Going Globally as a Russian Engineering University

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Julia Ziyatdinova graduated from Kazan State Pedagogical University in 1999. Her major areas of study were foreign languages and she finished her University course with honors and qualification of teacher of English and Turkish. She continued her training and obtained PhD in Education degree in 2002. The topic of her PhD study was titled "System of Character Education in the US Schools: Current State and Trends for the Development". She also received additional minor degrees in Management (1998) and Psychology (1999) in Kazan State Technological University.

Julia joined the team of Kazan State Technological University as an instructor at the Department of Foreign Languages and the School of Foreign Languages "Lingua" in 1999 and was rapidly promoted to the position of Associate Professor at the Department of Foreign Languages in 2003. Her teaching career was perfectly balanced by the experience of a translator and an interpreter. She is a well-known person at Kazan international conferences and other events for her high quality consecutive and simultaneous interpreting, such as interpreting for the Academy of Sciences of the Republic of Tatarstan.

The new milestone in Julia's career was the position of the Chair of Department of Foreign Languages for Professional Communication in 2007, when she took over all the responsibilities related to foreign language training at Kazan State Technological University. The teaching and research priorities of her department were then focused on professional and intercultural communication for students in a technical university, professional translation and creation of foreign language environment at a university.

Because of her talents and activities, Julia became one of key figures in university international life. When Kazan State Technological University obtained the new status of a National Research University and joined the list of Top 30 Russian universities, Julia was offered a position of a Head of University International Office. She took over this position in April 2011 and rapidly gathered a strong team of professionals to face the challenges of the new university status and transformed International Office into University International Affairs with two offices covering all the aspects of internationalization.

In addition to her intensive career, Julia is also the Director of Center for Intercultural Communication – a company within the University structure offering excellent language training services for students and adult employees.

Julia is the author and co-author of over 85 publications including monographs, journal articles and study guides.

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Vasily Ivanov graduated from Kazan State Chemical and Technological Institute (today Kazan National Research Technological University, KNRTU) in 1976. He continued his research and obtained a PhD in Engineering in 1986. At the same time, he held the administrative positions in the regional system of education management. He received the position of the First Vice-Rector of KNRTU for Academic Affairs in 1989, which he has held since then. He received the degree of Doctor of Science in Education for his dissertation "Designing the Contents of Professional Pedagogical Training for Faculty of Technical Universities" in 1996. Professor Ivanov enhanced the development of engineering pedagogy at KNRTU as a separate subject and a research discipline. He investigates the problems of engineering pedagogy in the following areas: continuing psychological and pedagogical education in an engineering university; teaching methods for engineering disciplines in an engineering university; innovative engineering education; continuing professional development programs. Vasily Ivanov chairs the Academic Council for Defense of PhD and Doctorate Thesis in Engineering Pedagogy at KNRTU for degrees in "Theory and Methods of Teaching Chemistry in Schools and Universities" and "Theory and Methods of Professional Education". Under his supervision, 11 PhD dissertations and 3 doctorate dissertations in engineering pedagogy were

defended. Since 2012, Vasily Ivanov has been a member of American Society for Engineering Education, and has participated in ASEE Annual Conferences and International Forums. Professor Ivanov has been an active member of IGIP Russian Monitoring Committee since the day of its foundation in 1995. Under his leadership, in 1997, a Center of Engineering Pedagogy was founded at KNRTU with an accredited European Engineering Educator program. He was the key driver of the 42d IGIP International Conference ”Global Challenges in Engineering Education” held in Kazan. in 2013 Vasily Ivanov has published over 400 research and methodology works, including 20 monographs, 38 textbooks and study guides, 92 papers in the leading peer-reviewed journals, 35 papers in international journals.

Going Globally as a Russian Engineering University

Russian engineering education institutions have faced internationalization challenges throughout their entire history. An interesting page in the history of engineering education in Russia is that the foundation of engineering schools was the response to the country's internationalization challenges. Peter the Great, the first Russian Emperor, pushed Russia to integrate with Western Europe and established first schools of engineering, such as "School of Mathematics and Navigation", which started training engineers for developing Russian industry and shipbuilding on January 14, 1701.

The challenges of Russian engineering education during its early history was the lack of qualified engineering educators (as well as other education specialists) and the government invited them from Europe, especially from Germany. The history of Russian science and engineering in the 18 – 19 centuries is full of European professors, who taught students in Mining Institute (founded in 1773) and Road Institute (founded in 1809). The late 19 Century was the time when the first polytechnic schools were established in Russia, such as Polytechnic school in Kazan (1890) to satisfy the needs of growing Russian industry.

Engineering education in the Soviet times was the necessary tool to satisfy tremendous internal need for industrial specialists, while globalization was not the beacon to follow [1]. Internationalization existed, however, in a form of active academic mobility, as Soviet engineering universities used to enroll thousands of students from Asia (China and Vietnam) and Africa.

Thus, this brief historical overview allows drafting current challenges and trends in Russian engineering education [2], including chemical engineering [3] as one of the most popular programs in Russia. The country is proud of strong engineering education traditions, but wants to globalize it now as there is a strong belief in the government and academia, that going global is necessary to survive in the modern world. There are certain gaps between historically stipulated current state of Russian engineering education and the vision of "ideal and globalized" engineering universities among politicians and engineering educators, such as:

- the gap between the social demand of the global world for internationally competitive specialists capable of international scale professional activities and the Russian engineering university graduates and faculty who are not ready for intercultural communication;

- the gap between the demand for international recognition of research done at Russian national research universities and the low presence of the Russian scientists in the international databases of grants, publications and conferences;

- the gap between the demand for expanding the international presence of an engineering university, social order to the universities to get into the top positions in the international university rankings and the real positions of the Russian national research engineering universities in the global education market.

The Russian government considers internationalization of engineering education to be an important tool to modernize its economy and make it internationally competitive. One of the responses to the following gaps is the establishment of a network of National Research Universities. The universities, which received this new status, were top regional centers of engineering education. From the global point of view, this approach is similar to solutions we can see, for example, in China, Malaysia and other actively developing countries in Asia and all over the world, which establish their own groups of top universities with many newly organized universities to face challenges of modernization and development. On the other hand, universities in the USA, Canada and Western Europe, which have quite longer traditions of engineering education excellence and establishing various leagues of universities, are the centers for integration of Russian engineering education into global engineering education societies, such as ASEE, IGIP, AIChE, and etc.

A characteristic example of a National Research university is Kazan National Research Technological University (KNRTU), which was developed from Kazan Polytechnic School established in 1890. KNRTU is the only Russian National Research University which focuses on research and academic programs in Chemical Engineering and trains skilled professionals demanded in both the Russian and global markets.

Research at KNRTU is based on long-lasting traditions of excellence in chemistry and technology. There are 5 research priorities related to chemical engineering corresponding to the strategic areas of economy development in the Russian Federation. These priorities are: Chemistry and Technology of Polymer and Composite Materials; Chemistry and Technology of High Energy Materials; Integrated Processing of Hydrocarbon Resources; Nanotechnology, Nanomaterials; Energy and Resource Saving Technologies for Advanced Materials.

These research priorities are the "centers of gravity" grouping scientific, academic and innovative projects around the most urging issues of science and technology with the focus on chemical engineering.

The Kazan National Research Technological University is quite active in its internationalization represented by partnerships with over 120 international research and education organizations in USA, Germany, China, and etc. The experience of the recent years demonstrates that the key to internationalization success is to move from individual projects to complex interconnected research and education activities with foreign partners. In other words, integrative approach in international partnership is required [4]. Such results are achieved by establishing a set of "priority partners for internationalization", which are usually active international partners of KNRTU with several ongoing and successfully implemented joint projects. This approach is a reflection of the general trend in the Russian system of higher education: although the government sets internationalization as priority and engineering universities are encouraged to establish as many international contacts as possible, there is a general sense of saturation by empty MoUs among Russian universities and the feeling that successful internationalization can be achieved with a limited group of partners with long-lasting and complex success stories.

Another internationalization trend of KNRTU is its collaboration with industry [5], mostly in terms of integration into innovative infrastructure, primarily by ties with industry and innovative

companies. Russian regional and national innovative organizations are quite successful in going global. Thus, KNRTU's integration into the global network started from a partnership with the regional innovative cluster of the Republic of Tatarstan, a region of the Russian Federation ("Idea "Technical Park, and IT-Park, regional industrial companies), supported by the national leaders in innovations (Skolkovo Foundation, Rusnano) and strengthened by international commercialization centers.

Kazan National Research Technological University implements the strategy of training its employees in top international universities with engineering background. Since 2010, 300 – 400 professors were annually sent abroad for short-term training. Over the last 2-3 years, however, there is a growing trend of switching from outgoing to incoming academic mobility of faculty as more attention is given now to inviting top professors from international university partners to give lectures at KNRTU. This policy is a part of its development strategy which is common to the internationalization initiatives of other national research universities in Russia. On the other hand the outgoing academic mobility of students is much weaker compared to academic mobility of faculty which is not the case for University partners in Europe and America. A comparison of approaches and experiences in Russian and American universities [6] is quite an important tool for tracking internationalization success in Russian University. More attention by the university administration is now being paid to the problem of ongoing student mobility in the last years by focusing on dual degree programs and student grants.

An important project being implemented by Kazan National Research Technological University is the development of a multilingual environment aimed at teaching Engineering English to its faculty, students and administrators, which often have poor communicative skills [7], [8], [9]. Another aim of this project is training translators with specific engineering background, demanded today by Russian industry as well as for the implementing university internationalization projects [10]. All other Russian universities face this problem with certain success stories demonstrated by top central universities in Moscow and Saint Petersburg and such regional university as Tomsk Polytechnic University. The success of this project in Kazan National Research Technological University is now being assessed by English First BV as a part of their global project aimed at estimating average level of English in the world.

Implementation of an internationalization strategy is a dynamic and complex process. To track the progress of internationalization, it is necessary to set certain "milestones" on university's way to being global. The following classification is proposed for the internationalization level of universities based on the experience of Russian universities:

- declarations (the level of intentions to globalize university's activities in the forms of concepts, strategies and internationalization programs);
- reconnaissance (seeking optimal internationalization ways and approaches specific for a university);
- organization (creation of a sustainable internationalization environment where all globalization initiatives are supported by faculty and students);
- productivity (the level at which internationalization is integrated into any aspect of a university' life.

This classification reflects the "ideal" (optimal) internationalization pathway. Each level can be described by a set of parameters and their detailed discussion is certainly worth of several additional papers. It is useful, however, to check the **hypothesis** that Russian universities and among them Kazan National Research Technological University are beyond the lowest, declarative level or at least have a real progress on their way up. The fact is, internationalization is actually "declared" by the national and regional governments in Russia as well as by university councils and is reflected in various internationalization concepts and programs adopted by universities in Russia. So let's consider this level to be the default one. Another interesting point is to check if the internationalization process is uniform or too much attention is given to some globalization aspects.

The instrument selected for tracking a university's progress in going global is a feedback from students and faculty, who are, indeed, the main and direct drivers of integration into the international space. This feedback is necessary to reveal achievements and shortcomings of ongoing internationalization and to make corrections to this process for the following years. Such a feedback was achieved in Kazan National Research Technological University administration as a pool of questionnaires filled out by students (890) and faculty (227). The questionnaire collected data from students and faculty about

1. the quality of education at their university in comparison with other international universities:
    - goals of education;
    - level of equipment;;
    - level of degree programs
    - level of computer technologies;
2. their personal achievements in going global:
    - English language command;
    - personal contacts with international students and faculty;
    - participation in international conferences and publications in international journals;
    - visits to foreign universities;
    - applications to international granting programs;
3. their personal ideas on what can be achieved with internationalization:
    - the advantages of engineering education if it is internationalized;
    - priority areas of internationalization.

The questionnaires also contained basic demographic information, such as age, sex, year of study etc. allowing further analysis of the data, for example, the popularity of engineering education among male and female students and faculty.

The answers to the questionnaires are summarized and statistically processed. The obtained information gives the statistics on the opinions of the students and faculty and on their practical participation in the internationalization policy of the university.

Age	**Men**			**Women**			**Total**
	MSc	**PhD**	**DSc**	**MSc**	**PhD**	**DSc**	
under 25	10			17	1		28

26-30	4	8		11	14		37
31-40	9	15	3	10	37	3	77
41-50	2	6	5	3	16	1	33
over 51	0	10	21	4	12	5	52
Total	25	39	29	46	80	8	**227**

Table 1. Faculty members - participants of internationalization survey

Table 1 shows the participating 227 faculty members and the statistical details including their sex, age and the degree level. Is should be clarified that 39 faculty members have the highest, Doctor of Science degree (DSc), which is beyond PhD degree and is specific of the Russian system of university education.

Year of study	**Men**	**Women**	**Total**
1 year	10	18	28
2 year	217	287	504
3 year	74	108	182
4 year	58	50	108
5 year	4	16	20
Master's program	12	8	20
PhD program	14	16	30
Total	387	503	**890**

Table 2. Students - participants of internationalization survey

Table 2 shows the participating 890 students, and the statistical details including their sex, age and the year or program of study.

Data analysis

89.9% of faculty and 89.1% of the students consider that the engineering university education should aim at training internationally competitive graduates. 81.9% of the faculty and 78.9% of students think that the experience of the world famous research universities should be taken into account. Unfortunately, the present state of the education at Kazan National Research Technological University is not that good. 24.2% of faculty members and 31% of students think that the quality of education meets international standards. 12.8% of the faculty and 21.5% of students see the university classrooms as well equipped. 26.9% of faculty and (30.4% of students consider the academic and research equipment to be at a high level. The opinion on level of computer technologies used at the university is a little higher: 40.1% of the faculty and 42.5% of students agree that they are good enough.

Only 27.9% of students think that they can be employed by international companies abroad after graduation.

Although both the faculty members and the students think low of the degree programs quality, equipment at the university and their own prospects for international employment, the faculty members are still very optimistic about the future of their university in the international

education and research environment: 62.6% of the faculty and 61.2% of students think positively of its development prospects.

It can be concluded, therefore, that this optimism is supported by their personal investment into the international future of the Kazan National Research Technological University. The most important component for going globally is the ability to speak the language of the scientific world, that is, English. 60.8% faculty members indicate that they are learning English at the moment. 15.9% of them are doing it very intensively. It should be pointed out that all the 36 faculty members who consider their English language command as advanced have not stopped learning it. It is interesting to see that 92% of those learning English consider it important to use the experience of the world famous research universities at their Kazan National Research Technological University, that is 10% higher than in general among the survey participants.
Unfortunately, not all of those who consider their English language command as advanced have an opportunity to communicate in English regularly, only 22 out of 36 faculty members do it. At the same time, the low level of the English language skills is not the greatest obstacle for communication: 15% of faculty in total say that they regularly communicate with their foreign partners, although 12 of them consider their language skills as elementary.

69.2% of the faculty regularly attend the lectures and workshops of the invited foreign professors (under the research university funding), and 41.5% faculty have participated at least once in professional development programs abroad in the last five years under the special governmental research university funding. Unfortunately, only 52 (23%) of the latter participated in scientific conferences, and, therefore have publications in international conference proceedings. At the same time, 7.5% of the faculty members have joint publications with their foreign colleagues in foreign journals or other printed materials. 21.6% of the faculty members have independent international publications cited in international databases such as Scopus or Web of Science.

The data on student's academic mobility is more discouraging. Only 1.1% of students have an experience at international universities under 3 months, and 1.2% of students spent a semester or more abroad. 6 of the latter gained this opportunities through international granting academic mobility programs. In total, only 2.9% of students applied for such grants,, although 5.5% declare that they are ready to apply for the new grants. These figures are comparable to the faculty members: in the last five years only 8.8% of them applied to international granting organizations.

Another set of questions in the survey analyzed the use of foreign research by the Russian researchers. The answers show that 29.5% of the faculty read international research journals regularly or frequently, while 36.1% of the faculty read international journals seldom. At the same time, 18.5% of the faculty regularly cite international journals in the publications, 22.9% of the faculty cite them frequently, and 33.9% cite them seldom. We can draw a conclusion that 9.7% of the faculty of those citing international publications does this by reading the Russian research papers which cite foreign journals.

At the end of the survey, the participants were asked to evaluate the importance of each of the suggested internationalization priorities in the following order:

- Creating international education market
- Training personnel for international market
- Intercultural dialogue and exchange
- Exchange of trainees
- Creating new curricula
- Cooperation between universities
- Incoming foreign students mobility
- Outgoing Russian students mobility
- Agreements on equivalence of diplomas
- Foreign language teaching and learning
- Distance learning
- Implementation of new communication technologies
- Internationalization is unnecessary

The answers are summarized in Table 3. The analysis of the results revealed that the answers can be grouped into 4 major categories by their importance among students and the faculty.

Internationalization priorities	**Faculty**	**Students**	**Average per faculty/students (%)**
Internationalization is unnecessary	4 (1.8%)	29 (3.3%)	-
Distance learning	33 (14.5%)	169 (19%)	**21/21**
Creating international education market	51 (22.5%)	196 (22%)	
Creating new curricula	53 (23.3%)	214 (24%)	
Agreements on equivalence of diplomas	53 (23.3%)	163 (18.3%)	
Implementation of new communication technologies	61 (26.9%)	324 (36.4%)	**30/30**
Foreign language teaching and learning	65 (28.6%)	262 (29.4%)	
Training personnel for international market	68 (30%)	258 (29%)	
Intercultural dialogue and exchange	72 (31.7%)	275 (30.9%)	
Incoming foreign students mobility	77 (34%)	228 (25.6%)	
Exchange of trainees	72 (31.7%)	406 (45.6%)	**46/48**
Outgoing Russian students mobility	95 (41.9%)	451 (50.7%)	
Cooperation between universities	143 (63%)	423 (47.5%)	

Table 3. Students and faculty members on internationalization priorities

First of all, almost nobody among students (1.8%) and the faculty (3.3%) believes that internationalization is useless, that is quite important, because the rest of answers is given by them with the consideration of the need for internationalization.

The first "yellow" group is the least important both for students and faculty: 21% in an average. A possible explanation of such low level is that internationalization priorities listed in this group are general and more often discussed by ministries and governments (such agreements on equivalence of diplomas and even creating new curricula, because in Russia this process is strongly controlled by the ministry of education in science) and is therefore not quite important for faculty and students.
The second "green" group lists the priorities important at a university level for its successful internationalization. It is considered more important by faculty and students (30% in an average), confirming that they feel a part of a university "family", however, it is still relatively low as over two thirds of faculty and students require further explanation of the importance of internationalization priorities in details specific to their university.

The "red" group related directly to the academic mobility of faculty (exchange of trainees) and students (outgoing student mobility) and it is not a surprise that they are highly popular. Cooperation of universities is the most general priority (in other words, if this priority is marked as important, a student or faculty member says "yes" to internationalization in general) assuming that it will contribute to his or her personal academic development.

A very interesting effect is that the average values are almost the same for faculty and students (except some easily explained differences: students consider outgoing student mobility more important while faculty is more for the exchange of trainees), so we don't have social groups differing in their attitude to internationalization. It reveals that internationalization priorities, although considered necessary by everybody, are still more discussed at the government, ministry and university levels, and are only on their way to becoming personalized tools for the professional development of students and faculty.

Conclusions

Kazan National Research Technological University has definitely moved beyond the level 1 in many forms of internationalization: faculty exchange, international conferences, publications in global databases etc. (corresponding to Level 2 as various approaches are being implemented while more time is needed to optimize them).

It is clear from the comparison of academic mobility of students and faculty at Kazan National Research Technological University, that internationalization process is not uniform and professors enjoy having more internationalization opportunities such as participation in research activities and conferences abroad. To correct this, it was proposed to return to the declarative stage and give more emphasis to student's academic mobility to give a ground for seeking better ways for student academic mobility (Level 2).

It is also interesting, that there is definite support of all internationalization initiatives by faculty and students (required to achieve Level 3). The questionnaire proves, however, that this support

is more like a general "feeling" (as seen from general questions) while the statistics on participation in specific internationalization projects is poor (specific data of student's study abroad prove that student are quite inert in internationalization). In other words, unless we have optimal internationalization ways crystallized (Level 2 accomplished), it is not a good idea to start pursuing Level 3 (for example, by general "advertisement" of internationalization among faculty and students, what is actually being done now, without specific, attractive and efficient offerings such as student and faculty grants and dual degree programs).

Thus, Kazan National Research Technological University is close to achieve Level 2 with certain efforts required to optimize this process. Internationalization is generally supported by faculty and students, but this support should be redirected to optimized and university-specific initiatives.

The data represented in this paper are not considered to be fully completed and closed for further processing. Vice versa, the approach of the authors is that the data can be further enriched by additional statistics or analysis to track the progress of Kazan National Research Technological University at every stage of its way to advanced internationalization levels.

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References

[1] Knight, J. (2004) Internationalization Remodelled: Definition, Approaches and Rationales. Journal of Studies in International Education. Vol. 8, No 1.pp. 5–31

[2] Osipov, P.N. (2012) Intensification of professional training as a pedagogical problem. Proceedings of the 15th International Conference on Interactive Collaborative Learning, ICL 2012 6402033

[3] Shageeva, F.T., Ivanov, V.G. (2013) Contemporary technologies for training future chemical engineers. Proceedings of the 2013 International Conference on Interactive Collaborative Learning, ICL 2013 6644546, pp. 106-109

[4] Valeeva, E.E., Kraysman, N.V. (2014) The impact of globalization on changing roles of university professors. Proceedings of 2014 International Conference on Interactive Collaborative Learning, ICL 2014 7017901, pp. 934-935

[5] Sanger, P.A., Ziyatdiova, J., Barabanova, S.V., Ivanov V.G. (2014) Training the Trainer: An Integrated University / Industry Program of Improving Russian Industrial Trainers. 121th ASEE Annual Conference and Exposition, Paper ID 9334

[6] Sanger, P., Ziyatdinova J. (2013) Bridging the Communication Gap of a Foreign Speaking Instructor in Hands On Pedagogy. Proceedings of the 2013 International Conference on Interactive Collaborative Learning, ICL 2013 6644617, pp. 433-435

[7] Valeeva, L.A., Valeeva, R.A. (2013) Development of future engineers' critical thinking in foreign language teaching. International Conference on Interactive Collaborative Learning, ICL 2013 6644619, pp. 438-439

[8] Gorodetskaya, I.M., Khramova, A.Y., Khramov, V.Y. (2013) Development of communicative competence of engineering students as a determinant of academic mobility. Proceedings of the 2013 International Conference on Interactive Collaborative Learning, ICL 2013 6644537, pp. 61-65

[9] Bezrukov, A. (2013) Flexible learning model for computer-aided technical translation. Proceedings of 2013 International Conference on Interactive Collaborative Learning ICL 2013 6644680 pp.673-675.

[10] Bezrukov, A., Ziyatdinova, J. (2014) Internationalizing engineering education: A language learning approach. Proceedings of 2014 International Conference on Interactive Collaborative Learning, ICL 2014 7017788 pp.299-302.