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STUDENTS' RESEARCH WORK AS A NECESSARY PART OF EDUCATIONAL PROCESS IN TECHNICAL UNIVERSITY

Modern educational process in technical universities obligates academic staff to prepare professionals, who are able independently update their specific professional knowledge. In accordance with an on-line tutorial on an individual plan more than quite half of loading is taken forthe independent study that requires from students to have the high level of generaleducational abilities and skills and basic methods of research work. It is important in the conditions of modern society which becomes more global. For this reason it is not easy for teachers to carry to the listenersa certain volume of actual materials, which will be memorized passively. That is why a student should independently seize new knowledge, obtain new information, process it and create completely new knowledge for employing it into educational process.

Educational process in a technical university considers students' research work to be an essential element ofa curriculum, and we promote the development of programs that incorporate such inquiry-oriented activities. We use the term *investigation* to describe an exploration or study intended to answer a question about the professional technological world and uncover properties and relationships among structural elements of this technological world. Investigations may involve working with physical models and events, simulations of naturally occurring processes, data that summarize findings of research, or written accounts of studies conducted by others.

We promote the inclusion of students' investigations in an educational curriculum for two reasons:

1. Scientific work helps students to understand the nature of science through firsthand experience of scientific practices.

2. It helps students to understand scientific content by giving them direct experience with natural phenomena.

Because knowing and finding out are not separated in science, it is important for students to learn science in a way that is consistent with the nature of science itself. To appreciate the logic and process of scientific reasoning, and not just its results, students need opportunities to gain new knowl-edge by asking questions about the world of their future profession and working with problems that require the collection and analysis of evidence to formulate and support conclusions. They should understand the predictive power of scientific theories and the importance of testable hypotheses, verifiable data, and the need for skepticism in seeking to validate these theories. Investigations should be structured to support students' curiosity and creativity and encourage collaborative efforts. Carefully planned group investigations can provide students with access to a greater range of ideas about what is being studied than would be available when working by themselves, and the process of working together can be motivating to students.

Students learn what they practice doing, and investigations help to engage students actively in science. Investigations should, therefore, allow students to collect, sort, catalogue, observe, use instruments, dissect, compute, count, graph, and measure. In addition to helping students understand the nature of science, conducting investigations also helps them to acquire the skills of their professional engineering practice. Students should have opportunities to work with machinery and equipment around them, develop questions about them, and find answers to those questions. Students should learn computation and estimation skills, manipulation and observation skills, critical thinking skills and how to communicate with tables and graphs. These skillsare learned through practice in the context of well-designed and purposeful investigations.

In the present work the author reports an exampleof students' investigations during one year of the Integrated UndergraduateDegree at Civil Engineering Faculty of Belarusian national technical university. The students performed a scientific work named «Structural analysis of English and Russian word combinations of construction subject matter» comprising mechanical, chemical, material science and even the new building technology implementation. Those tasks werecarried out within activities going at practical English classes. This project was a very interesting work and took the time of two semesters. The aim was to explain the students how useful those experiences had been, allowing them to explore many techno-scientific activities within their engineering education.

The work was divided into two equal parts. The first half of the work included lectures on «Building materials and technology» and the instruction that provided the students with the tools they would use throughout the course, particularly in the second half that focused on carrying out the scientific work. The second half of the project included the following stages: defining the problem, collecting data, detailed design and documenting the above process. Theobjectoftheinvestigationwasengineering terminology from textbooks «Engineering the Future», «English for Civil Engineering», «Английский язык для студентов архитектурных и строительных специальностей» [1; 2; 3]. The results of the analysis are given in table 1, 2.

Table 1 (fragment) – Similarity of English and Russian word combinations of construction subject matter; 177 WC (68,3 %)

№	Qualitative character of similarities and examples	Syntactical model	Quantity	%
1	En: Annexe Рус: Пристройка	N	87	49,5
	…. …. ….	….		
99	En: Discontinious Рус: Прерывистый	A	33	18,9
	…. ….. ….	….		
128	En: Hoist Рус: Поднимать	V	17	9,8
	…. …. ….	….		
139	En: Take part in Рус: Принимать участие в	V+N+P	1	0,7
140	En: Prepare for Рус: Подготовить к	V+P	2	1,1
	....	….		
143	En: Havesmthathand Рус: Иметь что-то под рукой	V+S+P+N	1	0,7
	…. ….. ….	….		
160	En: Reinforced concrete Рус: Армированный бетон	A+N	25	14,2
	…. …. ….	….		
177	En: Eccentricallyloadedcolumn Рус: Внецентренно нагруженная колонна	R+A+N	1	0,7

Table 2 (fragment) – Dissimilarity of English and Russian word combinations of construction subject matter; 82 WC (31,7 %)

№	Qualitative character of dissimilarities and examples	Syntactical model	Quantity	%
1	En: Pollution-free Рус: Экологически чистый	A↔R+A	1	1,22
	…. …. ….	….		
3	En: Mining mechanical engineer Рус: Горный инженер механик	A+A+N↔A+N+N	1	1,22
4	En: membrane-cable tensile structure Рус: тентовая конструкция	A+A+N↔A+N	1	1,22
	…. …. ….	….		
13	En: dormant tree Рус: Главная балка перекрытия	A+N↔A+N+N	3	3,66
	…. …. ….	….		
21	En: outrigger girdere Рус: балка выносной опоры	A+N↔N+A+N	1	1,22
22	En: sprung Рус: давший трещину	A↔A+N	1	1,22
	…. …. ….	….		
25	En: depositsofusefulminerals Рус: Месторождение полезных ископаемых	N+P+A+N↔N+A+N	1	1,22
	…. …. ….	….		
39	En: Heat Ventilation Aeration Conditioning Рус: отопление и вентиляция	N+N+N+N↔N+C+N	1	1,22
	....	.....		
45	En: Brick veneer Рус: кирпичная облицовка	N+N↔A+N	6	7,32
	....	….		
53	En: caisson of foundation Рус: кессоны фундамента	N+P+N↔N+N	3	3,66

Abbreviation from Table 1, 2: A – adjective, N – noun, V – verb, S – pronoun, R – adverb, P – preposition, C – conjunction, B – article.

The observations of quantitative similarity anddissimilarity of investigated English and Russian word combinations of construction subject make it possible to conclude:

– most of the combinations displayparallelism in syntactical models (78,2 % – single-componentword combinations, 17,6 % – two-componentword combinations and only 4,2 % – multicomponentword combinations);

– only 31,7 % fromthe total amount ofinvestigated word combinations display dissimilarities in their syntactical structure;

– international termsthatareborrowed from English form 12,1 % of the investigated vocabulary (***disk*** *– диск,* ***bungalow*** *– бунгало*).

Qualitative information helps to analyze in what way qualifiers that include prepositions, articles and word order are used in above-named languages. Hereaftertheobtaineddatawillbeusedinan automatic system database for processing texts of identical subject group.

In conclusion it should be stressed that students' research work is significant for technical students to study professional conceptions at English practical classes. It helps the student groups to discover new ways of thinking about engineering. Student-centered investigations are learning contexts that require students to explore engineering subjects through inquiry, discovery, and research.As inquiry-based activities are developed and incorporated into curriculum materials, academic staff recognizes the need to provide teachers with specific experiences that enable them to use the activities effectively. All the departments of a technical university should work closely to develop field test strategies for embedding information about the use of student investigations within the materials themselves and for providing teachers with relevant professional development experiences.

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