Comparative Analysis of ICT Policies and Practices in Russia and the US

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Abstract: This paper presents results of a comparative study of the US and Russian educational policies and practices in the area of "Information and Communication Technologies" (ICT) across six areas: 1) the level of basic ICT/computer literacy; 2) the level of teachers' ICT/computer literacy (including ICT instructional literacy); 3) the technical base of ICT Education; 4) the quality of education standards and syllabi content for ICT/CS subjects; 5) the level of students' motivation for learning ICT/CS subjects; and 6) the level of regional, national, and international interconnectivity. This analysis revealed positive features in both countries, including policies and practices which can be transferred between the two countries. Thus, the paper suggests possible improvements for both ICT educational approaches.

1. Introduction

The paper contains results of the comparison between US and Russian ICT educational policies. The paper addresses the following questions: 1) What is common in the US and Russian ICT education and what are the differences between them? 2) What are the positive features of the US and Russian ICT education systems?

2. ICT Educational Strategy in the US

The American ICT educational strategy is a broad decentralized array of ICT policies and programs at the national, state and local levels. The following discussion provides an overview at the national level.

2.1 ICT National Initiatives of the US Department of Education

The US Department of Education (USDOE has established numerous programs addressing ICT literacy. The *Technology Literacy Challenge Fund* (TLCF) program (1995-2000) was created to address four major goals: 1) make modern computers accessible to all children; 2) connect classrooms to the Internet; 3) integrate educational software into educational curricula; and 4) prepare teachers to teach with technology (USDOE, 1996). The USDOE also provided funding to states and local districts through the *Preparing Tomorrow's Teachers to Use Technology* (PT3) program. Its goals included: "Faculty development; Course restructuring; Certification policy changes; Online teacher preparation; Enriched-Networked-Virtual Video case studies; Electronic portfolios; Mentoring triads; and Embedded assessments" (USDOE, 2008b).

Currently, there are many other USDOE projects: the *Education Technology State Grants Program* aims to increase student achievement through the integration of ICT into the teaching and learning process (the funding is $280 million for 2008). The *21st Century Community Learning Centers Program* has a primary goal to create programs supporting students' ICT activities outside the classroom (the funding is over $1 billion for 2008). The *National Educational Technology Plan* intends to help states and districts "prepare today's students for the opportunities and challenges of tomorrow". Finally, the National Center for Education Statistics' *Technology-Based Assessment Project* was designed to support the use of technology to improve the quality and efficiency of educational assessments. Many schools have received funding through the *Enhancing Education Through Technology* Act of 2001. This program focused particularly on increasing teachers' ICT knowledge and skills by that requiring that 25% of the funds be used for professional development.

Of course, the largest federal program is *No Child Left Behind (NCLB)*, originally signed into law in 2000. In terms of ICT, NCLB has made it a national goal for all 8th graders to be technologically literate. Unfortunately, unlike reading and math, monitoring student ICT literacy has not been included in NCLB requirements, and most states do not administer separate tests for ICT literacy.

2.2 The National E-rate Program

Enacted as part of the Telecommunications Act of 1996, the E-rate Program established lower rates for Internet access for schools. The E-rate Program makes "discounts available to eligible schools and libraries for telecommunication services, Internet access, and internal connections. The program is intended to ensure that schools and libraries have access to affordable telecommunications and information services."(Universal Services Administrative Company, 2008). Although this program does not directly address the ICT use in schools, it does help schools to enhance the quality of ICT education and develop their own ICT educational projects with fewer financial limitations.

2.3 Non-governmental ICT Educational Projects of National and International Scope

There are also many national organizations and programs that provide important frameworks for improving the ICT knowledge and skills of students, teachers, and administrators. These organizations include the Society for Information Technology & Teacher Education (SITE), Consortium for School Networking (CoSN), the International Society for Technology in Education (ISTE), the Association for Educational Communications and Technology (AECT), "Project e-Quality", the "Cable in the Classroom" program, the "Tech Corps", and many more.

3. ICT Educational Strategy in Russia

The Soviet and Russian government has always paid special attention to science and technology education. In the second half of the 20th century and the beginning of the 21st century, Computer Science (with ICT as one part) has become one of the most important scientific disciplines.

3.1 Informatization of the Education Process

Informatization of Education has been a long-term process since 1985 when Computer Science was included in the school curricula as a compulsory subject, alongside mathematics, physics and other scientific disciplines. Simultaneously, schools were supplied with computer facilities. The first computers were developed specially for schools by Soviet research institutes and enterprises. However, since the 1990s, schools have been supplied with IBM PCs. In the 1990s, Computer Science became compulsory for all higher education institutions (HEI) and for all specialities, and was included in the State Education Standards. Today all higher education institutions have faculties and departments of Computer Science/ICT.

3.2 Computerization of Rural Schools Program

In 2000, the Russian government recognized that graduates of rural schools were in a worse position than graduates of city schools. Today almost all rural schools have at least one computer class and Internet access. Normally, these classes are used very intensively for teaching Computer Science. However, both teachers and students have almost no opportunity to work on their own projects. As a result, the graduates of rural schools have a limited perspective on computers.

3.3 Federal Project on Higher Education Institutions (HEI) Teachers' Retraining

In December, 2007, the Federal Agency of Education (formerly, the Ministry of Higher Education) of

Russian Federation issued an order on HEI teachers' retraining. Subsequently, retraining has been conducted in many priority directions and programs, including "Contemporary Pedagogical Technologies", "ICT in Education", and "Information Security".

3.4 Federation of Internet Education (FIE)

The challenge of improving teachers' ICT literacy has been addressed by many governmental and non-governmental projects. But the Federation of Internet Education (FIE) project, sponsored by Yukos Company, was especially impressive. According to the general plan of this project started in 1999-2000, well-equipped learning centers were created in every region/district of Russia. Teachers of different subjects were trained intensively to create their own digital educational resources and to use existing ones. Every center graduated 1000 to 2000 teachers per year, but the program has recently been dropped.

3.5 Intel® Teach to the Future

The international educational project Intel® "Teach to the Future" is partially sponsored by the Intel Company and partially by higher education institutions where it is applied. This project aims to help teachers integrate ICT into innovative methods of teaching.

4. Comparison Between ICT Educational Policies in the US and Russia

4.1 Higher Education System as a whole

In the US, there are approximately 4000 public and private higher education institutions, including approximately 2300 private and over 1600 public institutions (NCES, 2007). In 2003-2004, the total number of undergraduate students was approximately 14.8 million and the number of graduate/professional students was 2.4 million, for a total of 17.2 million. In 2008, it is now approximately 15.7 million and 2.6 million, respectively, for a total of 18.3 million. Approximately 96 percent of all children 5-17, 35 percent of adults age 18-24, and 10 percent of adults aged 25-34 are enrolled in an educational institution. (NCES, 2007 and 2008a)

In Russia, there are 685 governmental higher education institutions, all of these having state accreditation. Futhermore, 619 non-governmental higher education institutions have been licensed for educational activities. Thus, the number of higher education institutions is 1,304. In 2003–2004, the total number of students of higher education institutions was 5,947,500. In the former Soviet Union, education at all levels was free for anyone who could pass entrance exams; students were provided with small scholarships and free housing. This provided access to higher education to all gifted people. More than 20% of Russians of age 30–59 hold five/six-year degrees (this number is twice as high as that of the United States).

4.2 Basic Computer Literacy

In the US, approximately 85 percent of the postsecondary insitutions have some form of "general education" requirements. However, very few of these requirements focus on ICT skills. However, most students are expected to demonstrate basic computer literacy through assignments integrated across the curriculum. In the Soviet Union, Computer Science was established as a compulsory school subject in 1985.

4.3 Level of Teachers' ICT/Computer Literacy (including ICT Instructional Literacy)

In the US, although teacher ICT use is increasing, teacher knowledge, skills, and comfort level with ICT resources continues to be a problem. Unfortunately, there is very limited national data on student, teacher, and administrator ICT knowledge and skills. However, earlier data suggest that teacher training has not kept pace with the level of ICT access in schools (Slowinski, 2000): 67% of the teacher training programs report that fewer than half of their faculty members and/or mentor teachers model the integration of IT in their own teaching; almost 60% of the surveyed schools report that less than half of field supervision faculty possess the skills they need to provide professional advice about instructional technology; only 40% of first-year teachers felt adequately prepared to meaningfully integrate technology into their classrooms; of 4,049 elementary, junior high, and high school teachers, less than 20% view themselves as very well prepared to integrate technology into instruction; and approximately 40% of teachers require monthly assistance in integrating technology into a lesson.

In Russia today, as was mentioned above, almost all schools, including rural ones, have computer classes for teaching Computer Science. But teachers of non-computer subjects have no opportunity to teach their disciplines using computer facilities. Many of them are ICT illiterate or use computers very primitively, like a modern version of a typewriter. Teachers' illiteracy is surprising since so many ICT educational projects have been undertaken. Most school teachers have studied how to apply ICT in education as pre-service students or later, during subsequent professional development. But ICT skills are quickly lost unless frequently applied. Moreover, schoolteachers are not motivated to apply ICT since it takes time and effort for preparation, and there are no financial incentives for ICT application.

4.4. Technical Base of ICT Education

The level of ICT availability in the US is very high. Virtually all students and teachers have ICT access. The current state of the technical base of ICT Education in US schools can be characterized by various indicators of ICT access. The first indicator of ICT access is the percentage of schools with Internet access. Due to the E-rate progrsam, internet connectivity rose to essentially 100% for all schools by 2003 and has remained at that level, irrespective of size, location, community type, level of minority enrollment, or school wealth (World Bank, 2006). The second indicator is the student-to-computer ratio. According to the most recent figures, the current average ratio is about four students per computer. Although the student-computer ratio is helpful in monitoring ICT availability, it has limitations. Teachers increasingly use cooperative learning techniques where groups of students often share computers, so a one-to-one ratio is not necessary or in some cases even desirable. In addition, many students bring laptops and/or smart phones to school with them, so the official computer-student ratio underestimates the true level of computer accessibility in schools. However, even though all schools and most classrooms today are connected to the Internet and have many computers, there may still be significant differences in the levels of ICT access among different types of schools. These differences (the so-called "Digital Divide") can depend on school size, grade span, level of financial resources, and various student demographics. (Bausell, 2008)

In Russia as a result of the Informatization of Education process, there is a quite good technical base for higher education including contemporary models of computers and software. This technical base was funded through federal and regional budgets and other forms of non-budget financing. When conducting ICT labs, student groups are divided into smaller subgroups (10-12 students), according to the principle "one student – one computer". For tutorials the amount should not exceed 25 students in the group. As for primary and secondary schools, the situation is ambiguous. While some city schools, especially in Moscow and oil-extracting regions, have numerous well-equipped computer classes, rural schools have one laboratory of computers supplied in 2001-2004 but these computers are now out-of-date. Thus the Digital Divide exists between different regions inside the country.

4.5 Education Standards and Syllabi Content

In the USA the International Society for Technology in Education (ISTE) has developed the National Educational Technology Standards (NETS). The NETS program has provided the foundation for states to develop their own technology standards and assessment, and there has been progress made in designing and enforcing technology standards and assessments at the state level. (ISTE, 2008). There are standards for students, teachers, administrators and technology leaders (NETS*S, NETS*T, NETS*A, and NETS*L, respectively).

Overall, the implementation of these standards across the states is uneven - there are numerous standards, but very little standardization. According to the "Technology Counts" project (Bausell, 2008), 48 states have adopted technology standards for students (with only Iowa, Mississippi, and the District of Columbia lacking such standards). Unfortunately, although almost all states have technology standards for students, only five states (Arizona, Georgia, North Carolina, Pennsylvania, and Utah) have corresponding assessments used to measure progress against those standards. Forty-four states have technology standards for teachers, but only 35 states have standards for administrators. Only 19 states have formal policies that require technology coursework or competence for initial teacher licensure, and 9 of those states also have technology requirements for initial administrator licensure.

In Russian education, including the tertiary level, the last few years have seen a process of total unification and standardization. The main goal of this process has been to achieve a better quality of education as a whole. As was mentioned above, there are hundreds of tertiary education institutions in Russia, all of them having ICT/CS specialities or subjects. But for various reasons, not all of them can provide an equally high level of ICT/CS education quality. One of the reasons for this is that in the past the lecturers could teach what and how they wanted according to their own syllabi. So policy makers believed it was necessary to develop a structure and content for all existing curricula to provide a standard high level of education quality. The syllabi are elaborated in accordance with the State Education Standards which regulate almost 80% of their content. The other 20% are elaborated by the university itself. As a result, any student of given specialty in any university will be taught according to nearly the same syllabus.

4.6 Regional, National, and International Interconnectivity

In the US, there are high levels of regional, national, and international connectivity with "bandwidths" growing ever larger. As with "access", the speed of connectivity is not an important limiting factor. The most significant barriers are the knowledge and skills of teachers in terms of their ability to integrate technology into instruction. The low skill and comfort levels in technology pedagogy are exacerbated by a generational gap between how teachers view technology and how their students view technology. In other words, the use of technology in pedagogy is limited by instructors' traditional views of technology and pedagogy and when ICT is used, it often fails to take advantage of current students' orientation to technology. For example, many teachers are still adapting to the possibilities of "e-learning" (i.e., learning facilitated by computer-based electronic technology), whereas students are already embedded in "m-learning" (i.e., mobile learning using a wide variety of interconnected technologies).

In Russia, regional and national interconnectivity of ICT/CS education seems to be of a high and consistent quality since education standards and syllabi content are common for all education institutions, both governmental and non-governmental. Every student graduating from an education institution can continue his/her education in any other education institution. Students have to pass entrance examinations, and this can be a very tough task depending on the chosen higher education institution. The ICT graduates of provincial institutions are especially vulnerable due to the Digital Divide and the significantly lower quality of teaching at these institutions. Thus, they have less chance to continue their education in more advanced institutions.

5. Conclusions

The US and Russian ICT educational systems have similar features: 1) an emphasis on the importance of ICT education; 2) relatively high levels of ICT access for educators; 3) active national programs, policies, and standards for ICT education; 4) persistent issues around the Digital Divide.

But there are also some differences between the US and Russian ICT education. The US has an extremely decentralized approach to ICT education. This has the benefit of encouraging a wider diversity in innovation and experimentation in ICT education, but it leads to a fragmented and redundant approach to research, development, and implementation, and results in a slower and less widespread implementation of "best practices". Russia has a more centralized approach. This has the benefit of a coordinated and systematic implementation of "best practices", but lacks the value of diverse and divergent approaches to research, development, and implementation.

Possible recommendations for improvement of the US ICT educational approach are the following: 1) To adopt national standards of ICT education of all levels (for example, by implementing the NETS); 2) To include the level of ICT literacy as a criterion into staff tenure and promotion standards; 3) To incorporate innovative practices based upon ICT use into everyday teachers' activity; and 4) To develop a deeper understanding of ICT impact on the educational process for both students and teachers.

To address these last two recommendations, educators and policymakers will need to critically examine the relationship between ICT and pedagogy in education. Changes in instruction have gone through important changes over the years, from CAI programming with "drill and practice" (late 1970s - early 1980s) to computer-based training (CBT) with integrated multimedia (late 1980s - early 1990s:) to internet-based training (mid-90s) to e-Learning (early 1990s - early 2000s); to social software and "m-Learning" with open source content (mid to late 2000s). Thus, ICT policies and programs need to move beyond issues of access and reflect a deeper understanding of the interaction between ICT and instruction by balancing the value of standardization (as demonstrated by the Russian model, among others) with the power of grassroot research and innovation.

Possible recommendations for improvement of Russian ICT educational approach are the following. 1) To stimulate, both tangibly and intangibly, those teachers who aspire to use ICT as instructional tools when teaching their subjects; 2) To eliminate consequences of the Digital Divide between regions using technologies that are normally in use in developing countries (for example, Mobile Computing); 3) To switch from the traditional 4-ball marking system to more flexible 100-ball one, as far as to systems of ratings and credits; 4) To accelerate the process of integration into the world educational system by accepting the system of international academic degrees.

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