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Innovative Internationalization in Education of Civil Engineers at STU in Bratislava, the Slovak Republic

Pavla Cantarero

Department of Languages, Faculty of Civil Engineers, Slovak University of Technology in Bratislava, 810 05 Bratislava, Slovak Republic

ABSTRACT

This paper presents experiences in teaching Slovak and international civil engineering students from various countries. The English language courses focus on the technical terminology used across 20 departments at the Faculty of Civil Engineering, STU in Bratislava. The study also introduces innovative approaches to engineering education developed as part of research at the Faculty of Arts, Comenius University in Bratislava. The research investigates three main aspects: internationalization of teaching, educational innovation, and the evaluation of teaching improvement. Details of teaching practice are presented, and proposals for future research design are outlined. A special type of European standard, known as Eurocodes, is gradually replacing national standards. Eurocodes enable design of load-bearing structures using materials such as aluminum alloys, concrete, fiber-reinforced polymers, glass, steel, timber, and composites. Since their terminology differs from that traditionally used in the UK, the USA, and Australia, Eurocodes offer a unique opportunity for language and technical education. Their availability in many languages makes them an extremely effective tool for teaching international students. This paper describes innovative education based on Eurocodes. Student feedback, teacher performance assessments, and seminar evaluations are presented. Key objectives include: (i) supporting local students in adapting to and benefiting from international practices ("internationalization at home"); (ii) meeting the needs of international students and effectively supporting their learning; (iii) critically evaluating teaching and student learning; and

*CORRESPONDING AUTHOR:
Pavla Cantarero, Department of Languages, Faculty of Civil Engineers, Slovak University of Technology in Bratislava, 810 05 Bratislava, Slovak Republic; Email: balazpa@gmail.com

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(iv) using a variety of approaches to enhance learning and assessment. Peer learning, in which students learn from one another without direct instructor involvement, is an especially effective method.
Keywords: Innovative Education; Internationalization; Future Civil Engineers; Foreign Students

1. Introduction

The Department of Languages at the Faculty of Civil Engineering, Slovak University of Technology in Bratislava, offers English and German language education during the first four semesters of the Bachelor's program[1–3]. The courses primarily focus on the terminologies of 20 different departments.

Over the four semesters, the terminology of five different departments is covered each semester. Students often find it difficult to understand specialized terms not found in basic dictionaries and to apply them in their tasks for other subjects.

A teacher may instruct up to eight student groups per week, totaling 16 classroom hours. With each group potentially having up to 25 students, a teacher can have as many as 200 students in a semester.

The courses are attended by both Slovak students enrolled in the normal five-year program and Erasmus exchange students from various countries who study in Slovakia for only one or two semesters. These international students come from a wide range of countries, including Brazil, Greece, Hungary, Kazakhstan, Kenya, Kuwait, Lithuania, Mali, Palestine, Poland, Russia, Spain, Syria, and the UK, among others. The internationalization of teaching must be implemented alongside teaching innovation and the evaluation of its results.

While English is often considered the global lingua franca, Eurocode English serves as a specialized lingua franca for civil engineers. Integrating it into civil engineering education within the context of internationalization and European standardization is highly beneficial. This approach increases student motivation and makes their language skills more applicable to design practices in their home countries. The use of Eurocode-based multilingual terminology tables is crucial for successfully integrating this knowledge into the design of structures in their home countries. This article outlines several engaging teaching strategies—such as student presentations, educational games, real-life projects, and interactive discussions—that reflect modern, student-centered approaches. These practices could offer valuable insights and inspiration for other educators in similar fields.

2. Effective Teaching for Internalization

In the past, different national standards were used for designing load-bearing structures in various countries. Common European standards (Eurocodes) were designed to replace the national standards of all CEN members. The introduction of Eurocodes eliminates technical trade barriers in Europe, harmonizes technical specifications, and creates a more open marketplace. The terminology used in Eurocodes is distinct from that of the UK, US, or Australia, and also differs from some textbooks. This presents a significant challenge for many people, including English language teachers. However, Eurocodes also facilitate the internationalization of teaching.

Eurocodes are published by the European Committee for Standardization (CEN). The abbreviation "EN" comes from the French Norme Européenne (European Standard). The first versions, known as "prestandard Eurocodes" (ENV Eurocodes), were published between 1991 and 1999. The conversion to the first-generation EN-Eurocodes was completed by 2007, and by April 1, 2010, CEN member states were required to replace their national standards with these Eurocodes. The national standards organizations of over 30 countries are obligated to implement this European Standard. However, Eurocodes are also used outside of Europe.

Eurocodes are published in three official languages: English, German, and French. Other countries must translate them into their own languages without making any changes. This is why the terminology of Eurocodes, available in so many languages, is an extremely efficient tool for educating foreign students.

The set of Eurocodes consists of 10 main documents (EN 1990 to EN 1999) and 58 parts that cover: a) the basis of design; b) actions on structures (effects of densities, imposed

loads on buildings, self-weights, traffic loads on bridges, snow loads, wind actions, actions induced by cranes and machinery, accidental actions from impact and explosions, actions in silos and tanks, actions during execution, seismic actions); c) the design of structures made from various structural materials like concrete, steel, composite steel and concrete elements, timber, masonry from individual stone or brick units, aluminium alloys, d) geotechnical and seismic design. They also cover the design of a wide range of structures, including bridges, buildings, silos, towers, masts and crane girders. The first generation of EN-Eurocodes, currently in use, is being replaced by a second generation, which will be mandatory for CEN member states from April 1, 2028. The second generation includes the design of structures made from glass and fiber-reinforced polymers. There are 66 parts of Eurocodes of 2nd generation from which some parts are already available [4–36]. The second generation enables the design of structures from glass and fiber reinforced polymers and according to FEM.

Eurocode English introduces new terminology that sometimes differs from UK, US, or Australian English. For instance, instead of the single term "load" used in the UK, USA, or Australia, Eurocodes distinguish between "action" and "load". This distinction has been adopted in many other languages as well. In French: action & charge; in German: Einwirkung & Last; in Spanish: accion & carga; in Italian: azione & carichi; in Greek: Δράσεις (Dráseis) & Φορτία (Fortia). The term "action" covers the effects of loads, imposed deformations, and temperature, while "load" refers only to loadings.

The author is currently preparing a glossary of terms in six languages (English, French, German, Spanish, Slovak, and Czech), some with definitions. This glossary is based on both the first and second generations of Eurocodes. Examples of terms are provided in **Tables A1–A7**. The glossary is continuously being updated as part of the author's research.

This extensive collection of terms allows students to analyze their origins, which can be international (often of Latin or Greek origin), specific to Eurocodes, or national (see paragraph 3).

Definitions are crucial because the meaning of a term often depends on its context. Sometimes, a definition also needs to be accompanied by a figure or diagram for clarity (see **Figure 1**).

As a first step in internationalization, a pictorial dictionary titled Civil Engineering [2] is used. with the Slovak and

English definitions and comments by its authors. Every term (in UK English with a US equivalent if different) is accompanied by its definition and a photograph, picture, or diagram (**Figure 1**).

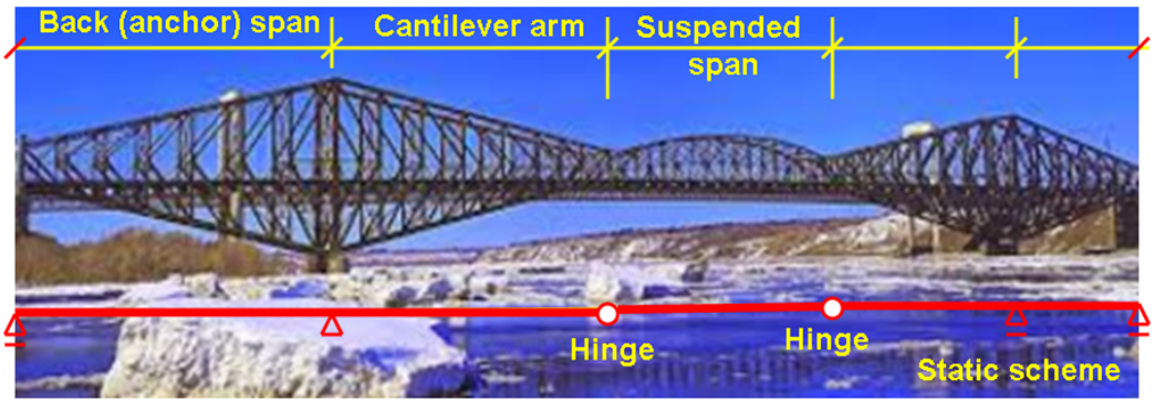


Figure 1. Cantilever bridge is called also Gerber bridge. Gerber girder (beam) is the girder (beam) with inserted hinges.

3. Formulation of Problems and Methods of Their Solutions

It is also important to incorporate the latest terminology of ISO 6707 [37, 38], a standard published by the International Organization for Standardization, a global federation of 165 national standards bodies. The Eurocodes themselves [4–36] accept many of the rules given in ISO 6707 [37, 38].

The most important aspect in the internalization of teaching is selection of relevant topics and how they are

presented. Suitable topics include: (i) comparisons of structures built in students' home countries; (ii) the preservation of cultural heritage [39, 40], including case studies, (iii) historical structures, which students are eager to learn about (and foreign students can share their experiences visiting Slovak castles); (iv) world record structures; (v) failures of structures and lessons learned from them; (vi) lives of notable structural engineers. This approach brings real-world experiences from various countries into the classroom.

These topics are taught using several methods: (i) student present PowerPoint presentations followed by discussion and questions from their peers; (ii) given topic is discussed in a group of students or by pairs; (iii) a chosen theme becomes content of student's scientific work [41]; (iv) students participate in a game where they act as bridge designers and create a "brochure" about their bridge, using specific vocabulary like pier, pylon, support, abutment, cable-stayed, suspension, arch, or beam bridge; (v) interesting videos are used, as "a picture is worth a thousand words". A visit to a real or simulated construction site is even more valuable; (vi) a favorite student game is "Be More Descriptive," where students replace generic words like "nice" with more specific and varied alternatives such as enjoyable, pleasurable, or admirable.

Socrates believed that education should foster freedom and inquiry [41]. He argued that all learning is simply recollection, not the cramming of new facts. Therefore, teaching should assist students in discovery rather than just supplying information. The goal is to instill a spirit of inquiry and a love of learning.

The papers from STRUCTURE magazine, particularly those about historical bridges and their designers by Frank Griggs, Jr., have also been helpful to teachers [42–47]. Our students like the papers written by Frank Griggs, Jr. about historical bridges and their famous designers in STRUCTURE magazine. STRUCTURE magazine is published exclusively for practicing structural engineers. As a premier publication of the National Council of Structural Engineers Associations (NCSEA), the Structural Engineering Institute (SEI) of ASCE, and the Council of American Structural Engineers (CASE) of ACEC, STRUCTURE communicates with every member of the leading structural engineering associations in the U.S.

Our expectations are clear: students will better understand specialized terms and be able to apply them. Our hypotheses are that students' attitudes will improve and their motivation will increase rapidly. This is because they will understand the meaning of new English terms and their translations into their native languages. Their ability to apply these terms in structural design is crucial, and mixing English knowledge with design knowledge helps them retain new information. This significantly improves their design skills, which is important for their future professional lives and serves as a major motivation for most students

A teacher's efforts are rewarded when they receive feedback like the following, written by a student from Brazil: "Thanks to you, dear professor, I started to like learning English". However, there is room for improvement in motivating shy or less motivated students. The author was positively impacted by a Nigerian student who used a device to convert his spoken words into written sentences on a screen during his presentation.

The beginning of pandemic period was challenging, and we were really hitting our rhythm as a class during that time. We were working from home, and all lectures were going to be conducted remotely. We did what all good teachers do: we adapted. Knowing that students were watching lecture from a variety places, we did not mandate students to keep their video or audio on, and it was very odd to talk into the silence. But after some time we all adapted to remote learning and I found remote teaching successful.

We agree with the observer that students should not rely solely on information from the Internet. We also agree that students' lectures could be shorter and discussions longer. The idea of peer learning in the form used at conferences is very good. This is good preparation for their future scientific activities. On the other hand, at conferences, the time for a lecture is limited to 5–10 minutes. There is such proverb: less is more. That means that presentations should contain smaller number of slides and students should be more active in discussions.

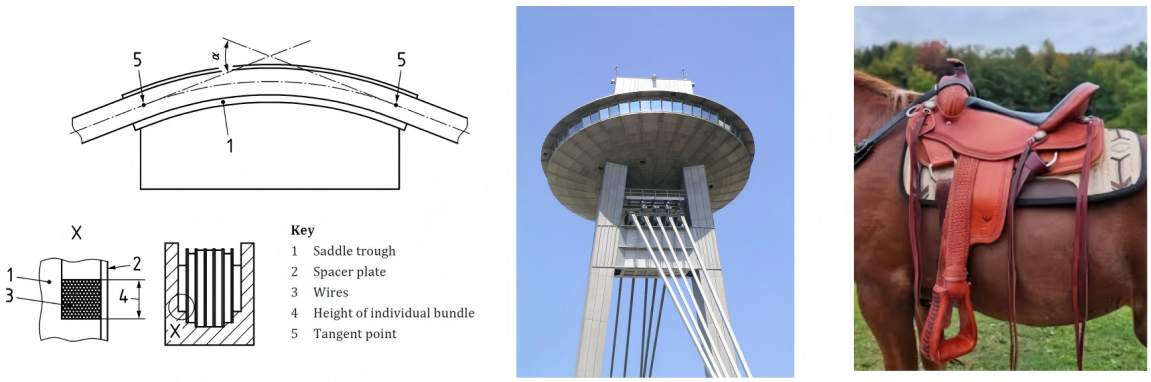
A very useful method how to keep in memory the meaning of the terms is "method of misunderstanding" between people of different nations. Imagine an English boy offering a cake to his German girl, who does not understand English, with the words: "this gift is for you". "Der Gift" in German means "poison."

The analysis of terms origin and using grammar and

linguistics in teaching is also very useful. Use of human and animal similarity in term understanding is also very efficient (see **Figures 2–4**). **Figure 5** and **Figure A1** are also important for understanding of terms meanings.

(a) **(b)** **(c)**

Figure 2. (**a**) "web breathing" of steel beam; (**b**) cable "eye"; (**c**) "teardrop" shaped hole.



(a) **(b)** **(c)**

Figure 3. (**a**) and (**b**) saddle for the cables on the top of bridge pylon; (**c**) saddle for the horse.

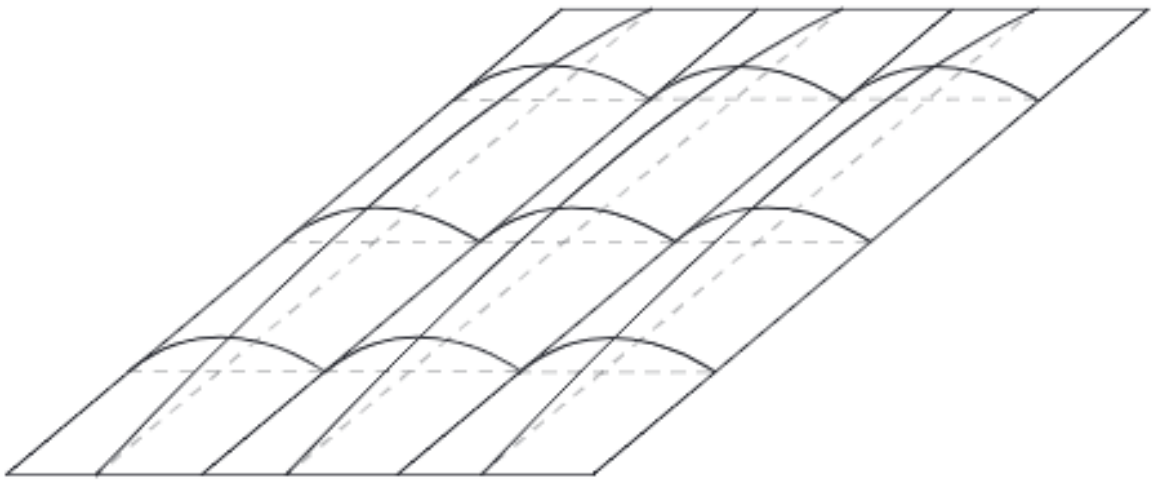
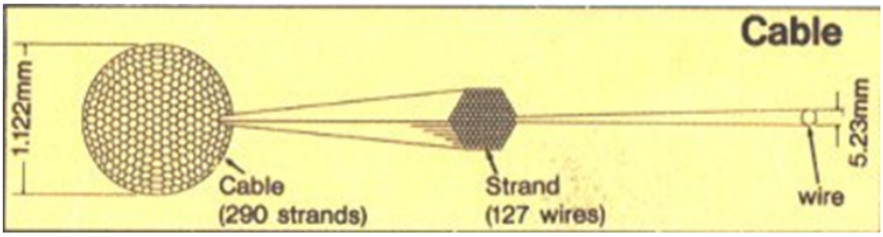


Figure 4. "Hungry horse" imperfection of steel plate.



(a)

(b) (c)

Figure 5. (**a**) Explaining terms cable, strand and wire; (**b**) Golden Gate bridge in USA; (**c**) Akashi Kaikyo bridge in Japan.

Glossary (which is part of our PhD thesis) lists 605 terms in the 6 languages taken from Eurocodes. In the analysis, we focused on English and two Romance languages: Spanish and French. With students, we looked at:

a) The similarity of terms in all three of these languages (example: diaphragm – diaphragm – diafragma – diafragme), which are internationalisms (see **Table 1**);

b) In particular, the similarity of two Romance terms: Spanish and French (example: mosty – bridges – puentes – ponts) (see **Table 2**);

c) cases where terms differed in all three of these languages: (example: rebro, web, tabiquillo, paroi interne) (see **Table 3**).

Table 1. Terms of international origin used in Eurocodes.

No.	Slovensky (Slovak)	English	Español (Spanish)	Français (French)
1	diafragma	diaphragm	diafragma	diafragme
2	deflagrácia	deflagration	deflagración	deflagration
3	detonácia	detonation	detonación	détonation
4	emisivita	emissivity	emisividad	émissivité
6	globálna analýza	global analysis	análisis global	analyse globale
7	lokálna analýza	local analysis	análisis local	analyse locale
8	zaťaženie *	action	acción	action
9	rotačná kapacita	rotational capacity	capacidad de rotación	capacité de rotation
10	kategória detailu	detail category	categoría de detalle	catégorie de détail
11	modul	modulus	módulo	module
12	adhézia (priľnavosť)	adhesion	adherencia	adherence
13	konštrukcia	structure	estructura	structure
14	efektívna perióda	effective period	periodo eficaz	période effective
15	statická duktilita	static ductility	ductilidad estática	ductilité statique

Note: * Slovak terminological experts refused to use term “akcia” in Slovak Eurocodes.

Table 2. Similar terms in two Romance languages (in Spanish and French) used in Eurocodes.

No.	Slovensky (Slovak)	English	Español (Spanish)	Français (French)
1	mosty	bridges	puentes	ponts
2	nosná konštrukcia mosta	deck	tablero	tablier
3	podpera	support	apoyo	appui
4	spoj	junction	junta	junctions
6	lano	rope	cable	câble
7	pilier	pier	pila	pile
8	ložisko	bearing	aparato de apoyo	appareil d'appui
9	dýchanie (stien)	breathing (of plates)	respiro (de placas)	respiration (des tôles)
10	spojler	spoiler	deflector (spoiler)	déflecteur (spoiler)
11	vlhkosť dreva	moisture content	contenido de humedad	humidité
12	vyškárovanie	pointing	rejuntado	rejointoiement
13	horninové prostredie, základová pôda	ground	terreno	terrain
14	trieda kvality	quality class	clase de calidad	classe de qualité
15	stena	wall	muro	mur

Table 3. Different terms in different languages used in Eurocodes.

No.	Slovensky (Slovak)	English	Español (Spanish)	Français (French)
1	škrupina	shell	lámina	coque
2	lávka pre peších	footbridge	puente peatonal	passarelle
3	prútová konštrukcia	frame	entramado	ossature
4	vzper	buckling	pandeo	flambement
6	kazeta	liner tray	perfil-bandeja	plateau
7	prút s konštantným prierezom	uniform member	elemento uniforme	barre uniforme
8	nárožníky	leg members	patas	membrures
9	uzol	joint	unión	assemblage
10	napätie	stress	tensión	contrainte
11	rozkmit napätia	stress range	carrera de tensión	étendue de contrainte
12	prameň	strand	cordón	toron
13	opora	abutment	estribo	culée
14	lanový záves	cable stay	tirante	hauban
15	voľná výška	headroom	gálibo	gabarit

4. Results and Evaluation of Teaching Process

To collect research data, student knowledge is evaluated every three weeks. The first week, a task is assigned. The second week, students present their work, and the third week, they take written and oral tests to verify their ability to apply the new information. In the weekly two-hour sessions, new topics are discussed in the first hour, and tests are conducted in the second. To motivate students, a competition format is used, with winners chosen by both student votes and the teacher's opinion.

Collecting data from all 250 students is "pure science fiction" due to the lack of administrative support. Therefore, the research will focus on a group of 20 students to evaluate the effectiveness of the teaching innovations.

The following data are collected from students: (i) the teacher's willingness to consult during seminars and office hours; (ii) teacher punctuality; (iii) overall evaluation of seminars; (iv) the perceived usefulness of the knowledge gained for their future career; (v) the amount of time spent preparing for the course weekly; (vi) whether they would recommend the course to younger colleagues. The examples of collected data are show in **Figures 6–9.**

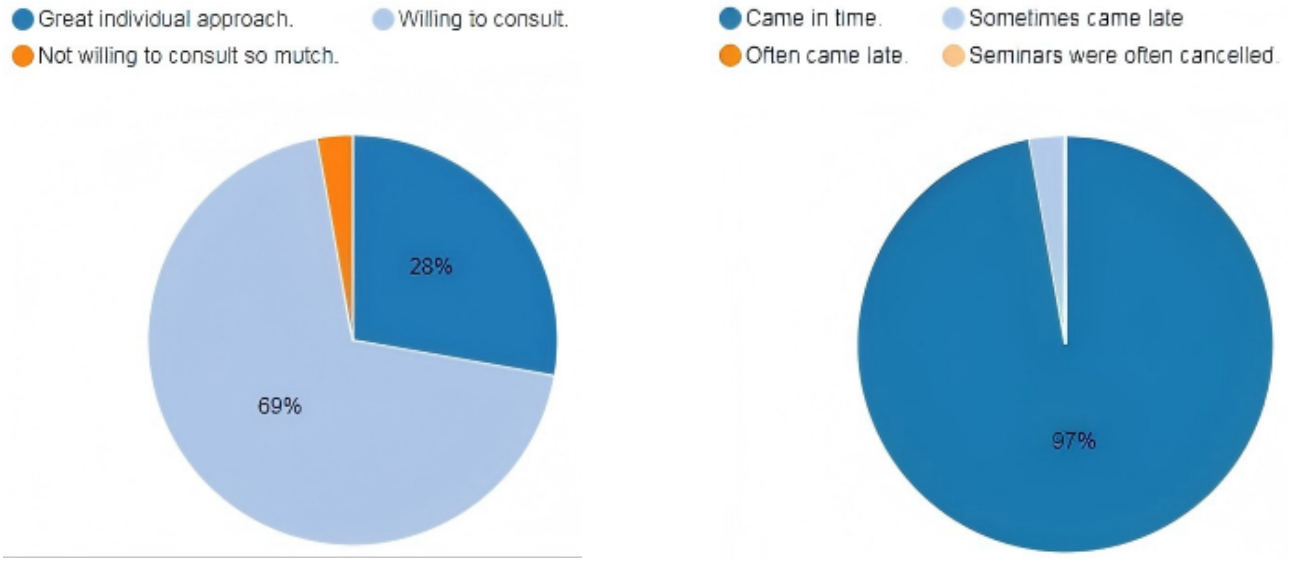
Statistical evaluation of exams is presented in **Figure 10**.

The statistical data in **Figure 10** are interesting but cannot fully capture the change in students' attitudes toward English study caused by the new teaching methods. This might be better observed in the next semester, but a different English teacher may be assigned. Nevertheless, an indirect improvement in student attitudes can be seen from the reactions of colleagues who teach other subjects. For example, a teacher of metal structures was pleased when a student, using a Eurocode and a STRUCTURE magazine article, re-

spectfully disagreed with her explanation of a detail, citing knowledge from our tutorials.

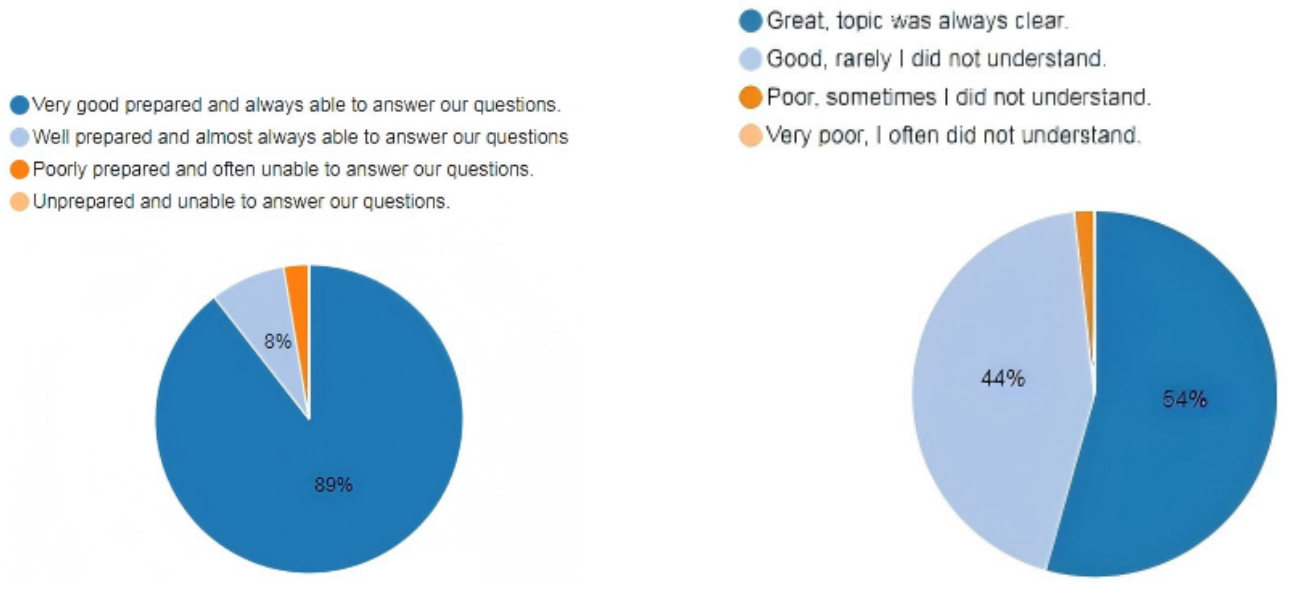
A direct confirmation of the new method's effectiveness is the fact that the number of students participating in the last Student Scientific Conference (SSC) on topics from our seminars increased significantly. International students also showed interest in taking part[48–51]. Popular topics among students include green design, reconstructions, and earthquakes[52–54].

Most students have already studied English for several years in primary and secondary school. However, repeating and reinforcing advanced English grammar is still necessary at the university level. It is most effective when integrated into the context of civil engineering topics.



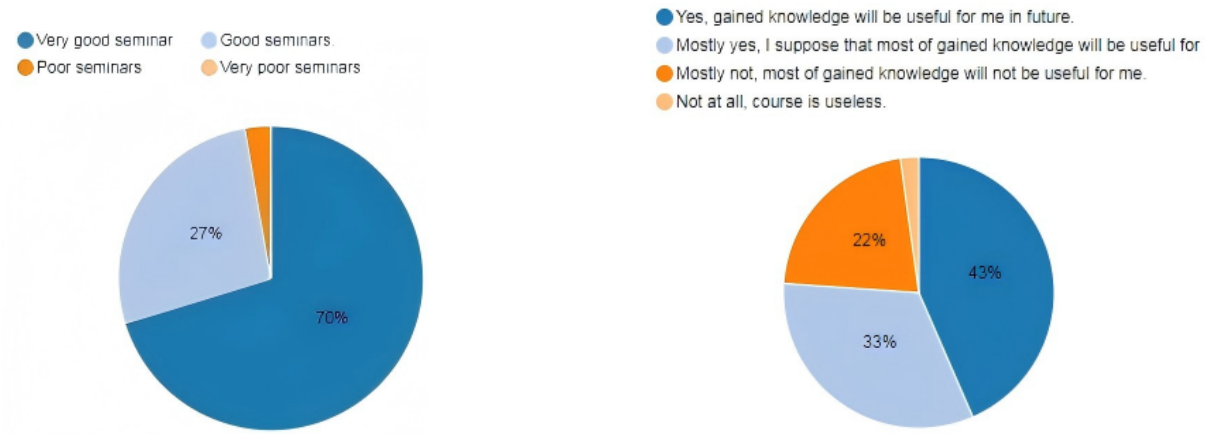
(a) **(b)**

Figure 6. Teachers' willingness to consult during seminars and if he came to seminars in time: (**a**) Teachers' willingness to consult during seminars and consultation hours; (**b**) Did teacher come to seminars in time?



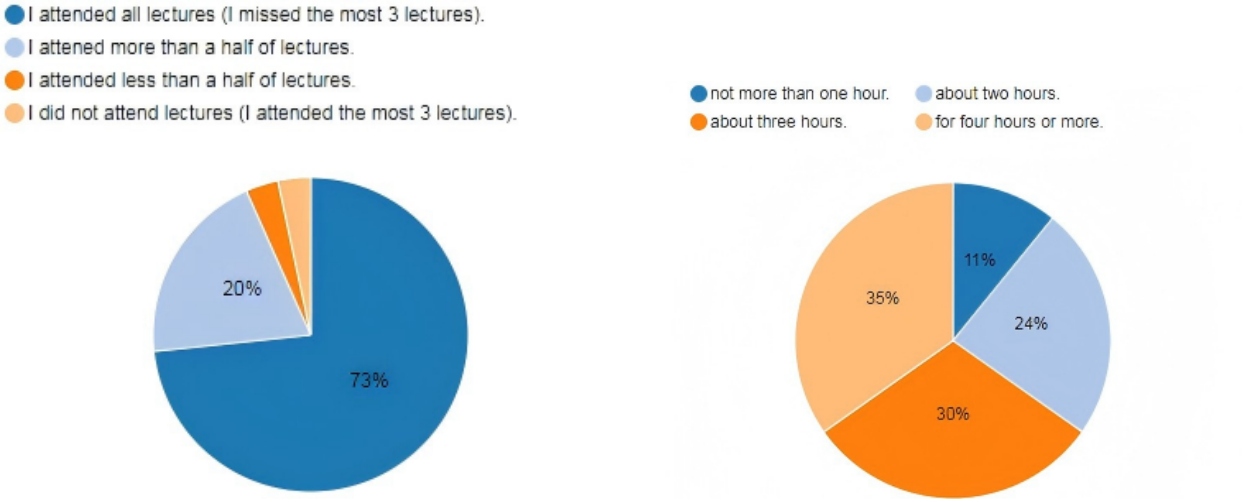
(a) **(b)**

Figure 7. Evaluation of teacher: **(a)** Teacher was usually; **(b)** Lecturer's explanations were.



(a) **(b)**

Figure 8. Evaluation of seminars: (**a**) Overall evaluation of seminars; (**b**) Final evaluation of the course. Do you think that gained knowledge will be useful for you in future?



(a) **(b)**

Figure 9. Attending of lectures and time spent for preparation for the course: (**a**) My participation in lectures; (**b**) How much time did you spend preparing for the course weekly? (time except of lectures and seminars).

Information	Quantity
Enrolled students:	26
Inactive students:	7
Successfully completed:	17
Failed courses:	9
Without completion :	0

Mode of completion: Graded credit

Term	A	B	C	D	E	not pass.	FN
term 1	6	6	4	0	0	0	6
term 2	0	1	0	0	0	0	0

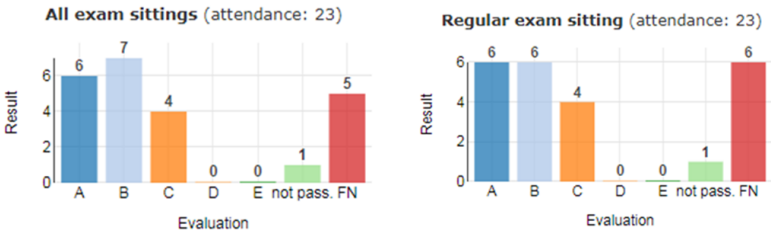


Figure 10. Statistical evaluation of exams.

Note: Grade A means the best result at examination.

Evaluation of Peer-Learning Exercises

The teacher used a peer-learning exercise in which students gave presentations. Four students—Joseph and Samwhel from Africa, Natalia from Slovakia, and Boniface from Africa—gave lectures on roofs and alternative energy sources. After each lecture, students discussed the topics and asked questions. The number of active students ranged from 3 to 12.

- What was the purpose of the exercise (e.g., learning new concepts, reflecting on material learned, assessing learning)?

The purpose of this exercise was to introduce students to new terminology related to alternative energy. The students' interactions were a result of their own natural initiative, and they appeared comfortable and tolerant with one another.

- Have students worked in groups where local and international students—or students from different countries—were mixed?

Both local and international students discussed the lectures with each other.

- Was this mixing a result of a) students initiative, b) student initiative after teacher encouragement, c) teacher made mixing compulsory or arranged students into groups/pair?

This type of mixing was natural students' initiative.

- Have students interacted with each other easily?

Yes, they did so with ease.

- Did students appeared to feel comfortable while engaged in peer learning?

They appeared to feel absolutely comfortable. They were tolerant and appreciative of their classmates, in stark contrast the Slovak politicians.

- Have students tried to draw each other into the exercise?

The students discussed mostly with the student lecturers, but also with each other.

- Has the instructor engaged students in peer assessment?

It was not necessary.

- Did the peer-learning exercise attain its aims? Explain why you think so.

Peer learning is the process of students learning with and from each other. In this case, a special way of peer learning was chosen: a student presents a lecture, which is followed by discussion of other students.

- Is there any other important thing that caught your eye during the observations?

The teacher noted that the students discussed mostly with the presenters but also with each other. The peer learning exercise achieved its goal of students learning with and from each other. One observation was that Natalia used a video from the internet for her presentation instead of creating her own lecture. It was also noted that some students were not fully familiar with online education due to device quality and lack of experience. The teacher appreciated Joseph's use of a program that transformed his spoken words into text on the screen.

- What suggestions do you have for further improvement?

Suggestions for improvement include making student lectures shorter and discussions longer. The idea of peer learning, similar to what happens at conferences, is excellent for preparing students for future scientific activities. The proverb "less is more." applies here: presentations should have fewer slides and students should be more active in discussions. Other suggestions include using larger fonts on slides, focusing on only one or two problems per slide, and having presenters ask questions to engage the audience. The use of accompanying music is also an option, but the author warns against songs that might be too relaxing.

5. Conclusions

This paper details the results of applying new teaching methods to the Civil Engineering English course for both Slovak and international students. The application of these new methods increased the motivation of the majority of students. In particular, introducing original engineering and scientific papers from STRUCTURE magazine was highly engaging for students. They learned a lot about the famous world designers of different civil engineering structures and details about them (e.g., bridges, tall buildings,

tunnels, dams, etc.). Other papers were focused on details of design of structural members in tension, compression, bending, torsion and their combination made of various structural-materials: steel, concrete, timber, aluminium alloy or different composite materials (e.g., steel-concrete composite, aluminium-concrete composite, timber-concrete composite, etc.).

The conclusion is clear: it is far more effective to use "real" topics from the engineering world to teach civil engineering English than to use standard English textbooks written by "pure" English teachers. This presents a significant challenge for English teachers who may not be specialists in technical subjects. Using papers and textbooks from the UK, USA, or Australia that focus on elementary design procedures with numerical examples is very effective. It is best to avoid textbooks for advanced designers. The fact that Eurocodes are published in many languages is a great help, as their use in teaching supports internationalization.

Teachers should discuss the results and how they can be interpreted from the perspective of previous studies and of the working hypotheses. The findings and their implications should be discussed in the broadest context possible. Future research directions may also be highlighted.

Future research will concentrate on: (i) English as an international language, including theoretical considerations [55], frameworks, and innovative approaches in diverse teaching settings; (ii) conversations discussed in [56, 57]. It is mentioned in [56] that academics from the whole world submitted several proposals about teaching in higher education. The study [57] explores how trusting relationships between PhD students and their supervisors contribute to the success of academic development programs.

"All theory is gray, my friend. But forever green is the tree of life" [58]. The teacher may know all the above theories and methods; nevertheless, he is in some situations limited by: a huge number of students with different levels of English language and not enough knowledge of the subject, total disinterest or insufficient number of necessary teaching hours. Recently, the department has faced a new phenomenon: a significant number of Ukrainian students. They face a language barrier, psychological stress, and unstable housing conditions, which make it difficult for them to study.

The author has focused on an innovative teaching method based on the latest second-generation Eurocodes, which will be available in different languages. The terms and definitions in these documents are the result of compromises among top experts and represent a crucial part of innovative education for international students.

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Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

The data used in this study are available from the corresponding author upon reasonable request.

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Conflicts of Interest

The author declares no conflict of interest.

Appendix A

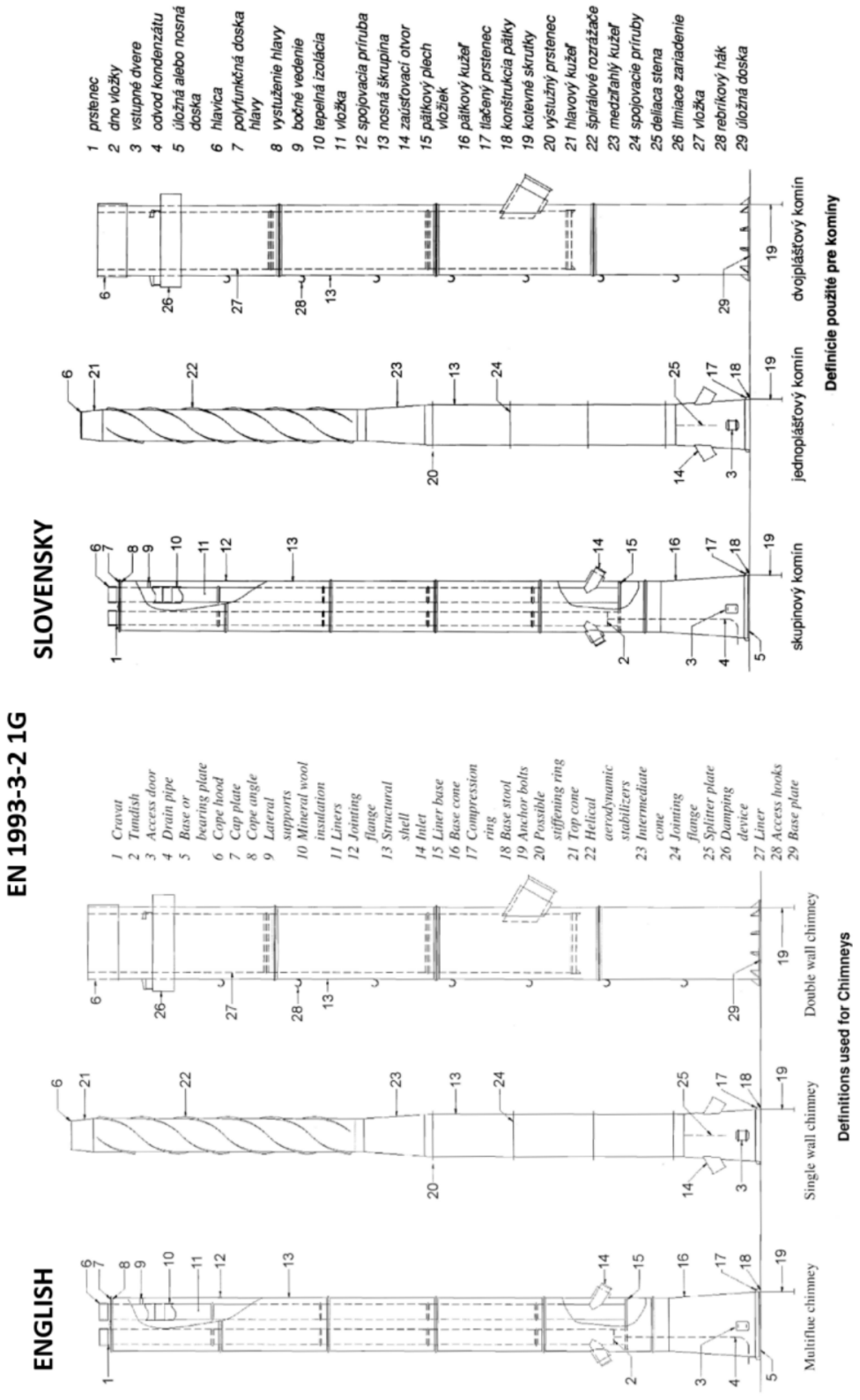

Figure A1. Terms relating parts of chimney in English and Slovak language according to the first generation of Eurocode EN 1993-3-2 Design of Steel structures. Part 3–2 Towers, masts and chimneys — Chimneys.

Table A1. Examples of Eurocode terminology based on EN 1990 Basis of structural design.

English	Français (French)	Deutsch (German)	Slovensky (Slovak)
construction works	construction	Bauwerk	stavba
type of construction	mode de construction	Bauart	druh stavby
method of construction	procédé d'exécution	Bauverfahren	spôsob výstavby
structure	structure	Tragwerk	konštrukcia
structural system	système structural	Tragsystem	nosný systém
execution	exécution	Bauausführung	zhotovovanie
design criteria	critères de dimensionnement	Bemessungskriterien	kritériá navrhovania
transient design situation	situation de projet transitoire	vorübergehende Bemessungs-situation	dočasná návrhová situácia
hazard	danger potentiel	Gefährdung	ohrozenie

Table A2. Examples of terminology based on Eurocode EN 1991-1-1: Part 1-1: General actions Densities, self-weight, imposed loads for buildings.

English	Français (French)	Deutsch (German)	Slovensky (Slovak)
bulk weight density	poids volumique apparent	Wichte	objemová tiaž
angle of repose	angle de talus naturel	Böschungswinkel	uhol uloženia
structural elements	éléments structuraux	tragende Bauteile	nosné prvky
movable partitions	cloisons mobiles	versetzbare Trennwände	premiestniteľné priečky
gross weight of vehicle	poids total autorisé en charge (PTAC)	Gesamtgewicht eines Fahrzeuges	celková tiaž vozidla

Table A3. Examples of terminology based on Eurocode EN 1992-1-1: Design of concrete structures – Part 1-1: General rules and rules for buildings.

English	Français (French)	Deutsch (German)	Slovensky (Slovak)
precast structures	structures préfabriquées	Fertigteile	montované konštrukcie
plain or lightly reinforced concrete members	éléments de structure en béton non armé ou faiblement armé	unbewehrtes Bauteil	prvky z prostého a slabo vystuženého betónu
unbonded and external tendons	armatures de précontrainte non adhérentes et armatures de précontrainte extérieures	interne und externe Spannglieder ohne Verbund	nesúdržná a vonkajšia predpínacia výstuž
prestress	précontrainte	Vorspannung	predpätie
tie	chaînage	Zugglied	ťahadlo

Table A4. Examples of terminology based on Eurocode EN 1993-1-1: Design of steel structures – Part 1-1: General rules and rules for buildings.

English	Français (French)	Deutsch (German)	Slovensky (Slovak)
frame	ossature	Tragwerk	prútová konštrukcia
sub frame	sous-ossature	Teiltragwerk	čiastková prútová konštrukcia
global analysis	analyse globale	Tragwerksberechnung	globálna analýza
capacity design	dimensionnement en capacité	Kapazitätsbemessung	kapacitné navrhovanie
uniform member	barre uniforme	Bauteil mit konstantem Querschnitt	prút s konštantným prierezom

Table A5. Examples of terminology based on Eurocode EN 1995-1-1: Design of timber structures – Part 1-1: General – Common rules and rules for buildings.

English	Français (French)	Deutsch (German)	Slovensky (Slovak)
dowelled connection	broche	Stabdübelverbindung	kolíkový spoj
equilibrium moisture content	humidité d'équilibre	Gleichgewichtsfeuchte	rovnovážna vlhkosť
fibre saturation point	point de saturation des fibres	Fasersättigungspunkt	bod nasýtenia vláken
laminated timber deck	platelage de bois lamellé	lamellierte Holzplatte	drevená lamelová doska
slip modulus	module de glissement	Verschiebungsmodul	modul popustenia

Table A6. Examples of terminology based on Eurocode EN 1996-1-1: Design of masonry structures – Part 1-1: General rules for reinforced and unreinforced masonry structures.

English	Français (French)	Deutsch (German)	Slovensky (Slovak)
unreinforced masonry	maçonnerie non armée	unbewehrtes Mauerwerk	nevystužené murivo
confined masonry	maçonnerie confinée	eingefasstes Mauerwerk	zovreté murivo
frog	creux	Vertiefung	vyhĺbenina
adhesion	adherence	Haftfestigkeit (Adhäsion)	priľnavosť
bed face	face de pose	Lagerfläche	ložná plocha

Table A7. Examples of definitions of term bridges taken from EN 1993-2 Design of steel structures. Part 2: Bridges.

English	Español (Spanish)	Slovensky (Slovak)
bridges (in German: Brücken)	**puentes** (in French: ponts)	**mosty** (in Czech: mosty)
civil engineering construction works mainly intended to carry traffic or pedestrian loads over a natural obstacle or a communication line.	obras de ingeniería civil cuyo propósito principal es soportar cargas de tráfico o de peatones salvando un obstáculo natural o una línea de comunicación.	inžinierske stavby určené predovšetkým na prevednie zaťaženia od dopravy a chodcov cez prirodzené prekážky a iné komunikácie.
shear lag effect (in German: Wirkung aus Schubverzerrung)	**efecto de arrastre por cortante** (in French: effet de traînage de cisaillement)	**účinok ochabnutia šmykom** (in Czech: účinek smykového ochabnutí)
non-uniform stress distribution in wide flanges due to shear deformation; it is taken into account by using a reduced "effective" flange width in safety assessments.	distribución no uniforme de tensiones en alas anchas debido a la deformación por cortante; se tiene en cuenta mediante la determinación de un ancho.eficaz. de ala en las comprobaciones de la seguridad.	nekonštantný priebeh napätia v širokých pásoch spôsobený šmykovou deformáciou; pri posudzovaní bezpečnosti sa zohľadňuje použitím „efektívnej" šírky pásu.

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