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SHAPING SKILLS OF REASONING IN ESP COURSE AT TECHNICAL UNIVERSITY

Liudmila Ivanova (a), Tatiana Margaryan (b)*, Nataliya Nikolaeva (c), Tatiana Borodina (d)
*Corresponding author

(a)) Bauman Moscow State Technical University, the 2ⁿᵈ Baumanskaya Str. 5, Moscow, Russia, isi_53@mail.ru
(b) Bauman Moscow State Technical University, the 2nd Baumanskaya Str. 5, Moscow, Russia,
t.margaryan@bmstu.ru
(c) Bauman Moscow State Technical University, the 2nd Baumanskaya Str. 5, Moscow, Russia, natalynic@yandex.ru
(d) Bauman Moscow State Technical University, the 2nd Baumanskaya Str. 5, Moscow, Russia, t-
borodina@yandex.ru

Abstract

At present, the university graduates have to acquire not only profound knowledge but unique skills and competencies to be successful in the labour market. One of the main competencies of modern engineers is their proficiency to reason, to debate or to argue reasonably. The Russian tertiary education standards consider argumentation skills as a key competence for university graduates. These skills are critical for making decisions and students can develop their argumentation skills in their English classes at a technical university. The paper reviews and analyzes the issues of teaching reasoning in the ESP course. The authors share their ideas on the ESP design course applying IT tools and indicate the ways to pursue further research. To improve communicative competence in the specialist area, the authors suggest shaping the skills of argumentation through the ESP course acquisition. Teaching strategies, regarding stages of skills development, are identified. Theoretical background and literature review give grounds for designing effective assignments to promote fruitful communication and make our graduates more competitive in the workforce.

Keywords: Argumentation, critical thinking, ESP, professional communication, skills of reasoning.

1. Introduction

The process of teaching foreign languages (FLT) is undergoing a serious transformation due to the progress in the global professional communication facilitated by the rapid growth of the Internet and new technologies. Therefore, the issues of enhancing FLT are a demand of the day at a technical university. Unfortunately, the existing teaching aids very often are not sufficient enough to shape the core engineer competencies required by the latest tertiary education standards. This contradiction can be resolved by a new ESP course design utilising new educational technologies and IT tools in the classroom. Such an ESP course would contribute to forming professional skills and basic competencies essential for integration of the future expert into the international engineering community and gaining knowledge in the specialist area and also would develop the students' interest in their future occupation.

University graduates should master their non-technical skills (NTS) in their specialist areas. Such skills, as for example, the competency to communicate effectively and reasonably in foreign languages, to use information technologies and others (NTS-5, NTS-3, NTS-10 Federal State Educational Standard of higher education for the specialist areas 09.03.04 Software Engineering (bachelor's level), 24.03.01 Rocket facilities and Cosmonautics (bachelor's level), 28.03.02 Nanoengineering (bachelor's level) are significant. The state educational standards and requirements are the basis for the humanitarian education of future engineers. These standards should be considered in syllabus and course design at a technical university. We believe that the competency to communicate effectively and reasonably can be developed in the course of language acquisition as well. Thus, the designed ESP course has to meet learners' immediate needs for communication in academic or workplace settings and educational standards. This course can also assist university graduates to become more competitive in the global labour market.

2. Problem Statement

In order to meet the student needs and the educational standards, we have to create the ESP course and e-learning environment that provide students with new teaching materials to practise their skills. Communicative competence is one of the main competencies of future engineers. It includes discursive, linguistic, sociolinguistic, sociocultural, educational competence components. The skill of proper professional communication depends on the quality of the constituents. Having studied the theoretical and conceptual issues relating to the communicative competence defined by Miloradov (1999), Parkinson (2011), Pedemonte and Balacheff (2016), we can conclude that the best way to form skills and abilities of professional communication and interaction in a foreign language is a model suggested by Mirolyubov (2004). According to it, we have to develop the following abilities:

- to operate the encyclopaedic and background information (to confirm or refute some thesis);
- to use linguistic means (linguistic competence);
- to reason and persuade.

Today, the skills to persuade a partner, to provide convincing arguments and objections, and to be comprehensive are a must for engineering students (Shklyar & Viktorovich, 2017; Karpov, 2016). To encourage our students to be comprehensive and persuasive we must teach them to express their opinion, to support it with arguments, to provide logical conclusions and inferences. Now many universities offer tests evaluating the argumentation skills, e.g. GMAT (Graduate Management Admission Test), the

entrance examinations for GRE (Graduate Record Examinations) in the USA, Canada, and New Zealand. So, shaping the skills of reasoning and argumentation is imperative in the ESP course at a technical university.

3. Research Questions

There is a number of research papers devoted to the issues of teaching reasoning (Almazova, Eremin, & Rubtsova, 2016; Cavlazoglu & Stuessy, 2018; Erduran, 2018; Karpov, 2015; Khalyapina, Popova, & Kogan, 2017; Pedemonte & Balacheff, 2016; Popova & Vdovina, 2016; Rybka, 2012; Sinnott-Armstrong & Fogelin, 2015; Zemlinskaya & Fersman, 2017) but there is lack of investigations on the development of argumentation skills in engineering students. Besides, most authors provide only a theoretical background on the issue, whereas no practical solutions are suggested. We reviewed and analyzed various teaching materials, primarily course books and manuals (Bgashev & Dolmatovskaya, 2002; Gnienko, 2010; Orlovskaya, Samsonova, & Skubrieva, 2015; Polyakova, Sinyavskaya, Tynkova, & Ulanovskaya, 2007). We tried to identify the range of assignments intended to develop skills of reasoning during language acquisition. Unfortunately, neither of the reviewed course books contains exercises or tasks for shaping these skills. The existing teaching materials for engineering students do not provide students with practice-oriented examples of argumentation and reasoning. Thus, it is essential to design the multimedia ESP course with an appropriate new content for the argumentation skills development involving the necessary IT tools.

4. Purpose of the Study

The main purpose is to share our experience in designing the ESP course for engineering students which is focused on the new standards and e-learning environment. Our goal is to shape skills of reasoning and argumentation through language acquisition and to contribute to professional communication competence development. IT tools are integrated to create new content.

5. Research Methods

To design the ESP course focused on skills of reasoning and argumentation shaping, we have:

- to review the literature on this issue and to study the theoretical background;
- to identify the criteria for texts selection intended to develop skills of reasoning and argumentation;
- to describe texts structures and their specific features;
- to compose the list of argumentation skills;
- to study the structure of argumentation;
- to design assignments and exercises by means of IT tools;
- to develop evaluation criteria for skills assessment.

6. Findings

6.1. Required skills

Our experience and the obtained experimental data demonstrate poor reasoning skills of engineering students. According to our survey and interrogation, only 14 percent of undergraduates are able to produce utterances containing arguments. Students sometimes substitute a very vague commentary for substantial arguments. Very often they are not able to present information, express their opinion, and support the ideas clearly, concisely, and logically so that the listeners can follow the line of reasoning. In other words, our students lack the skills of reasoning and argumentation.

Skills are a part of the syllabus content; therefore, it is significant to develop competencies and skills required. If we compare intellectual skills of our graduates with the skills of other professionals, we can admit that they are almost equal. They are good at their field and comprehend the world on the whole but their skills of communication are not good enough and they should be improved. Besides, we have to shape skills vital for the 21st century professionals such as critical thinking, quantitative reasoning, creativity, information literacy, collaboration, communication skills (Burkhardt et al., 2003).

These skills are also referred to the category of intellectual skills and they cannot be evolved automatically. We have to develop them gradually step by step according to the generally accepted psychological cognitive model: purpose – motivation – object – pattern – operation – result – reflection – correction. Some authors (Ibraim & Justi, 2016; Ivlev, Ivlev, & Ivleva, 2017) limit the list of skills only to the skills of logical thinking, reasoning and objections which are considered to be sufficient enough to take part in the discussion. Such skills constitute an operational base for a person to be involved in a discussion on any issue. The ESP course is an opportunity to master these skills. But the list of skills for engineering students should be extended as the range of issues they have to analyze and discuss is really wide. Actually, Miloradov (1999) has extended this list with the skills of argumentation. We share his ideas and suggest the list of skills to be developed at a technical university through the ESP course acquisition:

- skills to support reasons to own utterance;
- skills to appeal to the opponent's arguments;
- the ability to summarize and make conclusions;
- skills to respect the opposite point of view;
- skills to bring evidence clearly and concisely
- skills to keep to the issue discussed;
- skills to compare or to contrast own judgment with the opposite point of view;
- the ability to listen to the partner, to hear and to comprehend what is discussed.

Therefore, it is significant to select appropriate texts in the ESP course design. Text selection should be made according to the criteria of critical intention, authenticity, consistency, coherence. Texts should include examples of reasoning and argumentation and IT tools should also be integrated into the ESP course. The ESP educators consider electronic resources containing authentic engineering information to be beneficial for creating a e-learning environment (Sergienko, 2009; Ivanova, 2010).

6.2.Text selection

Let's consider text styles used for teaching argumentation and reasoning.

The *publicistic style* is intended to affect a person to persuade of the statement validity or provoke the response not only by the utterance argumentation logics but also by its emotional intensity. It is close to the scientific prose due to its factual consequentiality, the utterance intensity and strict separation into logical pieces (paragraphs). The main distinctive feature of publicistic style is the conciseness of narration, which in turn comprises both logical argumentation and emotional impact.

The *scientific prose style*. The purpose is to prove some hypothesis, create new concepts, disclose the laws of existence, and investigate relations between different phenomena. The language means used in this style, therefore, tend to be impersonal.

The main feature of this style is logical sequence of statements with indication on their relationship. Thus, the distinctive feature of scientific style is what is called "sentence – patterns". Such patterns can be of three types: postulatory, argumentative and formulative. A hypothesis, scientific proposal or prediction should be based on the well-known facts that have already been systematized and defined. The reference to these facts only precedes the author's ideas which can also be presented in the form of formulas, theory, principle, argument, research results, etc. A sentence pattern containing a definition of scientific statement, i.e. a sentence that summarizes arguments, is usually a final sentence. The characteristic feature of the style is quotations and references that serve as indirect support the idea. The need to quote and reinforce arguments seriously affects the utterance syntactic structure.

To identify and to analyze arguments in the text and to produce utterances containing arguments, students first should be aware of the argument structure. Some theoretical grounds would facilitate discourse appreciation. And the assignments could be designed then in accordance with the argumentation structure and the stages of argumentation evolution. Learning argumentation and arguing still raises theoretical and methodological issues. Argumentation requires specific intellectual and social skills. It, as a necessary skill, facilitates students` intellectual development.

6.3. Argument structure

Students should be aware of the argumentative speech structure as a basic component of the verbal communication culture of future engineer. Regarding the NTS-3, the ability to express opinions and to provide at least two arguments supported by information and knowledge, life or reading experience should become essential in shaping communicative skills.

The key approach in teaching an argumentative statement/utterance is the argumentation theory. In the science of logics an argument is often called a premise, i.e. a statement intended to support a thesis. In the theory of argumentation there is a broad notion of arguments. Argumentation provides evidence, explanations, and examples to justify some idea. Sinnott-Armstrong and Fogelin (2015, p. 3) define an argument as "a connected series of sentences, statements, or propositions (called "premises") that are intended to give a reason of some kind for a sentence, statement, or proposition (called the "conclusion")". The arguments objectivity is determined by the logical rules and ability to use the appropriate arguments for the issue discussed.

Argumentation in problematic discourse was studied by Erduran, Ozdem, and Park (2015), Ibraim and Justi (2016), Ivin (2015), Ivlev and Lepskaya (2017), Muller Mirza and Perret-Clermont (2009),

Pedemonte and Balacheff (2016) and others. There are three reasoning techniques viz. logical arguments (employing all kinds of facts – statistics, data obtained through experiments, science-based laws, etc.), illustrative arguments (the exact examples and those taken from literature) and references to authority (in many cases - citation). The key task of an argument is to convince. However, not everything that convinces us is an argument. Warning, advice, expression of opinion or even description are not considered to be arguments. Explanation is not an argument too, because explanation is often an extended story about the issue itself. Thus, teaching argumentation involves three stages: 1) teaching thesis (thesis formulation), 2) teaching convincing arguments, and 3) teaching conclusion. Therefore, exercises are to be of three types.

Teaching argumentation includes the ability to convince the opponents by means of the critical assessment of statements, hypotheses, assumptions, and opinions. Thus, the aim is to teach an evidence-based (argumentative) statement. Muller Mirza and Perret-Clermont (2009) argue the necessity to improve the students' ability to argue during the entire course of studies, but now it is reasonable to optimize the process of skills development by means of ICT (Information and Communication Technologies). Updating the training content by using new educational technologies and introducing information technologies in the training practice significantly optimizes the formation of foreign language communicative competence of technical University students (Ivanova, 2010).

Logically flawless and reliable arguments reveal the essence of the topic. Common errors made in reasoning, as a rule, are tautology (or a circular motion). Usually students fail to justify the validity of certain insights and concepts. The validity criterion or logical fidelity is the main feature of deductive reasoning. An inductive argument cannot be logically correct and is potentially vulnerable. If the students have no idea on the issue and possess no skills of abstract thinking, it is better to use the induction method: to present a typical, specific, well-known phenomenon and make a conclusion based on general patterns. In the deductive method, on the contrary, they pass from the general laws to details and can estimate specific processes, phenomena, and events. The argumentation encourages the students to conceive the issue and invites to a dialogue or discussion.

6.4. Argument teaching approach

The technique of teaching argumentation and reasoning includes teaching:

1. Thesis statement (the sender expects the addressee to accept the thesis and arguments);

2. Arguments presentation.

When we discuss something we have to follow the logics in a coherent statement to make our opponent understand us. It is important to structure the statements logically. We can do it in the following way: first, we have to design a three step teaching model: thesis – arguments – conclusion; second, state the subject of a short message (what do you want to say?); third, determine what you want to achieve (to put new problems, to refute or defend a point of view, to convince the audience, etc.); fourth, to think over the main thesis, to select examples.

The skills of logical thinking can be developed by exercises with strict management (the exercises of the first level are primarily individual by nature). This group of exercises is based on the information taken from a text/video/audio material. Students are given a topical statement (thesis). They need to investigate the information to find the data required and to choose the arguments to support it. Exercises

of the second level with partial control imply well-developed mental abilities (individual concepts supported by argumentative judgments) (Gurova & Nikolaeva, 2010).

The ESP multimedia course integrated into some e-learning environment (LMS Moodle 3.0) should be of interdisciplinary character, as the assignments with high integrative capacity require students to use information from various subjects and apply their intellectual skills. The ESP educators should take into account the students specialist area to shape communication skills in general but with the emphasis on the development the ability of reasoning (Margaryan & Alyavdina, 2018), e.g.

Assignment 1. *Acquire relevant information from the Internet to support the issue:* Why was the external fuel tank orange during the Shuttle program? Make attempts to give your reasons.

Thesis: This technology is considered to be an engineering challenge.

Argument 1 (vehicle cargo capacity is ….) = actual figures

Argument 2 (the cost to deliver one pound of payload into orbit is …) = actual figures

Argument 3 (to increase the vehicle cargo capacity it was decided to ….) = actual figures

Conclusion.

As students very often do not know much in their field of engineering, they have to refer to the English-language Internet sources to find factual information and explain why such an engineering decision was made during the Shuttle program implementation (professional competence) and present a monological reasoned statement. It is very helpful to ask students some leading question. To teach students to ask interesting, manageable questions in order to specify the situation or phenomena is also one of the goals in teaching reasoning. "Choosing an interesting and manageable question may manifest first as an exercise in sense-making and then in either self-persuasion or as part of a dialogue" (Passmore & Svoboda, 2011, p. 8).

6.5. Evaluation criteria for reasoning/argumentation skills assessment

The argumentation features to be assessed were suggested by Rybka (2012). We have adapted them for students of a technical university and designed the evaluation form to assess the skills.

Table 01. Features of arguments used

#	Feature	Description
1	Structure of the argument	The thesis is supported by one argument.
		The thesis is supported by more than one argument.
2	Argument specificity	The arguments are brief and concise.
3	Consistency between the thesis and arguments	The thesis remains the same throughout the proof. There is no substitution of one thesis by another one.
4	Presenting arguments in one of the argumentation techniques	Argumentation is presented with an example. One or more examples are provided to generalize.
		Reasoning is on the analogy. There is a transition from one case to another.
		The argument is presented with the reference to the authority. There is a link to the information sources.
		Reasoning is based on objective examples; conclusions based only on personal experience are excluded.

5	Argument emotiveness	No emotional exaggeration of the problem.
6	Argument reliability	The arguments are true (valid). There are no invented and false facts in reasoning.

Table 02. Evaluation Rubric for argumentation/ reasoning skills

Evaluation criteria	U	P	F	G	E
Structure of reasoning/ argumentation	There is too little language for evaluation of argumentation/ reasoning skills.	There is no use of reasons to support the speaker`s position.	A single reason is used for one statement.	More than one reason is used for one statement.	A variety of reasons provide sufficient grounds to accept the argument.
Specificity of reasoning/ argumentation	-	Reasoning/argumentation is not developed.	Reasoning is ambiguous and not specific.	Reasoning is brief and clear.	Reasoning completely matches the context.
Consistency between the thesis and arguments	-	There are contradictions and inconsistencies between the thesis and arguments.	Arguments do not support a statement or a statement is modified.	One or two lapses in deductive connections or development of reasons may be unbalanced.	Arguments are appropriate, extensive, and well logically organized / arranged.
Exemplified argumentation	-	No example is provided.	The only example is not specifically linked to the main point.	The example is appropriate; it provides specifics and details in support of a claim.	Argumentation is supported by more than one meaningful example.
Argumentation by analogy	-	Argumentation is presented without making use of analogies.	Arguments by analogy are not convincing.	The two things being compared are similar in some respects, making the argument stronger.	The analogy between two things is striking, meaning that it is much stronger and more convincing than the usual kind of comparison.
Argumentation from authority	-	Arguments lack the reference to the authority.	An argument from authority may not	An argument from authority is	The argument is presented with the reference to the authority. There is

			always be used clearly or appropriately	used although there may be some under-/over-use.	a link to the information sources.
Objective reasoning	-	Reasoning is influenced by personal characteristics, feelings or opinions of the subject.	Reasoning is partially based on the individual experience.	Reasoning is mainly objective although there may be an overemphasis placed on some subjective factors while others are diminished.	Reasoning expresses a reality without subjectively modifying it.
Emotiveness	-	Emotional negative sense overweighs rational argument	Reasoning is based on heavy exaggerations.	The use of emotive terms in arguments is sometimes but not always manipulative.	An emotional appeal is used effectively making the target audience more open to the arguments.
Reliability	-	Arguments are not fair or fabricated.	Arguments are presented in list-like manner and/or there may be little explanation of connection between some of the evidence and corresponding ideas.	Speakers follow up ideas with references to researched evidence. Reliability of arguments is noted and facts ties to ideas/reasons are explained to audience. Transitions between ideas and support may be jumpy, but argument is well rounded,	All ideas are backed up with specific, researched evidence. Evidence presents both facts and researched opinions and reliability/relevance of the research is clear. There are no invented and false facts in reasoning.

				thorough, and reliable.	

Note: U=unsatisfactory; P=poor; F=fair; G=good; E=excellent.)

7. Conclusion

Federal State Educational Standards stipulate the development of non-technical skills to be a part of future engineers training. Non-technical skills include skills of reasoning and argumentation which could be cultivated during the whole period of education. Primarily, it is humanitarian subjects that can explicitly foster these skills. They can also be shaped effectively through foreign language acquisition in the ESP course. The shaped skills of reasoning and argumentation can stimulate intellectual evolution of students and contributes to their professional career. The ESP course can provide the appropriate learning content and teaching materials with the examples of the professional argumentative discourse. The authors suggest designing a new ESP course by means of IT tools enriching the content with teaching materials which should contain theoretical background, examples of argumentation and reasoning, exercises, and assignments. This ESP course is considered to be an integrated part of an e-learning environment.

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