Development Goals of The United Nations is “Quality Education”, of which a major objective is to “ensure inclusive and quality education for all and promote lifelong learning.” According to this goal, “obtaining a quality education is the foundation to improving people’s lives and sustainable development” (UNDP, 2012)

Most countries understand that education should be a high priority in national policy and spend a lot of effort to improve its quality, and Kazakhstan is not an exception. The Government of the Republic of Kazakhstan has demonstrated a commitment to develop its education system by reforming existing policy, adopting new laws, identifying best practices, and implementing them in Kazakhstani society (Appendixes A, B). As a result, education performance in Kazakhstan has consistently improved in recent years. For example, in 2012, Kazakhstan moved upward ten positions, from 59<sup>th</sup> place to 49<sup>th</sup> place, in the ranking of the OECD countries participating in the Program for International Student assessment (PISA) (National Report of MES, 2013). In 2010 and 2011, Kazakhstan was ranked first on UNESCO’s “Education for All” Index, reaching 99% attendance for primary education, 92% attendance for secondary education, 99.6% for general adult literacy, and 99.3% for gender equality (NCESA, 2013).

However, according to the Program for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS), the scores of Kazakh students are below average scores for OECD countries. Moreover, a cross-regional comparison of educational achievement in the PISA 2012 reveals low scores in rural schools. The percentage of completion of test on math scores and reading literacy in rural areas in 2012 was 8-10% below the national average (OECD Report, 2012). Additionally, our multilinear regression analysis provided further evidence that quality of education in rural schools is a major weakness of the Kazakh education system. The main objective of this project is to identify key factors that are associated with the quality of primary and secondary education in Kazakhstan and offer a set of recommendations for how to improve the quality of education. The main policy question of this study is whether the

national government of Kazakhstan can design and implement to strengthen the outcomes of primary and secondary education.

This project analyzes the root causes of existing low performance of primary and secondary education students in rural areas of Kazakhstan. Primary and secondary school is an important channel through which young people acquire skills that improve opportunities for better jobs and quality of life. Rural youth in Kazakhstan are performing significantly lower than other youth in the country, which decreases their opportunities for social and economic development. Thus, the quality of education in Kazakhstan – particularly in rural areas - is an important topic for consideration. Based on our analysis of international case studies and the Kazakhstani national education system, the authors propose some recommendations for improving the quality of education in the Republic of Kazakhstan. Recommendations for improving the quality of primary and secondary education in Kazakhstan include:

- a) Focusing on improving teacher quality and ensuring that every child benefits from high-quality instruction;
- b) Improving mechanisms for teacher recruitment;
- c) Engaging coaches to support teachers and enable teachers to learn from each other;
- d) Introducing a rotational system for teachers;
- e) Creating excellent primary and secondary schools in rural areas with involvement from the private sector;
- f) Establishing high-quality curricula and extra-curricular activities;
- g) Adopting more effective ways of learning through technology.

Consultancy group believes that implementation of these recommendations will improve the quality of primary and secondary education in Kazakhstan.

## **II. THE QUALITY OF PRIMARY AND SECONDARY EDUCATION: MAIN CONCEPTS AND QUALITY DIMENSIONS**

The concept of quality in education is complex and, in most cases, subjective. In recent years, a number of international attempts to define and improve education quality have been undertaken. UNESCO has defined education quality according to four areas: 1) learning to know, 2) learning to do, 3) learning to live together, and 4) learning to be (EFA Report, 2005). Thus, education quality emphasizes various areas of learning, ranging from content knowledge of both external and local subjects; skills to apply what is acquired in the larger society and labor market; qualities to create more structured, peaceful, and equitable societies; and prospects to develop individually. However, these areas of education quality are hard to measure and compare. One of the major international assessments, the Program for International Student Assessment (PISA) provides the assessment of education quality by determining content “literacy”. According to the OECD, the concept of literacy involves how students apply knowledge and skills; how they identify, solve, and interpret problems; and how they analyze, reason, and communicate (OECD Report, 2005). The PISA and other international assessments of OECD such as TIMSS (Trends in International Mathematics and Science Study), PIRLS (Progress in International Reading Literacy Study) illustrate good examples of testing secondary-school-age youth and measuring educational quality comparatively across the world.

UNICEF states that the terms efficiency, effectiveness, equity and quality have frequently been used synonymously with quality of education. Quality education comprises (UNICEF Report, 2000):

- a) Students who are healthy, well-nourished and ready to contribute and learn, and supported in learning by their families and communities;

- b) Environments that are healthy, safe, protective and gender-sensitive, and provide adequate resources and facilities;
- c) Educational content that is created in relevant curricula and materials for the acquisition of basic skills, particularly in the areas of literacy, numeracy and skills for life;
- d) Education processes through which qualified teachers practice child-centered teaching approaches in well-managed classrooms and schools, and competent assessment to facilitate learning and decrease disparities;
- e) Outcomes/results that contain knowledge, skills and attitudes, and are relevant to national priorities for education and constructive participation in society.

This description sees education as a compound system embedded in a political, cultural and economic context.

OECD reviews have found that despite substantial increases in spending and striving efforts at policy change, the performance of many primary and secondary education systems has been barely enhanced in recent decades. For instance, between 1980 and 2005, public spending per student in the US increased by 73%. The country also employed more teachers, so that the student-to-teacher ratio dropped by 18%. However, academic performance remained almost at the same level, except for some improvement in mathematics. The US further launched reforms to decentralize powers in school districts, and promote smaller schools and charter schools. The best charter schools revealed significant improvements in student outcomes, and demonstrated that consistent models may produce noticeable advances in academic performance.

The similar experiment with decentralizing power to individual schools in New Zealand in the mid-1990s was ineffective. The failed attempt acknowledges that changing a structure would not

necessarily improve the quality of education, and improving instruction by itself may lead to students' improvement.

The high-performing education systems among OECD countries recruit potential teachers among the top third of every cohort proceeding from their school system (South Korea, Finland, Singapore and Hong Kong). In the US, successful programs similarly aim for the graduates of top universities (the Boston Teacher Residency, the New York Teaching Fellows, and the Chicago Teaching Fellows), but recruit teachers from the bottom third of high school students. Singapore has an inclusive system for selecting, training, rewarding, and developing school teachers and principals. In Singapore, candidates are screened, tested, and selected before they enter required teacher training. After meeting the required criteria, teachers are officially hired by the Ministry of Education and paid a remuneration throughout their training. This mechanism makes teacher training an attractive and prestigious program in Singapore, which in turn makes teaching an especially prestigious profession.

Recent studies indicate that the government of Kazakhstan has recognized a strategic importance for education development. The State Program of Education Development 2011-2020 established main priorities, targets and indicators to be completed by 2020 (State Program of Education, 2010). The program focuses on access, quality, equity, and curriculum, and defines indicators for transitioning to a 12-year education system by 2019. The five-year National Action Plan for the development of student's functional literacy was adopted in 2012 to confirm the improvement of functional literacy skills, encourage creative thinking and problem solving skills, as well as ensure the readiness of students for lifelong learning. This plan includes a number of measures, predominantly modernizing the educational standards, programs and curricula along with

restructuring the management system with regard to approve schools with greater autonomy in adjusting the curriculum (IAC Report, 2014).

In recent years, Kazakhstan has launched a new system of professional development for teachers. Based on the network of Nazarbayev Intellectual Schools, professional development centers for teachers were created, and were grounded on innovative approaches and content improvement (IAC Report, 2014) (Appendix B).

### **III. DATA COLLECTION & METHODS OF RESEARCH**

In this study, we aim to identify factors that have a measurable impact on the quality of primary and secondary education in the Republic of Kazakhstan. The study employs a mixed methods approach that involves quantitative analysis of the data collected from various statistical agencies and subsequent interpretation of the key findings in the context of qualitative research based on primary and secondary sources. We used our findings to develop and substantiate a set of recommendations for sustainable improvement of the quality of primary and secondary education in Kazakhstan.

We selected several variables as possible factors influencing the quality of education in Kazakhstan at the regional and national levels. These variables include region (all oblasts and major metropolis Astana and Almaty), regional population, number of teachers, number of students, allocation of funding in the educational system, the number of contest winners in each region, average scores on university entrance examinations, numbers of pupils enrolled to post-secondary institutions, etc. The data for each variable were collected annually for sixteen regions in Kazakhstan and as a national average for the Republic of Kazakhstan over the 2011-2015 time period. We utilized the following primary and secondary sources of data to complete our dataset:

The Ministry of Education and Science, Agency of Statistic of the Republic of Kazakhstan, Regional statistics department of Kazakhstan, National Repots on Education of Kazakhstan, Reports of International Organizations (OECD, World Bank, UN, etc.), National Reports on Education of other countries, and other sources on Education.

We utilized this data to populate statistical models that enable identification of factors that influence educational quality at regional and national levels. Namely, we employed regression analyses to model three proxies for quality of education (test score, number of contest winners, and post-secondary matriculation rate) as a function of region, proportion urban population, funding allocation, number of pupils attending state and international subject Olympiads and scientific project competitions, number of teacher trainings, number of school principals trainings, number of pupils per computer, and teacher-students ratio. Analyses were completed using the statistical analysis software R (v. 3.2.4), and this platform was also used to generate appropriate graphical representations of major trends for publication. Additional post-hoc statistical analyses were performed to validate and elaborate on regional trends in education quality.

The decision to employ the chosen method is based on a series of analyzes performed by many researchers such as Owen Ozier , Gibbs Y. Kanyongo, Janine Certo, Brown I. Launcelot, who successfully investigated and explained education system of Kenya, Zimbabwe, and other countries by using regression analysis. Moreover, many international organizations use this method to evaluate some education program or education systems. As these studies demonstrate, regression analysis allows investigators to more deeply understand the relationships between factors that influence the quality of the education system, to see the positive changes in development, and to investigate adverse consequences of school instability, etc. (Ozier, 2015; Kanyongo et all, 2006; OECD Report 2005 )

The study period (2011-2015) was chosen based on reforms and programs that were actively implemented by the government in this period. During this period the Ministry of Education started to carry out the State Program of Education Development 2011-2020, which focuses on improvement of the quality of education system. The State Program of Education Development 2011-2020 established main priorities and indicators and identified targets to be met by 2020. Moreover, based on this Program the five-year National Action Plan for the development of students' functional literacy was adopted in 2012 to confirm the improvement of functional literacy skills, encourage creative thinking and problem-solving skills, as well as ensure the readiness of students to lifelong learning. This plan is geared toward modernizing the educational standards, programs, and curricula along with restructuring the management system concerning approve schools with greater autonomy in adjusting the curriculum. We support our findings with an analysis of primary and secondary literature, offering detailed perspectives on the phenomena observed and investigate the conditions responsible for the dependent variables.

#### **IV. FINDINGS AND RESULTS**

In this project, we defined three variables as proxies for quality of primary and secondary education: test score, post-secondary institutions enrollment, and numbers of winners of international and state Olympiads and scientific projects competitions.

By using multilinear regression analysis for these indicators, we have constructed a number of models by which we can identify variables that influence quality of education (Appendix C).

Namely, we created models to predict 'test score', 'enrollment to post-secondary institutions', and number of winners' (as proxies for quality of education) given several independent variables. Our final model for quality of education at the regional level included % Urban Population, Number of Schools, Student/Teacher Ratio, Teacher Trainings, Principal Trainings, Pupils Per Computer, Republic

Funding (log), and Number of Contest Participants (log). The Adjusted  $R^2$  values of regression analyses for test score, enrollment, and number of winners were 0.27, 0.44, and 0.12.

Our regression analyses yielded slightly different results for each of the three indicators of education quality, as summarized below:

### **Test Score model:**

- a) The model indicates that areas with higher proportion of urban population have higher test scores (log) ( $P = 0.017$ ). On average, we see that for every percent increase in urban population, the test score increases by 1.002 points.
- b) Furthermore, we have evidence that student-teacher ratio has a significant effect on average test score ( $P = 0.003$ ). For every unit increase in student-teacher ratio, the test score decreases by 0.022 points. This indicates that more teachers per student has a positive effect on test score.
- c) We also conclude that the number of teacher trainings has a significant effect on test score ( $P = 0.031$ ), although the effect we observed in our modeling approach was small. For every one unit increase in teacher trainings, the average test score increases by 1.000 point.
- d) The adjusted R-squared value of the model is 0.2739, indicating that we have accounted for 27.39% of the variation present in our data set.

### **Enrollment Model**

- a) We have evidence that student-teacher ratio has a significant effect on average test score ( $P = 0.018$ ). For every unit increase in student-teacher ratio, the percentage of secondary school graduates enrolling in post-secondary programs decreases by 1.88 points – a

relatively large effect. This indicates that more teachers per student has a positive effect on post-secondary enrollment.

- b) The adjusted R-squared value of the model is 0.4415, indicating that we've accounted for 44.15% of the variation present in our data set.

### **Winners Model**

- a) We have evidence from this model that the number of contest participants has a significant effect on the number of contest winners ( $P = 0.044$ ). This is a logical point, as the number of contest participants necessarily has an effect on the number of contest winners in a given region. For every increase of one participant, the number of contest winners in a given region increases by 2.60.
- b) The R-squared value of this model is quite low (both in absolute terms and compared to our other models) at 0.1164, indicating that only 11.64% of the variation in our data set is accounted for. Furthermore, the model P-value is greater than 0.05, the alpha-level selected for statistical significance in our study. Thus, we conclude that this dependent variable is not a sufficient proxy for quality of education, and will make recommendations based on the models that use 'test score' and 'proportion enrollment' as dependent variables.

From the regression analysis, we conclude that neither of the indicators are particularly powerful as proxies for quality of education using the available data. This is indicated by the low  $R^2$  values observed in all of the models. However, we have observed some interesting trends that can be useful in making recommendations for improving the quality of primary and secondary education in Kazakhstan.

Firstly, we have demonstrated conclusively ( $P < 0.05$ ) that the test score indicator reveals significant difference in performance between rural and urban areas. Furthermore, it is notable that

the student/teacher ratio has a significant impact on education quality when test score and enrollment are used as indicators. Interestingly, there is evidence to support the hypothesis that the number of teacher trainings has a significant effect on academic performance as indicated by test scores ( $P < 0.05$ ). Overall, we feel that the number of contest winners is not useful as a proxy for quality of education in the Kazakhstani education system, because our final model accounted for a very small portion of the variance in our data.

## V. ANALYSIS

The nature of the difference between quality of rural and urban schools is uncertain. Thus, we would like to understand the contributing factors that distinguish rural and urban schools from one another. To answer these questions, it is important to investigate the current situation in rural education of Kazakhstan and find factors that are associated with the low quality of primary and secondary education in rural area in the country.

According to the results of PISA, as well as the Unified National Tests there is a significant gap in the academic performance between urban and rural schools. Low scores of students in rural primary and secondary education in Kazakhstan are linked to lower quality of education (OECD Report, 2012). A deeper analysis of the causes for this lower quality can be examined using the first four components of quality identified by UNICEF (UNICEF Report, 2000):

- a) Orientation to learn - negative impacts of poverty affect ability to learn

In rural areas of Kazakhstan, family circumstances and parental involvement affect children's academic abilities. The main causes are unemployment and low incomes. In 2010, 45% of rural children under the age of 18 lived beneath the poverty line, and 7% under the extreme poverty line (UNICEF Report, 2013). At that time, about 10% of rural residents lived with incomes below the

monthly subsistence level of 16,072 tenge or 132 US dollars (USD 1 = KZT 121.3). As compared to the urban poverty rate, which is 4% (Agency of Statistics of the Republic of Kazakhstan, 2011).

b) Education environment – multi-grade classroom and low technology

In fact, 74% schools in Kazakhstan (5,569) are located in the countryside, with an enrollment of about 1.3 million children (MES Statistics Report, 2015). 3,268 of these schools are small multi-graded schools.

Rural schools in Kazakhstan are predominantly affected by a weak learning and technical base. Only 52% of rural schools have broadband access to Internet, and the ratio of students to instructional computers is 12.6 to 1 (MES Statistics Report, 2015). There is a similar pattern in the number of schools equipped with new modern science labs and libraries. In addition, 93% of the emergency and old schools (191 units) and 80% of the schools without gym (1,580 units) are located in the rural areas (MES Statistics Report, 2015).

Since the public provision of education dominates education service delivery, there is lack of competition. The private sector is not interested in secondary education as it is a duty of the state to provide free and compulsory school education. Over the last three years, the number of private schools in Kazakhstan has increased only by 9 units (109 schools) with an increase in enrollment of 2,000 people (MES Statistics Report, 2015). In general, the material and technical base of existing schools is outdated. All state-funded schools receive minimal funding from the state. As a result, wages are low at school institutions, there is a lack of interest in the work, professional educators are increasingly leaving the profession and the quality of educational services is weakened.

c) Educational content - theory rather than practicing higher-order thinking skills

Kazakhstan has made continuous improvements in the primary and secondary education curriculum. In 2002, a complex description of the content of secondary education was adopted. It defines items of knowledge, skills, and capacities to be obtained in a large number of learning areas (13-23 study subjects, depending on the level of school education). However, education in primary and secondary schools in Kazakhstan is not as effective as it could be. Data from TIMSS and PISA points out that the Kazakh school education is fairly effective at instructing theoretical knowledge and ensuring that students remember, recognize and retrieve information. However, it is reasonably weak at enabling students to acquire and practice higher-order thinking skills, such as applying and reasoning in math, or reflecting on and evaluating texts when reading. The primarily academic and widely broad primary and secondary school curriculum is a major obstacle to the effectiveness of instruction (OECD Report, 2013).

In terms of relating the curriculum to the needs of the community, this is not effectively done. Rural primary and secondary schools need to consider the needs of the families by providing opportunities for students to learn practical skills. For example, modern farming technology, agribusiness, vocational education, and other kinds of skills can help students not interested in tertiary education to obtain jobs after secondary school. For those who want to, however, there should also be a path with quality education for them to get the academic preparation they need.

d) Education processes - low quality teaching

Teachers in Kazakhstan suffer from low status and prestige. Education sector salaries are only 60% of the average national wage. Salaries are low even though the teachers who work in rural areas receive an additional remuneration of 25% (IAC Report on Resource Efficiency in School, 2014). Rural schools especially are being affected by an inequitable distribution of teachers. Highly-professional teachers are more likely to work in schools for gifted students where

supplementary resources and support are available. The share of teachers with the highest level of training in rural schools is only 11.5%, which is half the number in the city (24.4%). The percentage of teachers without categories is twice more than in urban schools (27% and 10% respectively) (IAC Report on Resource Efficiency in School, 2014). These numbers suggest that the needs of students who require highly-qualified instructors is not being met.

Teachers regularly evaluate student academic performance at schools. However, classroom assessment in Kazakhstan does not deliver a clear image of the knowledge and skills students have attained in school. There are few distinguished criteria by which to assess and compare learning results in various subjects and, therefore, there can be no guarantee that two students given the same score by different teachers in different schools are performing at the equivalent level (OECD Report, 2013).

This brief analysis demonstrates that rural schools have problems directly linked to teacher qualification, lack of resources, and the socio-economic situation in the rural areas.

To address these problems, the Ministry should investigate international experiences on improving the quality of rural education and determine best practices that can be applied to Kazakhstan. Indeed, the problems facing Kazakhstan primary and secondary education have been considered in other countries. Therefore, this report explores opportunities to learn from other countries dealing with rural secondary education and teaching quality. The report does not attempt to provide an in depth study of rural education issues but rather tries to point out some approaches to address quality. Among the countries selected are Australia, Korea, Sweden, Singapore, and China because these countries have similar experience with low academic achievement of students in rural areas compared to those in urban areas, difficulty recruiting and retaining teachers in rural areas, and having highly experienced and qualified teachers in rural areas.

## **1. The case of Australia and South Korea: issues of rural secondary education**

In these countries, rural students are not academically succeeding as well as their urban peers. Both international and national assessments of student performance have evidenced the necessity to address equity issues. The results of PISA 2006 revealed a significant performance gap between students from urban, provincial and remote areas of Australia with mean scores of 526, 508, and 468, respectively. The same trends were observed with South Korean students, where urban students succeeded the most, especially in language and mathematics (with differences 0.64 and 0.62). The main causes of these disparities in both countries lie in lower socioeconomic status and morale of rural students, as well as in low qualification of rural teachers, mainly because of limited access to quality professional learning opportunities. However, the difference between the Korean and Australian education systems is the existence of multi-graded schools in Australia, and the closure of small schools (<60 students) and clustering of them into large/hub schools in South Korea.

The shocking results of PISA and other assessments have pushed both governments to initiate extensive programs on providing equitable and quality education in rural areas. For that purpose, the Australian government has established the National Centre for Science, Information and Communication Technology and Mathematics Education in Rural and Regional Australia, while the Korean government created the New University for Regional Innovation initiatives.

In the way of achieving their aims, both governments have adapted different approaches.

Australia has focused on supporting and working professionally with practicing teachers. Numerous projects were conducted in order to improve teaching skills of in-service teachers, leading in turn to quality teaching in rural schools. Particularly, the Australian government has

created a network where teachers, educators, and other individuals can initiate and produce activities on enhancing the quality of education in rural areas. Moreover, they have established a culture of collaboration between extremely competitive researchers, following the common idea of quality rural education in Australia (Education International, 2009).

Australia educators have also been elaborating a better framework for a curriculum that will be relevant to the lives of students and their communities. Place-based education links to the context and the value of learning from specific places, and offers a variety of benefits for rural students and rural schools. The main task is engaging with students, helping them to realize their social context and the range of impacts existing on their community.

Additionally, the New Schools Project has become one of the outstanding Private-Public Partnership projects in Australia in recent years, especially in the New South Wales state. This project consists of two main modules (Education International, 2009):

1. Between 2002 and 2005, the private sector funded the design and construction of nine public secondary schools, which built in accordance with Department of Education and Training (DET) school design standards.

2. The private sector has committed to providing operation and maintenance of these schools' until 31 December 2032.

In return, the private sector should collect performance-related periodic outflows from the DET during the functioning stage of the project. Finally, by 2032 those buildings will be turned over to the public sector. This project is only a part of a broader move toward PPPs in the country. Recent data shows increasing investor interest in PPPs in education, with projects esteemed at \$3.7 billion in the pool (Education International, 2009). Currently, similar projects are being implemented in the Southern State of Australia (Education International, 2009).

The Korean government has elaborated the preparation part of preservice teachers by providing specific programs focused on rural education, for example, program for developing understanding of rural societies and rural schools, program for adjusting to rural schools and rural life and volunteering for service to the community, program for developing 'global mind, and so on (Education International, 2009). As a result, newly graduated teachers have been equipped to deal with teaching in rural conditions.

In general, the Korean policy on integration of small schools in rural areas has led to the considerable progress of education. The Ministry of Education consolidated two or three neighboring schools, each of which had less than 180 students, into one group and enhanced education of those schools by applying a common curriculum and facilities. Between 1981 and 1993, 3,743 small rural schools were combined (Youn-KeeIm, 2009). The Korean government delivered 500 million Won (428760.00 US Dollars) for closing or incorporating a school, 200 million Won (171504.00 US Dollars) for shutting a school division and 20 million Won (17150.40 US Dollars) for restructuring a school division, leading to the reunion or closing of 971 educational institutions a year. As of 2000 to 2005, 5,262 schools were joint or closed (Youn-KeeIm, 2009).

In order to solve an issue with teacher qualification, the government called talented principals and teachers to work in the rural schools. In the meantime, Korean public school teaching staff must rotate from school to school every 5 years. For the teachers working in remote rural schools, the government pays an allowance for itinerant teachers and provide a supplementary bonus to teachers who work with integrated classes. In addition, the government also offers accommodation and modern facilities for talented teachers in remote schools. As a result, schools in remote areas have access to good teaching process and after-school programs. Moreover, the government established multi-purpose classrooms as life-long education centers for all residents, school

libraries, and an advanced IT infrastructure for education. Finally, under the supervisions of cities and provinces, the Rural Education Development Councils were created with the aim of developing the condition for education and enable life-long education in rural areas.

The last interesting policy is intensive development of excellent high schools. In order to avoid rural students' migration into the cities, the government of Korea has developed excellent high schools in rural areas with provision of financial support. The governments' special support has led to developed educational programs and settings, and transferred the maintenance of school activities to the school's discretion. The network of such selected excellent schools extended from seven in 2004 to 86 in 2007 (Youn-KeeIm, 2009).

We have identified the following implications for teacher education practice based on the above lessons:

- a) Interference in both pre-service and in-service stages can be a successful approach for improving rural education.
- b) Training teachers specifically to rural schools may deliver superior outcomes in rural education.
- c) Teachers should be recognized as valuable resources for development of rural areas and education.
- d) Teachers' professional development programs might be effective when professional learning is provided in accordance with local contexts and pre-identified requests.
- e) To achieve sustainable development, an issue of retaining competent teachers in rural areas for at least five years must be solved.

## **2. Sweden: teachers' value**

In July 2011 the Swedish government introduced a system of teacher registration for teachers and preschool teachers, where the National Agency for Higher Education (NAE) has been identified

as the competent authority for the teaching profession and qualified teacher status certification. Starting from 2012, in order to teach at schools teachers have to register with the NAE. Registration is required for a teacher to be able to independently set grades and to be an advisor to new teachers throughout the next academic year. Thus, only registered teachers are qualified for a permanent position. In addition, to be permanently employed as a teacher, a candidate must have a university diploma in teaching and knowledge of the Swedish language as well as of the national regulations and standards relevant to the school system, in specific the regulations regarding the objectives of education.

The introduction of this system for teacher training was created due to the relatively high number of teachers working without a teaching degree. According to the NAE, in 2009/10 nearly 77% of upper secondary teachers held teaching degrees, while in upper secondary vocational education only 61% had a teaching qualification. The large share of fully suitable teachers was found in the child and recreation (89.6%) and health and nursing (79.1%) programs (UNESCO Report, 2012). The country has generally committed to guaranteeing quality education for all. Sweden has the one of the largest share of public expenditure on education (6.98%) among OECD nations. 6.8% of its GDP dedicated to education (the OECD average is 5.6%) (OECD, 2015). In addition, PISA results highlighted that Sweden has a more equitable secondary education system compared to other OECD states.

However, in recent years, Sweden's academic performance in PISA has dropped in all main fields of literacy, mathematics and science, from above or close to the OECD average to even less than the OECD average. The number of low-performing pupils has increased, and the number of highly performing pupils has declined considerably (OECD, 2015). Other international figures verify the points on decreasing student scores in main areas such as literacy and mathematics. Despite

Sweden having a comprehensive secondary education system and supporting disadvantaged student groups, there are a certain issues that should be addressed, such as vague funding policies and school choice activities that might affect improvement in equity and quality. So, these results serve as evidence of the OECD's finding that there is not a causal link between performance and per-pupil expenditure (OECD Report, 2013).

### **3. China: Teacher Rotation System Established to Benefit Rural Schools**

From 2014, the Chinese government has begun to implement a rotation system in order to send more qualified teachers to teach in rural schools for three years. This new policy requires at least 10% of teachers in urban and high quality schools be reassigned to teach in rural and lagging behind schools each year. In order to avoid sending less qualified teachers, at least 20% of the rotated teachers must be highly qualified (Zhao, 2014). The policy also requires principals and deputy principals be rotated to a different school after serving two terms in the same school. Teachers from rural schools and or deprived schools should have the opportunity to fill the vacated positions urban schools and better quality schools. According to the government plan, by 2020, about one million teachers and principals in China will be exchanged between good and deprived schools annually.

Rural areas in China are lacking resources and structure. Approximately 150 million young students study in rural schools (NewsPlus, 2014). Parents in rural parts of China also often migrant to larger cities for work, leaving their children behind without the parental guidance frequently needed during the course of their education. The available data indicates that only 17% of 2013 Tsinghua undergraduates were from rural areas of China—an enormous decrease from the 1970s when the figure was around 50% (NewsPlus, 2014). Despite the fact that the Chinese government has invested billions (Yuan) in the past to improve the quality of education in rural schools, the

effects are heavily reduced by the absolute quantity of youth that must be educated. For example, in 2006 the Chinese government created and paid for special three-year appointments in order to empower provinces to hire better qualified teachers to teach in rural schools. As a result, provinces hired 185,000 new teachers, and 87% of them continued working at schools after three years (The International Summit on the teaching profession, 2011).

Since urban teachers are accustomed to teaching at a fast rhythm, they are required to motivate and organize large numbers of students, often in overcrowded classrooms. The system has intended to use more digital technology in a teaching process. The rotation system is also an opportunity for rural teachers to gain experience and train in developed cities. As a result, the Chinese government seeks to improve the standards of teaching dramatically across the entire country. Due to enthusiasm at the province-level prior to the official issuance of this national policy, over 22 provinces had already established similar policies and begun piloting analogous programs (Zhao, 2014).

#### **4. Singapore: teacher selection**

Singapore has an inclusive system for selecting, training, rewarding and developing schoolteachers and principals. The system includes the following key elements (OECD, 2010):

- a) Recruitment: Special panels that include current principals select candidates from the top one-third of the secondary school graduating class. Potential teachers get a monthly stipend that is relevant to the monthly wages of graduates in other fields. There is a required commitment to teaching for at least three years. In general, curiosity in teaching is seeded initially through instruction internships in high schools; there is also an opportunity for mid-career start, which is a method of applying real-world practices to students.

- b) Training: all teachers in Singapore obtain training in the national curriculum at the National Institute of Education (NIE). They receive either a diploma or a degree course depending on level of education at the beginning. NIE pays a strong attention to pedagogical content and connections between modules within programs.
- c) Compensation: the Ministry of Education provides on occupational initial salaries and ensures that teaching is attractive for new graduates. In addition, there are retention and performance bonuses.
- d) Professional development: teachers in Singapore are entitled to 100 hours of professional development each year. Courses focus on subject matter and pedagogical knowledge. The professional development is mainly school-based, and led by staff developers, whose job is to identify teaching-based problems in a school. Teacher networks and professional learning communities that inspire learning from each other are widely accepted in Singapore.
- e) Performance assessment: teachers' performance is assessed annually towards 16 different competencies such as teachers' contribution to the performance and character development of the students, their connection with parents and community groups, and their contribution to their schools. Teachers who do excellent performance receive a bonus from the school's bonus pool.
- f) Career development: after three years of teaching, teachers are evaluated to define which of three professional paths might best fit them – master teacher, specialist in curriculum or research or school leader. Furthermore, teachers receive additional training relevant to their path.
- g) Leadership selection and training: In Singapore, teachers are constantly evaluated for their leadership potential and given opportunities to demonstrate and learn. Some are reassigned to

the Ministry of Education for a certain period. Upon these practices, potential principals are selected for interviews and pass situational exams on leadership. Later, they go to NIE for 6 months of executive leadership training, with salaries paid. This intensive training includes an international study trip and a project on school innovation. Furthermore, principals are transferred between schools systematically as part of Singapore's persistent development strategy.

### **5. Main points from OECD review on secondary education in Kazakhstan**

In 2014, OECD reviewed the situation in secondary education in Kazakhstan, and observed systemic problems in the school system of Kazakhstan (OECD Report, 2013). Experts specifically pointed to the high degree of differentiation of the quality of school education. The large gap between the best versus remedial schools and urban versus rural schools is reflected in the results of the Unified National Test and PISA. This happens mainly due to the focus of attention on selective, elitist education (gymnasiums, lyceums, schools for gifted children).

Congestion of the school curriculum and mismatch of the education content to the modern requirements lead to a low level of functional literacy. The six day-school week and three months summer vacation in Kazakhstan, both too long, also affect the educational performance. Therefore, balancing the workload, length of the school week, quarters and holidays is crucial.

The OECD review indicated to the strong relationship between the level of spending on education per student and student performance. Kazakhstan spends considerably less than peer countries, and therefore has much worse results on PISA than the countries of Europe, Asia, and Latin America, although the GDP per capita is close to the average for these regions, and sometimes exceeds it. The per-pupil expenditure in Kazakhstan, equivalent to 11.7% of GDP per capita, is two times less than in the OECD countries and far below the countries showing the highest

performance on the PISA, such as Poland, Japan, Switzerland and Estonia. OECD recommended to revise Kazakhstan's expenditure per pupil upward, especially considering that the country is planning to join the ranks of countries with high level of revenue by 2030 (OECD Report, 2015). In general, the PISA report indicates that without a consistent improvement for all it is unlikely that poor students' living standards will rise in the future. Although the increase in the average score is no less important, it is necessary to improve the results of the groups of students with the lowest socio-economic status. In Kazakhstan, the difference between students from families with low and high socio-economic status on the reader's literacy is 73 points on the PISA exam (about two schooling years). Therefore it is necessary to concentrate the focus on poorly performing pupils from groups with low social status.

OECD further recommends to implement the programs on early child development, parent support system for proper care and development of children, and to ensure improved quality of preschool education, including the infrastructure of pre-school institutions. It is necessary to revise the system of training pre-school educators, and implement a system of professional development for teachers using the Cambridge system, which has already been successfully deployed in intellectual schools in Kazakhstan.

Strengthening the policy of early detection and support for at-risk students and underperforming schools was another point of recommendation. In particular, this can be done by focusing on enhancing the training program in terms of the practical application of knowledge in real-life situations, and leaving room for development of creative abilities and skills of teamwork.

Lastly, OECD highlighted the necessity of revising the pay system and the selection process for the teacher profession. In order to ensure the quality of education, OECD recommends implementing a system of testing at the end of each school level and revising the existing external

evaluations format. Many of these recommendations were already reflected in strategic documents of the Ministry of Education of Kazakhstan, for example, the transition to 12-year school, improvement of national educational standards, development of dual training etc.

## **VI. RECOMMENDATIONS**

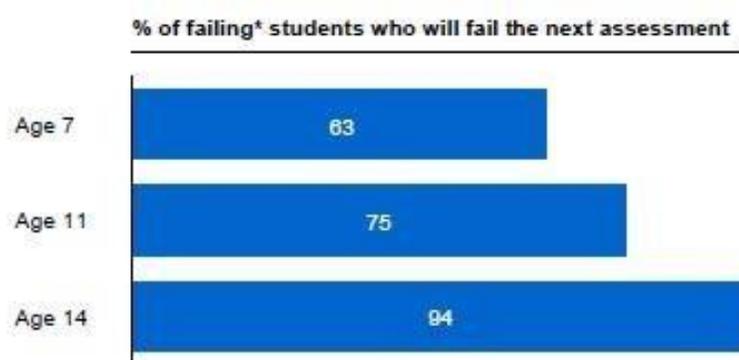
By doing research and exploring the efforts in other countries to address the quality of primary and secondary education, we came to realize that the government has the potential authority to influence the growth and development of school education. In the meantime, the findings indicate that the quality and qualification of teachers at schools is a focal point in achieving the quality education. Therefore, the government needs to prioritize this aspect of educational provision. However, as successful experiences show, engaging the private sector in bringing relevant educational facilities has promising effects as well. We believe that strategic cooperation that involving strong public-private partnership will make it possible to take advantage of the real quality upgrading in rural secondary education. Our policy recommendations aim to build the foundations for providing children, regardless of where they live, with access to motivating and quality secondary education that prepares them to live in, and contribute to complex and globalized society.

### **1. Focusing on teacher quality and ensuring that every child benefits from high-quality instruction**

As the experience of Australia and the findings of the OECD demonstrate, the focal driver of the progress in learning is the quality of the teachers. Australia's significant gains in rural education outcomes can be largely attributed to its focus on teachers. OECD studies on teacher effectiveness indicate that students retained with high-performing teachers will improve three times faster than

students engaging with low-performing teachers (OECD, 2007). The destructive effect of low-performing teachers is very apparent, particularly during the initial years of education. In primary schools, children that are taught by low-performing teachers for several years, experience an educational loss with long-lasting consequences. By age 7, students who score in the top 20 percent on tests are already twice as likely to complete a college degree as students in the lowest 20 percent. For example, in England, children who were failing at age 11 had merely a 25 percent probability of fulfilling the average at age 14. By age 14, the probabilities that a failing student would proceed with the anticipated standard of graduate qualifications had dropped to fair six percent (Figure 1) (OECD, 2007). Therefore, according to the OECD findings, even in good structures students do not develop to their fullest potential during their primary years at school, as they are not taught by sufficiently qualified teachers. Kazakhstan should reconsider the system of teachers' quality assurance in order to ensure that children in rural schools receive the proper primary and secondary education.

**Figure 1: Aggregate effect of failure, UK example, 2003**



*Source: Department for Education and Skills, UK*

Applying procedures which are designed to guarantee that every student is able to benefit from teaching is an effective tool to ensure quality education. Establishing high expectations for what every pupil should attain, monitoring academic performance correlated to those expectations, and

intervening on every occasion they are not encountered may improve lagging students' performance considerably. Those expectations should align standards generally, principally in regard of the OECD's PISA assessments and other important evaluation systems. The most effective tools that can be used for monitoring the quality of teaching and learning are:

- a) Periodic examinations on what students know, comprehend and can do.
- b) School reviews or inspections to assess the performance of a school toward a standard set of indicators.
- c) Annual external review on educational system improvement.
- d) Self-evaluations with an external evaluation within 3–4 years, with a strong stress on ongoing school self-evaluation throughout the intervening period.
- e) Self-review with special external evaluation once every five years based on an informal audit of teaching and learning to complement with schools' internal review procedures.

A combination of monitoring and effective interference is critical in ensuring that good instruction is provided throughout the system. The results of the monitoring are further used to raise standards and attain an equally advanced performance. In addition, it is crucial to ensure that resources and funding are directed at those learners who lack them most. The level of monitoring and interference is inversely related to the capacity of teachers and schools to advance by themselves. It is essential to oversee the processes for monitoring and intervention within the schools, where educators are able to recognize the students for support and work with them on a continuous basis. Particularly, targeting students from a poorer socioeconomic status with opportunities to learn from highly-qualified teachers may benefit their academic performance substantially.

## **2. Improving mechanisms for selecting and recruitment into teaching**

Ensuring that every child receives quality education requires effective mechanisms for selecting teachers. The highly-performing education systems admit that a wrong selection decision can result in up to 40 years of weak instruction. For those who want to become an effective teacher there is a need to possess a certain set of features that can be acknowledged before they come into teaching: a high level of literacy and numeracy, strong social and communications abilities, a readiness to learn, and the inspiration to teach. The selection processes are thus intended to assess those skills and qualities, and choose those candidates that hold them.

As the experience of Singapore and the findings of the OECD indicate, the Teacher selection mechanisms are crucial elements of the highly-performing education system. In Singapore, applicants are screened, tested and selected before they enter required teacher training. Then selected teachers are officially hired by the Ministry of Education and paid a remuneration throughout their training. This mechanism makes teacher training an attractive and prestigious program in Singapore, which in turn, makes teaching the most prestigious profession.

Applying such selection mechanisms in Kazakhstan may increase the quality of education. Currently only candidates at intellectual schools have special procedures of selection.

### **3. Engaging coaches to support teachers and enabling teachers to learn from each other**

As the case studies above demonstrate, making in-service training an effective instrument to improve teaching is always a challenge, but it can be done. In Kazakhstan, this issue might be solved through introducing the on-the-job coaching technique. Special expert teachers, competent in how to coach other teachers, may attend classes to observe teachers, give comments, sample instruction, and share in pre-class preparation. In some countries these experts are employed by the district or education authority full-time, in others they are highly qualified teachers who have been given a reduced instruction load in order to coach other teachers. Many education systems

have practiced coaching policies to effect substantial changes in teaching process, involving coaches from foreign education systems to train large numbers of teachers.

As China's rotation system and Australia's teacher network demonstrate, enabling teachers to learn from each other is another useful technique to increase the quality of teaching. Creating schools where teachers regularly observe and learn from each other's teaching styles inspires educators to exchange thoughts, and helps create a common stimulation for improving the quality of training. Establishing the special soft networks helps to create in-place learning opportunities, and serves as a platform for sharing new ideas and methods of teaching. For example, radio might be used as a tool to give teachers direct instruction on how to teach. In addition to actual programming, through special radio programs teachers can get instructional resources and complete teacher guides to support them in preparing for and accomplishing class activities. This approach focuses on the needs of both students and teachers, and mainly recognized as "dual audience direct instruction." Therefore, using such inexpensive software programs in enhancing teachers' basic skills might be applicable to remote rural schools in Kazakhstan.

#### **4. Introducing the teachers' rotation system**

As was done in China, the quality of rural secondary education in Kazakhstan might be enhanced if the national government introduces the teachers' rotation system which aimed to send qualified teachers to teach in rural areas. This approach nowadays has been successfully implemented worldwide. Providing rural schools with teachers who represent a high quality education should be accompanied with a proper reward system by setting a sufficient level of compensation to attract and retain high quality teachers in rural schools.

Recruiting quality teachers is usually a highly competitive policy since rural schools must be able to compete:

- a) with other professions, as generally teachers are not rewarded as other specialists;
- b) with neighboring regions that may compensate their teachers considerably more;
- c) with other schools in their own region.

In addition, family members of teachers, especially spouses, should be provided with workplaces, as well as with accommodations. Only such mechanisms inspire talented teachers to work in rural areas, in turn, schools in remote areas will have access to qualified and relevant teaching.

#### **5. Creating excellent primary and secondary schools in rural areas through involving the private sector**

As was done in Korea, it is possible to create excellent schools in rural areas through integrating and accumulating the resources of small schools in rural areas as well as involving the private-sector in the development of rural education. The government needs to pay careful attention to the needs of rural youth. Therefore, development of excellent secondary schools in rural districts can prevent the students in rural areas from going into the cities to search greater educational opportunities. These schools should be given autonomy and discretion to operate their affairs, and adjust educational programs in accordance with the local context and populations' need. Moreover, private companies who have been involved with this process should be provided with tax exemption or privileges in order to stimulate more private organizations to invest to secondary education in rural and remote areas. International practices show the widespread attention that public-private partnership in secondary education are receiving. Examples of schools using the public funding through vouchers for private school participation are dominant in many countries. In turn, the government should monitor and ensure that high-quality education services are delivered by such non-state providers.

#### **6. Establishing a high quality curriculum and extra-curricular activities**

Studies have shown that a relevant enriched curriculum may encourage students to learn and increase academic performance. Providing such a curriculum in rural schools can be difficult due to their small size and remoteness, yet, it is possible to give a certain flexibility to the teaching process. Moreover, some issues of small rural schools can be successfully addressed using educational technologies that make it cost effective to provide an extensive range of courses. Schools should also offer students the opportunity to be engaged in their community. Therefore, many rural education systems have been developing a curriculum based on the local context. This approach, commonly accepted as place-based education, empowers schoolchildren to make contributions to the areas in which they live. For example, in accordance with the country's agricultural orientation, agriculture as a subject has been taught in Kenya in the secondary level, with the overall purpose being the development of basic agricultural skills relevant to Kenya and the students' home environment (Kenya Secondary School syllabus, 2002). The main goal of teaching agriculture is strengthening interest and awareness for opportunities existing in agriculture (farming and agro-based enterprises) and illustrating that farming is a distinguished and profitable occupation; to enlarge the students' knowledge on basic principles and practices in agriculture, advance students' understanding of the value of agricultural enterprise to the family and community with a view of endorsing self-reliance, resourcefulness, poverty reduction, developed food security, problem solving abilities, a career outlook in agriculture and promote agricultural activities which improve environmental preservation (Waithera, 2013).

Since agriculture is the main source of livelihood for the majority of the Kazakh population living in rural areas, incorporating agriculture and agro-enterprise in the teaching and learning in secondary schools effectively is very important. Currently, the secondary school curriculum does not relate to the needs of the rural community. Rural students should learn more modern farming

technology and agri-business; for example, vocational education, and other kinds of skills that can help students get jobs after secondary school, since many of them might not want to go to tertiary education. For those who want to, however, there should also be a path with quality education for them to get the academic preparation they need.

### **7. Adopting better ways of learning through technologies**

Findings from literature review indicate that using information communication technology is essential for rural primary and secondary schools since it is problematic and potentially expensive to offer rural students a high quality curriculum. In addition, rural teachers mainly cannot access professional development programs located in distant cities. Given the massive potential of distance learning for rural schools, the Kazakh education system must ensure that the technology needs of rural students are addressed. Meanwhile, many studies from the Gates Foundation illustrate that technologies in the classroom are becoming more common and can increase student academic achievement (RAND, 2015). Students can make great academic advances if schools provide personalized ways to learn, especially where they have access to effective technology devices that support personalized learning. One of the two Gates studies (the study “Continued Progress”) indicated that students in schools practicing personalized learning approaches made better academic progress, throughout the course of two years, than a comparison group of similar students (RAND, 2015). The personalized learning strategy tracks all students to high expectations, and a teaching model allows flexibility for students to make choices on the content or structure of learning. In particular, schools apply a range of instructional methods and curriculum resources to meet the learning requests of all students. Additionally, there is time during the school day for individual academic support when students could request extra help.

This strategy might be essentially useful for small-sized rural schools in Kazakhstan, where students of diverse age groups are being taught together in one class.

## **VII. CONCLUSIONS**

More than 20% of the population of Kazakhstan are students of primary and secondary school. The quality of their education should be a main priority for state policy because children are the future of the nation. The disparity in the quality of rural and urban schools is a main problem which has to be addressed.

Rural schools in Kazakhstan enroll more than 1.3 million of children. The rural areas where these children live are economically, culturally, and demographically diverse. This diversity in place and people makes it questionable that a single public school model will work in all settings.

Important lessons can be learned from different countries' cases presented in this master project. Since each region has its unique cultural, economic, and social context, the delivery of public secondary education requires not just a narrow focus on education, but also a deep emphasis and broad-based collaboration around addressing the needs of rural children and their families in particular.

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## IX. APPENDIXES

### APPENDIX A: COUNTRY CONTEXT

#### Political profile

Kazakhstan declared independence from the Soviet Union in 1991 and approved its first Constitution in 1993. This Constitution describes the country as a secular democratic state with a presidential government and separation of powers between its legislative, executive, and judiciary branches. According to the Constitution and Law “On the administrative-territorial structure of the Republic of Kazakhstan,” the country is administratively divided into 14 regions and 175 administrative districts, 87 cities (2 cities of republican status, 40 regional cities and 45 cities of regional importance), 34 towns and 6,947 villages (OECD Report, 2015). Available data indicates that in 2011 Kazakhstan had 2,453 rural districts (OECD Report, 2015).



**Map: Regions of Kazakhstan**

Source: Wikipedia

## Demographic and Socio Economic Situation

Kazakhstan has a fairly small population living in a comparatively large territory. The density is 6.5 persons per square km. 43.2% of the general population live in rural areas. Kazakhstan's population as of December 1st, 2015 was 17.6 million People, 26.77 % of which are young people under the age of 15 (4,398,600 individuals) (MNE, 2015). Kazakhstan is primarily an Islamic country (70.2%), about one quarter of the population describes itself as Christian (26%), and 3.5% indicate "other" or no religious affiliation. Kazakhstan is a multiethnic country with a rich and diverse cultural heritage (Table 1) (IAC Report, 2015).

**Table 1. Share of ethnic groups in the population of Kazakhstan**

Ethnic group	% of population	Ethnic group	% of population	Ethnic group	% of population
Kazakhs	65.5 %	Uighurs	1.4%	Turks	0.6%
Russians	21.5%	Tatars	1.2%	Azeri	0.6%
Uzbeks	3%	Germans	1.1 %	Dungan	0.4%
Ukrainians	1.8%	Koreans	0.6%	Belarusians	0.4%

Indicators on the health and well-being status of the Kazakh population suggest that significant challenges remain in terms of human development. Life expectancy is low in comparison with countries with a similar level of income, and, despite improvements, maternal and infant mortality rates are still high. Currently, the overall life expectancy in Kazakhstan is 69.63 years; for males, the life expectancy is around 64.34 years, while the females have a life expectancy of 74.59 years (MNE, 2015). In 2014 the maternal mortality ratio was assessed at 11.7 deaths per 100, 000 births, and a rate that has been separated by more than 4 since the 2000s. There is an analogous pattern for infant mortality ratio, which declined from 18.8 deaths per 100, 000 births in 2000 to 9.72 deaths in 2014 (OECD Report, 2016).

According to the Committee for Statistics of the Republic of Kazakhstan, in 2012 the average size of a family in urban areas was 3.0 persons, in rural 4.0 persons (OECD Report, 2016). 58% of families in rural areas include 4 or more peoples, while in urban areas less than 29% of families have the same number of persons (OECD Report, 2016).

Kazakhstan has undergone substantial economic growth in the last decade. In 2010, the country's annual GDP growth was 7% and inflation stayed stable. With a GDP per capita of USD 11,358 in 2011, Kazakhstan is accepted as an upper-middle income economy (IAC Report, 2015).

Poverty has also noticeably dropped over the past decade, but rural poverty is still high. Between 2001 and 2012, the overall poverty rate declined from 47% to 4%. Particularly, rural poverty declined from 59% to 6%, and urban poverty plunged from 36% to 2% (IMF Report, 2014). However, the gap among rural and urban residents still remains extensive, with twice the number of people existing underneath the poverty line of USD 2.3 per day in rural areas than in urban areas (IAC Report, 2015). The rural population in Kazakhstan generally earn their income from self-employment and entrepreneurship (15.8% versus 6.6% in urban areas), while those living in urban areas have income from employment (75.1% and 63.5% respectively) (IAC Report, 2015). In 2010, the average nominal per capita income for rural areas was KZT 186.1 thousand (USD \$1,263), while for urban areas this indicator was 1.5 times higher at KZT 335.8 thousand (USD \$2,279) (Agency of Statistics, 2011). 10.1% of rural population lived with incomes below the monthly subsistence level of 16,072 tenge or USD \$132, while in urban areas it was at 3.7% (Agency of Statistics, 2011).

Per capita nominal income of the population estimated in October 2015 was USD \$236 which is 3.1% higher compared to October 2014, the real monetary income in October 2015 decreased by 5.8% (MNE, 2015). The average monthly nominal wage for employees (estimated) in November

2015 was USD \$445 (MNE, 2015). The current unemployment rate is 5% of the economically active population, while the number of persons registered with employment offices as unemployed at the end of November 2015 was 58,200 People, or 0.6% of the economically active population.

## **APPENDIX B: EDUCATION PROFILE**

Education is defined as a priority in Kazakhstan. The country has been implementing numerous education reforms to address the education needs and demands of a modern economy.

According to the Constitution and the Law on Education, primary and secondary education is compulsory in Kazakhstan and provided free of charge. In 2010 and 2011, Kazakhstan was ranked first on UNESCO's "Education for All" Index, reaching 99% attendance for primary education, 99.6% for general adult literacy, and 99.3% for gender equality (MES, 2010).

Secondary education is a basic level of education. It is received by citizens as a result of the acquisition of educational curricula of primary, basic secondary, and general secondary education in accordance with the state educational standards.

General secondary education is acquired in stages by mastering the educational programs of each level, beginning with primary (grades 1 to 4), progressing to basic (grades 5 to 9) and then the senior level (10, 11 or 12 grades).

Additionally, citizens have the right to obtain free higher education based, assuming sufficient/satisfactory scores on the Unified National Test. The Unified National Test taken at the end of the 11<sup>th</sup> grade, combines a senior secondary school graduating certificate and university admission examination.

The Kazakh educational policy offers equal opportunities to access general education for all categories of school-age children, regardless of nationality and religion. In addition, children of migrant workers are allowed to attend schools just as Kazakh children. Currently, schools in

Kazakhstan accommodate pupils from 23 diverse cultures. Ethnic Kazakhs cover 73% of students, ethnic Russians 14%, and ethnic Uzbeks 4%. Other minority groups include: Uighurs (1.5%), Ukrainians (1.3%) and Germans (1.0%) (MES, 2015).

Schoolchildren may study in official Kazakh and Russian languages as well as in other minority languages. The recent data shows that the language of instruction in most of the schools are Kazakh (3,819 schools), followed by Russian (1,394), Uzbek (60), Uighur (14), and Tajik (2). Approximately 2,113 schools presented more than one language of instruction (MES Report, 2015).

Free primary and secondary education is provided by a widespread network of educational organizations including lyceums, gymnasiums, boarding schools, special schools for gifted children and special educational organizations for children with developmental disabilities. The total number of students enrolled in primary and secondary education is 2, 615 898 pupils, about 1, 057 000 (39%) are enrolled in primary education (MES Report, 2015).

In the 2014-2015 academic year, 7, 567 schools operated in the country, of which 7,543 public and 109 private (MES Report, 2015). About 25% of schools are located in urban areas and assist 48% of student population, while 75% of schools are located in rural areas and assist 52% of the cohort. There are 5,569 rural schools with a total of 1.3 million students (MES Report, 2015).

### **Teachers in Kazakhstan**

Pedagogical workers in Kazakhstan are being prepared in several teacher training colleges and universities. Teacher training colleges have 9 teaching professions assigning 22 qualifications. Of the total of 139 universities 83 have licenses for teacher training (IAC, 2015). Candidates can apply to a pedagogical college after completion of lower secondary education (upon grade 9) or general secondary education (upon grade 11). Upon these colleges, students can apply to

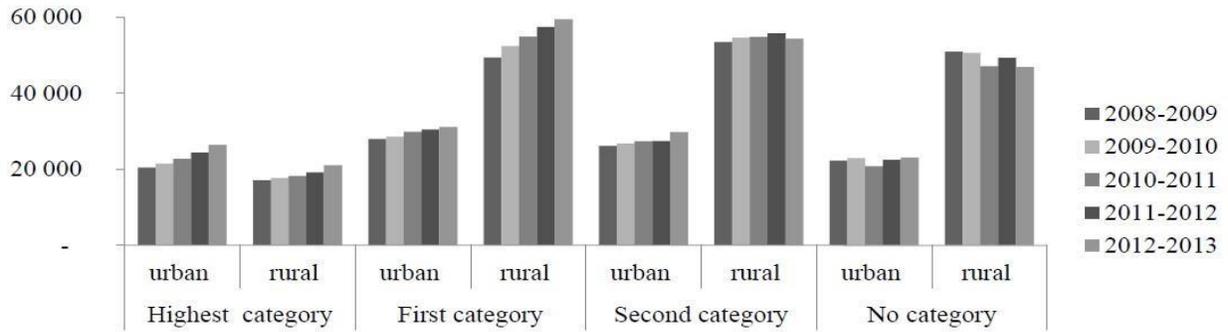
universities to earn higher education. Admission to universities is based on the Unified National Test results, and there is no additional examining to identify applicants' ability to the teaching profession.

Teachers are hired by the principals in accordance with staffing table and number of students. There is no a definite teacher selection system. While a vacancy occurs, every candidate can submit an application addressed to the principal. According to the Law on Education, individuals with relevant vocational and higher education are admitted to the teaching profession.

In recent years teacher's cohort in Kazakhstan has considerably increased. There are 294,897 teachers; about 60% of them work in rural areas (MES Report, 2015). One can observe a tendency towards higher degrees of education and professional development in both urban and rural teachers. According to the Law on Education, every five years teachers can undergo an attestation procedure to receive qualification categories that provide an additional payment. There are three categories of teacher's qualification: higher, first, and second. The figure underneath shows the steady increase in the number of teachers with first category, while the number of those without category is decreasing. The current share of highly qualified teaching staff, with the highest and the first category is 48% (MES Report, 2015).

An educational activity of teachers includes of conducting lessons and supplementary activities. Teachers' salaries are calculated in agreement with the teaching load system per unit, which is taken one load containing of 18 weekly hours of teaching time. Although the teachers' salaries have been repeatedly raised in recent years with various incentive schemes, the problem of insufficient level of teachers' wages is remaining significant. For example, the average monthly salary of school teachers in 2013 amounted KZT 60 470 or USD \$393, remaining one of the lowest wages in the country (IAC Report, 2015).

**Figure 1. Teachers by category, 2008-2013**

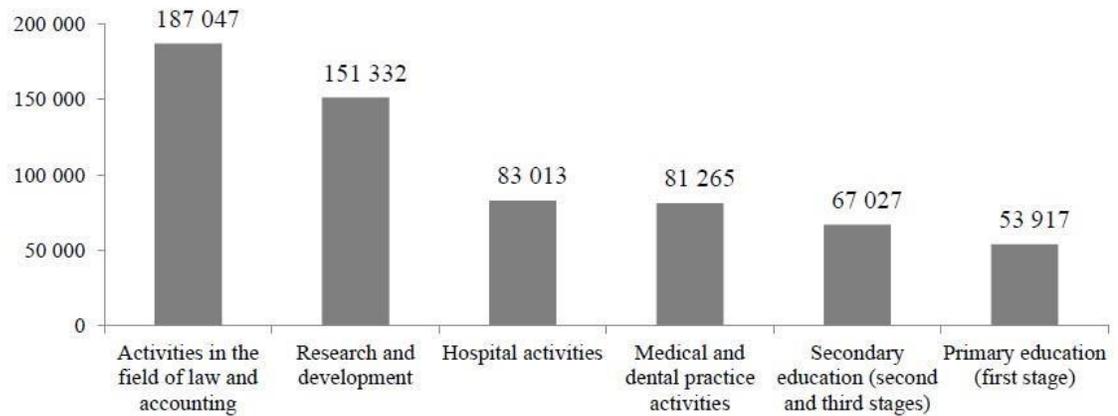


Source: IAC, 2015

As in many other countries, professional development is one of the requirements for teachers in Kazakhstan. Teachers are entitled to training at least once in five years for a period no more than four months. The professional development is implemented in the following ways:

1. Off the main job;
2. Combined (full-time and distance learning)
3. Via distance learning with definite periodic durations and intervals.

**Figure 2. The average monthly nominal salary in KZT, 2013**



Source: IAC, 2015

In recent years, Kazakhstan has started a new system of the teachers' professional development under the partnership between University of Cambridge and the Nazarbayev Intellectual Schools (NIS). The program includes of three levels of training as following:

1. Basic – training on the guide to the learning process in the classroom;
2. Intermediate: training on the guide to the learning process at school;
3. Advanced: training on the guide to the learning process in a school network ((MES Report, 2015).

After completion of the training program, teachers should pass an examination at NIS. In the meantime, they are entitled for following additional payments: the advanced level – 100%, the intermediate level – 70%, and the basic level – 30%. As of 2012, about 7% of the program participants failed this program (MES Report, 2015).

Thus, the additional payments lead to substantial differences in wages between those with low qualifications at the beginning their careers and those at highest qualification with many years of experience (see Figure 3). In addition, according to the Law on Education, teachers working in rural schools are provided with following supports:

1. 25% remuneration for working in urban conditions;
2. Lump-sum compensation to cover utility bills and costs for fuel for heating;
3. Teachers who have cattle are provided with forage and land for pasture and haymaking by decision of local government.

**Figure 3. The additional payments for qualifications**

Type of additional payment	Description	Average payment, in % of the base salary	Persons receiving additional payment
Additional qualification	Academic degree: candidate of science	1 minimal salary (national)	T; TS
	Academic degree: PhD	2 minimal salaries (national)	T; TS
	Qualification category G9: highest	100%	T
	Qualification category G9: first	50%	T
	Qualification category G9: second	30%	T
	Qualification category G11: highest	90%	T
	Qualification category G11: first	45%	T
	Qualification category G11: second	30%	T
	NIS certificate: level 3 (basic)	30%	T
	NIS certificate: level 2 (intermediate)	70%	T
	NIS certificate: level 1 (advanced)	100%	T

Source: IAC, 2015 (Notes: T – teachers, TS – teaching staff, G9 – secondary schools teachers with university degree, G11 – primary school teachers with vocational education)

### **Teachers' quality assurance**

Teachers in Kazakhstan are required to pass a teacher attestation procedure at least once every five years in order to access the higher category or to keep the current category. The attestation requires the teacher to submit a portfolio including information on professional development and pedagogical activities, as well as information about the educational attainment of teachers' students.

The attestation commissions are formed at the school level for second category, at the district level for first category, and at the province level for the highest category. The standard qualification characteristics for all teachers include: official duties, additional knowledge, and qualification requirements. Commissions examine the pedagogical experience (class preparation and methodological materials), participation in teacher training and professional activities

(conferences, workshops etc.), contribution to the development of study programs and curricula, leadership in teacher networks, as well as independent evaluations of teaching quality by parents and students. The last stage of the attestation procedure includes an interview with the teacher and lesson observation.

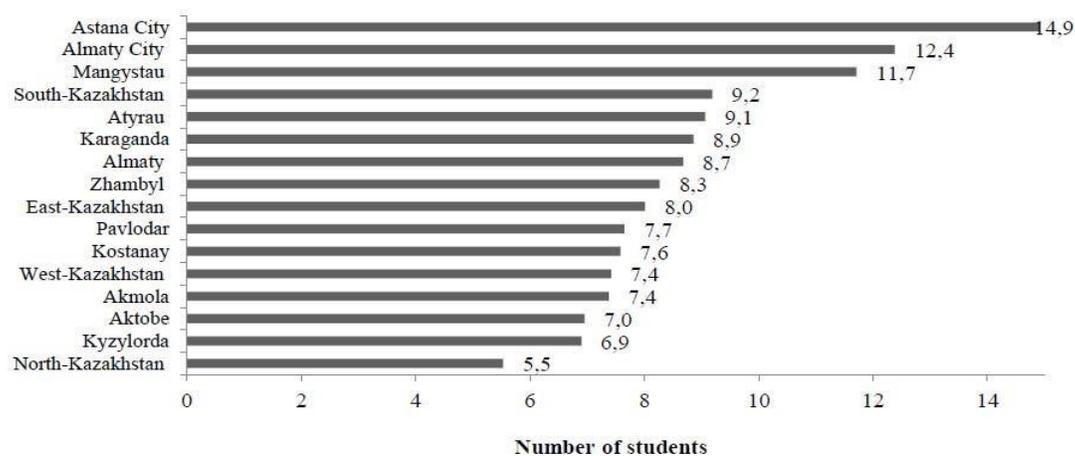
After the full examination, the attestation commission makes one of the following decisions: 1) teachers confirm the category for which they apply or keep the current category; 2) teachers are subject to re-attestation; 3) teachers do not confirm to the applied category or the category is withdrawn for a teacher looking for keeping the current category. Therefore, if teachers' attestation is not successful, teachers can be dropped to a lower category.

### **Class size and teacher-student ratio**

In Kazakhstan, class size should not exceed 25 students. The average number of students per class differs within regions and school levels.

The teacher-student ratio is also vary across the regions as follows, while the average for the country was 9 students for per teacher (MES Report, 2015). The similar pattern can be observed among regions based on both indicators number of students per class and number of students per teacher (see Figure 4 and Figure 5). The cities of Astana and Almaty are among the highest, while Akmola and North Kazakhstan regions are among the lowest in both indicators. These figures indicate to the internal migration processes towards current and former capital cities of Kazakhstan (Astana and Almaty respectively).

**Figure 4. Number of Students**



Source: IAC, 2015

**Figure 5. Relevant indicators across the country in the academic year of 2012-2013.**

#	Region, city	Grades 1-4 The average number of students	Grades 5-9 The average number of students	Grades 10-11 The average number of students	TOTAL The average number of students
1	Akmola	11.7	12.8	10.3	12
2	Aktobe	15.8	16.7	15.2	16.1
3	Almaty	19.2	19.4	14.3	18.6
4	Atyrau	19.1	18.5	15.2	18.3
5	East Kazakhstan	15.4	15.9	14.5	15.5
6	Zhambyl	19.1	19.2	16.4	18.8
7	West Kazakhstan	14	15.5	13.4	14.6
8	Karaganda	16.9	17.6	14.4	16.9
9	Kostanai	12.8	14.7	11.7	13.5
10	Kyzylorda	21.3	21.5	18.3	20.9
11	Mangystau	21.8	22.3	18.4	21.7
12	Pavlodar	13.8	13.7	11.8	13.5
13	North Kazakhstan	9.9	11.4	10.6	10.6
14	South Kazakhstan	20.8	21.7	20.8	21.2
15	Astana city	25.3	24.5	22.3	24.7
16	Almaty city	25.6	23.9	21.5	24.4
	<b>Average in Kazakhstan</b>	<b>17.7</b>	<b>18.1</b>	<b>15.6</b>	<b>17.6</b>

Source: IAC, 2015

### **Current reforms in education**

The government of Kazakhstan has recognized a strategic importance for education development. The State Program of Education Development 2011-2020 established main priorities, targets and indicators to be completed by 2020 (State Program of Education, 2010). The program focuses on access, quality, equity, and curriculum, and defines indicators for transitioning to a 12-year education system by 2019. The five-year National Action Plan for the development of student's functional literacy was adopted in 2012 to confirm the improvement of functional literacy skills, encourage creative thinking and problem solving skills, as well as ensure the readiness of students to lifelong learning. This plan includes a number of measures, predominantly modernizing the educational standards, programs and curricula along with restructuring the management system with regard to approve schools with greater autonomy in adjusting the curriculum (IAC Report, 2015).

### **Consolidating best practices**

The best practice centers on the basis of intellectual schools were established as cells of innovation designed at providing students with motivations for study, teachers with a new system of professional development, and schools with a prospect to deliver a personalized learning environment. In addition, the standardized national assessments at the end of each learning phase and assessment standards for student performance in the classroom have been introduced. Special attention has been paid to the ungraded schools through establishing a network of 26 supporting resource centers (IAC Report, 2015).

### **Professional development for teachers**

In recent years Kazakhstan has launched a new system of professional development for teachers. On the basis of the network of Nazarbayev Intellectual Schools (20 schools) the professional

development centers for teachers were created, grounded on innovative approaches and content improvement (IAC Report, 2015).

### **System management and financing**

One of the key objectives of the State Program of Education Development 2011-2020 is a review of financing mechanisms in education. From 2017 onward, funding at preschool, primary and secondary schools, except rural and ungraded schools, will be determined on the basis of a per capita funding formula. It takes into account the sum of children at each school and selection of supplementary features to account for alterations within schools and regions (MES, 2010).

In general, all public schools are funded in agreement with the one standard of provision: most of the expenditure consists of local budget, and additional target transfers are distributed from the central budget. Funding is based on data from prior budgeting years by considering inflation and variations in enrollment (amount of classes-sets). The financing plan, comprising a list of monthly expenditures, is designed in the sequence of rational budget distribution and implementation.

The Ministry of Education and Science is the fundamental body responsible for the control and intersectoral management in the field of education. While local governments are accountable for the provision of education services in schools, and follow central government policies.

Local budget funding of school education accounted for about 74% of all education expenses in 2013, or 1.8% of GDP. In the meantime, the central government's share has been comparatively stable, between 25-29% from 2006. The total public expenditure on education in Kazakhstan accounts for around 4% of GDP (IAC Report, 2014).

## **Infrastructure enhancement**

The State Program of Education Development 2011-2020 recognizes the need to improve a number of features in school infrastructure including (State Program of Education, 2010):

- the share of schools with chemistry, biology, physics, and language classrooms being modernized in accordance with the new standards (32% as of 2010) should be enlarged to 80% by 2020;
- the ratio of students to instructional computers (18 as of 2010) should be dropped to 1 by 2020;
- the share of disordered schools (2.6% as of 2010) should be reduced to 1% by 2020;
- the share of three- shift schools should be declined (from 0.9% as of 2010) to 0% by 2020.

## APPENDIX C: REGRESSION ANALYSIS

In this study, we used regression analysis to characterize the relationships between several independent variables and three proxies for quality of education. In statistics, regression is a method that allows for quantitative analysis of relationships, and enables inference about the size and variability of effects. The final models we selected for our analysis met the standard assumptions of this method, namely that the data are normally distributed and have homogenous variance. We confirmed that the normality and homogeneity of variance assumptions were met using Q-Q Plots of model residuals and scatterplots of fitted versus residual values, respectively. Because of the limited size of our data set, we could not construct a model with sufficient statistical power to make conclusions if we included “Region” among the independent variables. However, it is still interesting to consider the regional differences in quality of education, and so we conducted *post hoc* analyses of variance to address possible regional effects separately from the multiple linear regression (see below).

We tested several models to arrive at our final model for quality of education, using “test score (log),” “post-secondary enrollment,” and “number of contest winners” as proxy variables. The final model we selected is described below:

<b>Table: Summary of multiple linear regression analysis results from final model, using Test Score (log), Post-Secondary Enrollment, and Number of Contest Winners as proxies for quality of education. Significant difference evident at P &lt; 0.05.</b>					
<b>Estimate</b>	<b>Estimate</b>	<b>St. Error</b>	<b>t-value</b>	<b>P-value</b>	<b>Significance</b>
<b>Test Score (log)</b>					
(Intercept)	4.76E+00	8.90E-01	5.351	2.54E-06	***
Proportion Urban	1.80E-03	7.35E-04	2.455	0.01783	*
Number of Schools	6.27E-05	9.17E-05	0.683	0.49777	
Student: Teacher Ratio	-2.19E-02	6.89E-03	-3.171	0.00268	**
Teacher Trainings	6.15E-05	2.76E-05	2.229	0.03066	*
Principal Trainings	-2.68E-04	1.71E-04	-1.57	0.12318	

Pupils Per Computer	1.79E-03	1.74E-03	1.026	0.31024	
Local Funding (1000) (log)	-1.49E-02	5.89E-02	-0.252	0.80213	
Contest Participants (log)	-1.50E-02	2.01E-02	-0.745	0.46009	
Adjusted R-square: 0.2739; F-statistic: 3.593 on 8 and 47 DF, p-value: 0.002493					
<b>Post-Secondary Enrollment</b>					
(Intercept)	2.18E+02	1.00E+02	2.174	0.037	*
Proportion Urban	8.58E-02	7.60E-02	1.129	0.267	
Number of Schools	6.77E-05	1.08E-02	0.006	0.9951	
Student: Teacher Ratio	-1.88E+00	7.57E-01	-2.482	0.0183	*
Teacher Trainings	-2.26E-03	2.81E-03	-0.803	0.428	
Principal Trainings	-4.12E-03	2.03E-02	-0.202	0.8408	
Pupils Per Computer	1.03E-01	1.82E-01	0.566	0.5749	
Local Funding (1000) (log)	-6.85E+00	6.58E+00	-1.041	0.3056	
Contest Participants (log)	-1.71E-01	2.01E+00	-0.085	0.9327	
Adjusted R-square: 0.4415; F-statistic: 5.052 on 8 and 33 DF, p-value: 0.0003768					
<b>Contest Winners</b>					
(Intercept)	-5.22E+02	5.54E+02	-0.943	0.3506	
Proportion Urban	2.48E-01	4.58E-01	0.543	0.59	
Number of Schools	-4.29E-02	5.71E-02	-0.75	0.4567	
Student: Teacher Ratio	4.11E+00	4.30E+00	0.957	0.3434	
Teacher Trainings	6.31E-05	1.72E-02	0.004	0.9971	
Principal Trainings	1.31E-01	1.07E-01	1.231	0.2244	
Pupils Per Computer	3.57E-01	1.09E+00	0.329	0.7435	
Local Funding (1000) (log)	1.66E+01	3.67E+01	0.452	0.6532	
Contest Participants (log)	2.60E+01	1.25E+01	2.072	0.0438	*
Adjusted R-square: 0.1164; F-statistic: 1.906 on 8 and 47 DF, p-value: 0.08138					

Subsequently, we conducted *post hoc* analyses to better understand the regional differences in quality of education and to further verify the discrepancy between rural regions and urban centers. We determined using analyses of variance (ANOVA) that test scores in urban centers are

significantly higher than test scores at the regional level, with  $P = 0.00276$ . Additionally, urban centers have a significantly higher proportion of contest winners than the region on average ( $P < 0.005$ ). We concluded that there is not a significant difference between the urban centers and regional averages in the proportion of students who go on to enroll in post-secondary education programs ( $P = 0.145$ ).

We used a Dunnett’s test for ANOVA to do pairwise comparisons of regional test score values with test scores in urban Almaty – which has the highest test score overall. We found that when compared to Almaty (city), the Atyrau and Almaty regions have significantly lower test scores at  $P < 0.05$ . Mangystau ( $P = 0.05885$ ) and South Kazakhstan ( $P = 0.08868$ ) are also near to the  $P = 0.05$  threshold.

**Table: Summary of Dunnett’s test for significant difference in test score values between study regions and urban Almaty**

Region - Almaty City	Estimate	St. Error	t-value	P-value
Akmola	-11.154	4.196	-2.658	0.09323
Aktobe	-6.324	4.196	-1.507	0.70049
Almaty	-13.752	4.196	-3.277	0.01909
Astana	-3.178	4.196	-0.757	0.99735
Atyrau	-16.61	4.196	-3.958	0.00251
East Kazakhstan	-9.984	4.196	-2.379	0.17217
Karaganda	-10.542	4.196	-2.512	0.12973
Kostanai	-7.586	4.196	-1.808	0.47679
Kyzyl-Orda	-10.842	4.196	-2.584	0.11065
Mangystau	-11.964	4.196	-2.851	0.05885
North Kazakhstan	-7.792	4.196	-1.857	0.44273
Pavlodar	-7	4.196	-1.668	0.57881
South Kazakhstan	-11.244	4.196	-2.68	0.08868
West Kazakhstan	-5.962	4.196	-1.421	0.76352
Zhambyl	-10.912	4.196	-2.6	0.10648

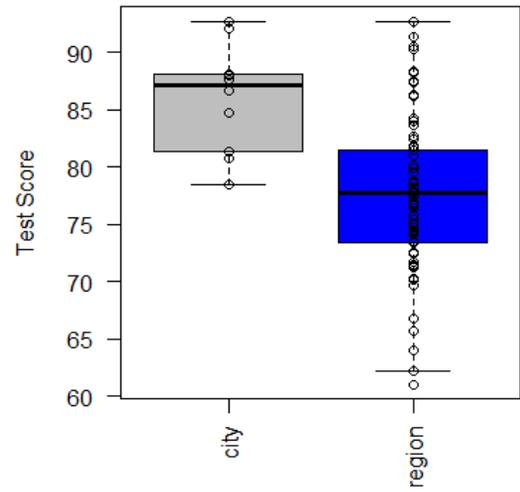
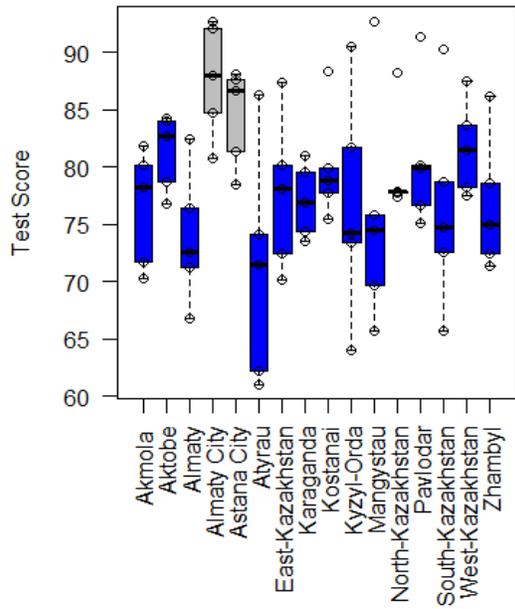


Figure: Test score by region and region type

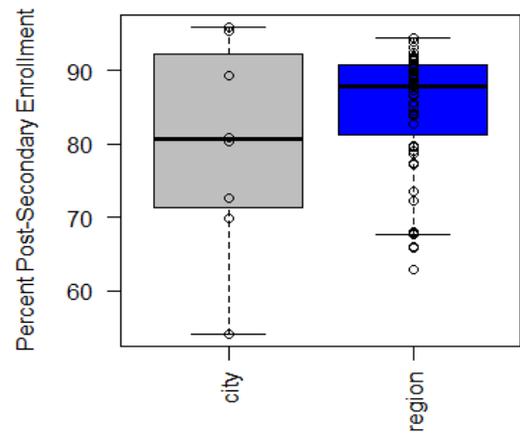
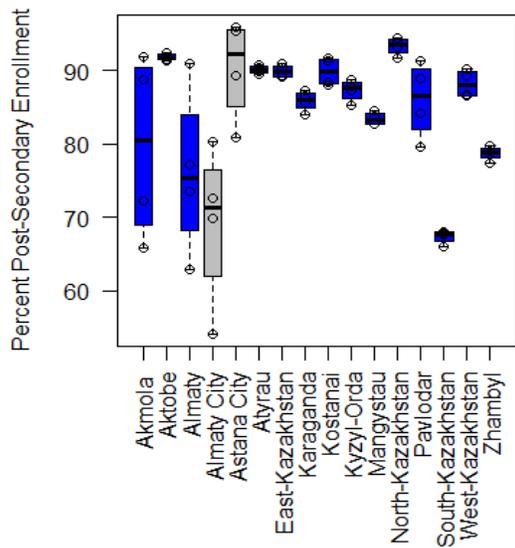
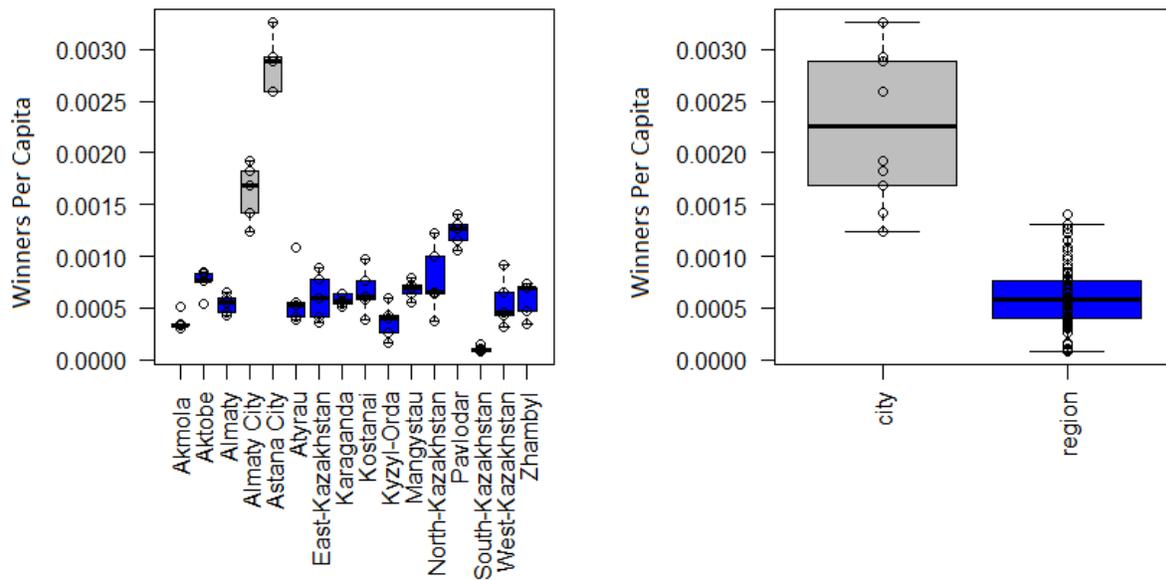


Figure: Post-secondary enrollment by region and region type.



**Figure: Number of winners per capita by region and region type.**