

Nataliia Tarasiuk*
Ukraine

Nataliia Osipchuk**
Ukraine

Alla Shykun***
Ukraine

The English Language Lexico-Grammatical Competence Formation of Civil Engineering Students in the Framework of Communicative-Cognitive Approach

Summary

This work presents the realisation of such principles of communicative-cognitive approach as the principle of integrated kinds of speech activity, the principle of systematicity, the principle of functionality in correlation with the principle of information transfer, the principle of unity of training, education and development, the principle of the cognitive gap, the principle of authenticity based on the samples of exercises of lexico-grammatical competence and authentic construction projects for future civil engineers. The English language lexico-grammatical competence model demonstrates the structure of its content on the level of knowledge and skills; preparatory, main, and advanced stages of linguistic competence formation in correlation with such levels of understanding of professionally-oriented texts as verbally-visual complex has been presented. The main peculiarities of the model's content have been highlighted. The system of lexico-grammatical competence formation includes three complexes of exercises: actualisation of lexico-grammatical knowledge on the level of the lexical unit and sentence (reading, speaking); on the formation and improvement of lexico-grammatical skills on the level of the lexical unit, sentence (reading, speaking); the formation

and improvement of lexico-grammatical skills on the level of minitexts in speaking and components of the verbal-visual complex (statistical tables, notes) in reading, on the formation and improvement of lexico-grammatical skills on the level of the sketch construction project as verbal-visual complex has been explained and demonstrated.

The samples of exercises in lexico-grammatical competence formation within the communicative-cognitive approach have been presented. The explanation of the communicative-cognitive approach's principles with the help of the system of exercises has been introduced.

The pedagogical experiment verifies the effectiveness of lexico-grammatical competence formation in the framework of the communicative-cognitive approach for civil engineering students with the help of one factor disperse analysis. Twelve students from each group (CE21, TPD22, TBC23) have been chosen to compare their results before the experimental test, control test, and after the experimental test within this approach.

Keywords: principle, exercise, language skills, paralinguistic skills, construction project

* Nataliia Tarasiuk, Candidate of Pedagogical Sciences, Associate Professor at the Department of Foreign Languages, National University of Water Management and Environmental Engineering, ORCID ID: <http://orcid.org/0000-0003-4514-6911>, e-mail: n.m.kuzlo@nuwm.edu.ua.

** Nataliia Osipchuk, Candidate of Pedagogical Sciences, Senior Lecturer at the Department of Foreign Languages, National University of Water Management and Environmental Engineering, ORCID ID: <http://orcid.org/0000-0002-3186-6806>, e-mail: n.v.osipchuk@nuwm.edu.ua.

*** Alla Shykun, Assistant at the Department of Foreign Languages, National University of Water Management and Environmental Engineering, ORCID ID: <http://orcid.org/0000-0003-2043-014X>, e-mail: a.v.shykun@nuwm.edu.ua.

1. Introduction

It has been acknowledged that the command of the foreign language is the cornerstone of being competitive in the global labour market. In language learning and teaching, “linguistic competence may be thought of as the learner’s knowledge of the structures and vocabulary of the language and his ability to produce and comprehend well-formed sentences in the language” (Fisher, 1984). According to the common European framework of references for languages, linguistic competence comprises lexical, grammar, semantic, phonological, orthographic and orthoepic competencies (Common European Framework, 2003). Lexico-grammatical content of the language is its basis. That is why we point out lexical and grammatical competencies as the key parts of linguistic competence.

The most challenging issue under the conditions of globalisation of economy and production is the issue of the language preparation of specialists of higher qualification, especially civil engineers, in the framework of our research. The qualitative training of future civil engineers is crucial for Ukraine, but it is very important in developing international relations with foreign countries. At present, lexico-grammatical competence formation in the framework of the communicative-cognitive approach poses the problem of realising principles of the communicative-cognitive approach in its stages in connection with the communicative-cognitive interaction of students at the linguo-cognitive level of language acquisition (problematic situations). An insight into the features of such component of linguistic competence, especially for future civil engineers based on the authentic construction project, contributes to teaching English for specific purposes (ESP) and elaborating exercises based on theoretical background about it.

2. Lexico-Grammatical Competence Formation Within Communicative-Cognitive Approach

Scholars have studied the methodical conditions of lexico-grammatical competence formation, especially stages and ways of language units acquisition (presentation, language practice, communicative practice, feedback) (Karpova, 2005), tasks of its formation (cog-

nitive, language, communicative) (Pastuhova, 2012), their connections with micro-and macrotext in correlation with the general peculiarities of the mentioned approach and communicative-cognitive interaction of students. The findings from these studies indicate general advantages of the communicative-cognitive approach or cognitive academic language learning approach in the communicative-cognitive educational paradigm in foreign languages teaching as reaching of thesaurus level, assistance in attaining students’ objectives in foreign languages learning. On the other hand, some scientists denote specifically such principles of this approach as the principle of integrated kinds of speech activity, the principle of systematicity, the principle of functionality, the principle of unity of training, education and development, the principle of the cognitive gap, principle of authenticity and others for the promotion of linguistic accuracy and linguistic appropriacy of students (Alexandrov, 2011; Barabanova, 2005; Hryhorenko, 2014). The aim we have set for ourselves in our study is to highlight the application of these principles towards the stages and tasks of lexico-grammatical competence formation based on the authentic construction project for future civil engineers. In order to accomplish this, the lexico-grammatical competence formation in the framework of the communicative-cognitive approach is realised with the help of the system of exercises and the pedagogical experiment.

3. Objectives

The research has the following objectives:

- to introduce the samples of exercises from the system of exercises of lexico-grammatical competence for future civil engineers;
- to explain how principles of the communicative-cognitive approach are realised with the help of the system of exercises;
- to verify with the pedagogical experiment the effectiveness of lexico-grammatical competence formation in the framework of communicative-cognitive approach for civil engineering students.

4. Elaboration of the System of Exercises of Lexico-Grammatical Competence for Future Civil Engineers

The system of exercises has been created based on the model of lexico-grammatical competence formation for civil engineering students.

The model of the English language lexico-grammatical competence demonstrates the structure of its content on the level of knowledge and skills; preparatory, main and advanced stages of linguistic competence formation in correlation with such levels of understanding of professionally-oriented texts as VVC (verbally-visual complex) as: the level of understanding of LU (lexical units) VVC, content-informational on the preparatory stage, content-informational and content-evaluative on the main stage, content-evaluative and pragmatic on the advanced stage (Mal'kina, 2009). The main peculiarities of the content of this model are

- correlation of language skills with paralinguistic skills based on sketches of the authentic construction project for future civil engineers;
- the correlation of the content of lexico-grammatical competence with such tasks of production activity of students as processing technical information, processing technical information complying with engineering concepts and such four stages of engineering activity as the setting of the task, the search of variants of the solution, analysis of variants of the solution, evaluation, and choice of concepts;
- the dominant kinds of speech activity are reading and speaking according to the needs and demands of the educational-professional programme of professional training for civil engineers;
- lexico-grammatical competence formation in such thematical cycles as "General characteristics of the construction project", "Layouts with notes", and "The whole sketch construction project".

The system of lexico-grammatical competence formation comprises three complexes of exercises: actualisation of lexico-grammatical knowledge on the level of lexical unit and sentence (reading, speaking); the formation and improvement of lexico-grammatical skills on the level of the lexical unit, sentence

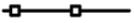
(reading, speaking); the formation and improvement of lexico-grammatical skills on the level of minitexts in speaking and components of VVC (statistical tables, notes) in reading, on the formation and improvement of lexico-grammatical skills on the level of the sketch construction project as VVC. The following exercises illustrate three stages of lexico-grammatical competence formation according to four stages of language unit acquisition (presentation, language practice, communicative practice, feedback) and tasks of its formation (cognitive or intellectual development, language, communicative). They are elaborated with the help of transition notes in the form of pictorial schemata, tables, and schemes developed specifically for lexico-grammatical competence formation.

4.1. Actualisation of lexico-grammatical knowledge on the level of language unit and sentence (speaking). Presentation. Tasks of lexico-grammatical competence formation: cognitive, language

Exercise 1.

Listen to the lecturer. Match the words with their correct images to say what the plot plan of the two-family residence includes. There is one extra image. Use the vocabulary grid. Work in pairs.

Plot plan

1. Building	 a.
2. Planter	 b.
3. Property landscaped area	 c.
4. Property fence	 d.  e.

Plot plan

Object	Presence on all plot plans	Presence on the plot plan of two family residence
Property fence	+	+

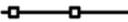
Ex. The plot of the construction project's two-family residence includes such items as:.....

Presentation. Tasks of lexico-grammatical competence formation: cognitive, language.

Exercise 2.

Work alone, then in pairs. Match the words with their correct images to choose the correct symbols legend for plot plan 1 below. Name the symbols in the symbol legend. Use the vocabulary grid. Work in pairs.

Plot plan

1. Building	a. 
2. Planter	b. 
3. Property landscaped area	c. 
4. Property fence	d. 
5. Property water line	e. 
6. Property shru	f. 

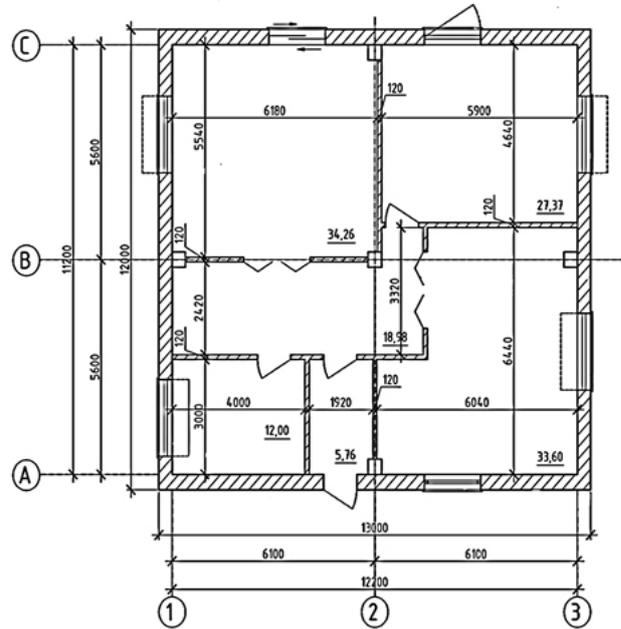
4.2. Lexico-grammatical skills on the level of sentences (speaking). Language practice, communicative practice. Tasks of lexico-grammatical competence formation: cognitive, language

You are applying for the position of civil engineer-trainee. You have to draw those symbols which correspond to customer's demands to check up and say where they are shown on the following floor plan. Use the following table for help.

Sliding doors, double door interior, vented window, brick

Example. There is a double interior door into the bedroom.

Floor plan (Fig.1)



Customer's demands Floor plan

Object	Function	Relation with other floors and rooms on its floor	by what
			floor room
Ground floor	five rooms		
Study room		powdery room	

View on the real location of components Floor plan

Object	Function	Relation with other floors and rooms on its floor	by what
			floor room
Ground floor	five rooms		
Study room		powdery room	

4.3. Lexico-grammatical skills on the level of mini-texts in speaking. Language practice, communicative practice. Tasks of lexico-grammatical competence formation: cognitive, language

Work in pairs. You want to become trainees at the construction company. You are given the probation task to check your knowledge of plot plan symbols. Describe what is around the family residence on the plot plan using the following substitution table and the table for the plot plan. One student has to draw symbols; another describes the plot plan with them. Then change roles.

Example Student 1



Student 2. There are new planters in front of the house.

1. There are	in front of the house
2. There are	at the back of the house
3. There is	right to the house

Plot plan

Object	Function	Peculiarities	Relation to other areas
Cottage			Adjacent buildings

Components near the object	Function	Peculiarities	Relation to other areas
driveway		concrete	to the right from the planter and

4.4. Lexico-grammatical skills on the level of the sketch construction project as VVC. Language practice, communicative practice. Tasks of lexico-grammatical competence formation: cognitive, language

Work alone, then in small groups. You want to employ to work as a civil engineer. You have been assigned the probation task in order to pass a trial period at the construction company. You have to draft two plot plans based on their comparable description. Work alone and draft the layouts based on the owner's demands at home with the help of computer engineering programmes Autocad, Autodesk, 3DMax, and Sketchup. Exchange layouts in pairs with groupmates. Use the following transition notes to evaluate if your plot plan corresponds entirely to the following list of criteria description. Make up the presentation of your engineering concepts to these plot plans.

Plot plan

Object	Function	Peculiarities	Relation to other areas
Cottage			Adjacent buildings

Components near the object	Function	Peculiarities	Relation to other areas
driveway		concrete	to the right from the planter and

Basic lines	+	-
Landscaped area		
Building material		
Attached items (garage)		

Draft of buildings and personal plots of land are plotted on this plan. Both plot plans have basic lines: property line, water line, natural gas line, and natural grades. The elevation part is located to the south for better lighting compared to the lowering of the second plot plan, which is located to the south. Left to the house is a garage with a driveway. There is no attached garage on the second plot plan, and it is located not far from the house.

Feedback

After the topic "Plot plan with notes" fill in the following table about what you have known before and what you have learnt. There is an example of how to do it.

What I have known before	What I have learnt, I am curious about, one thing I don't understand
the word construction project	

5. Principles of Communicative-Cognitive Approach

As stated in the introduction, it is clear that lexico-grammatical competence formation in the framework of the communicative-cognitive approach poses the problem of realising principles of the communicative-cognitive approach.

The important principle of the communicative-cognitive approach is the principle of functionality. Functionality is provided with the usage of those tasks which are used in the professional communication of civil engineers following the typical task of construction project and communicative functions of English for specific purposes (Chvychelova, 2010): inform about the content of sketches, describe the content and structure of drafts like in the following task: use the following transition notes to evaluate if your plot plan corresponds fully to the description to the following list of criteria, make up the presentation of your engineering concepts to these plot plans. In the

framework of our research, it is combined with the principle of information transfer from visual (sketches) to verbal (verbal) and vice versa adopted by H. Widdowson (Widdowson).

As far as the principles of unity of training, education, and development are concerned, the improvement of three sides of language personality (cognitive, motivational, and active) is directed at the development of students' cognitive and communicative activity (Romanenko, 2010). Typical situations between civil engineer and customer, civil engineer-trainee and civil engineer within problematic professionally-oriented tasks.

Let us now turn to the principle of authenticity, which promotes the development of verbal-semantic, linguo-cognitive and motivational levels of language personality determined by the theoretical-gnoseological model of Karaulov (2002). It is realised based on layouts and notes in construction projects of leading construction firms "Brown and Caldwell", як "Kiku Obata", "Thomas Miller and Partners", "ABHT", "CH2MHILL" and approaches to the real English-speaking professional environment.

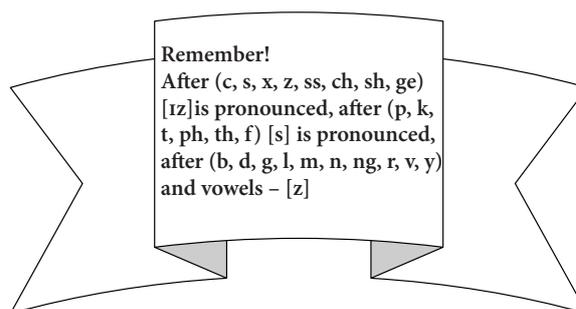
Let us now consider the principle of cognitive gap (Barabanova, 2005) or principle of problematic situations, which correlates with its theory. Cognitive language tasks of lexico-grammatical formation can be solved with the help of problematic tasks under this principle. Problem situations are revealed in the solution of creative tasks like adopting engineering concepts and elaborating layouts.

Moving now to consider the principle of integrated kinds of speech activity (Kovryho, 2010; Kovtun, 2015; Konoplianyk, 2015). Lexico-terminological system of the professional register is consolidated in the oral and written form with the help of this principle (Konoplianyk, 2015; Kravets, 2013). The content aspect of speech communication in the communicative-cognitive approach towards teaching ESP is predominant in relation to the language, that's why knowledge about typical orders of layouts is actualised, and skills are formed in the communicative contexts, which stimulate the real construction project activity of civil engineers according to the typical task of educational-qualified characteristics based on such dominant kinds of speech activity as reading and speaking with the usage of writing and listening for future specialists of the construction industry.

The dominant speech activities are reading and speaking because of the demands of educational-professional preparation of bachelor of the area of concentration 0921 "Civil engineering" qualification civil engineer. Understanding and processing technical information in the construction project as paralinguistic active text is done on content-informational, content-evaluative and pragmatic levels of understanding of the professionally-oriented text as verbally-visual complexes with the aim of appropriate perception and adoption of engineering concepts under the conditions of project organisation.

However, Kovtun emphasises another dominant speech activity for engineers as speaking, which helps to reveal the communicative needs of engineers for the fulfilment of such stages of engineering activity by Avdeeva as a statement of task, the search of variants of the solution, analysis of variants of the solution, evaluation and choice of solutions. Speaking as the aim of understanding reading is in making up monologues like presentations and dialogues. Writing as the mean of understanding reading is used for signing separate names of components of layouts, but comprehension is used for listening to the words and sentences pronounced by the lecturer.

Let us now turn to another principle of the communicative-cognitive approach – systematicity. Successive and systematic introduction of typical lexico-grammar clusters, grammar structures and forms reveals the system of systematicity (Kovtun, 2015; Chvychelova, 2010). The permanent accompaniment of exercises with lexico-grammatical comments promotes such principle of systematicity in lexical and grammar competence formation as the result of constant activation of such cognitive processes as remembering, conceptualisation and generalisation. These are the samples of lexico-grammar comments for exercises:



6. Experimental verification

The pedagogical experiment aimed to verify the effectiveness of lexico-grammatical competence formation based on the American construction project in the framework of the communicative-cognitive approach. The following experimental verification details the results as perceived by students on the lexico-grammar competence formation. It is provided on the participants involved in the experimental study and its procedure for collecting and processing the data findings. Data for this were collected from 72 civil engineering students of the National University of Water Management and Environmental Engineering.

Verification of obtained results has been calculated with the help of one factor disperse analysis (Sydorenko, 2001). We have chosen 12 students from each group (CE21, TPD22, TBC23) to compare their results before the experimental test, control test, and after the experimental test. Tests were elaborated based on the mentioned exercises on lexico-grammar competence formation. The ratings were defined based on these three tests.

The sum of ratings is $12+24+36=72$. The sum of calculations:

$$\Sigma R_1 = 12 \times \frac{(3 \times (3+1))}{2} = 72;$$

then, sums coincide. Let us determine L_{emp} .

$$L_{emp.} = \Sigma (T_j \cdot j),$$

where j – from 1 to 3 – number of tests, T_j – the sum of ratings for each test.

$$L_{emp.} = 12 \cdot 1 + 24 \cdot 2 + 36 \cdot 3 = 168$$

Let's define with the table

$$\begin{cases} 153 \rho \leq 0,05 & L_{emp.} > L_{cr} \\ L_{cr} & 156 \rho \leq 0,01 \\ 160 \rho \leq 0,001 \end{cases}$$

It verifies the hypothesis that the tendency to increase individual indexes from before the experimental test to after the experimental test is gradual and reliable.

Figure 1. Ratings of students of the group Civil Engineering

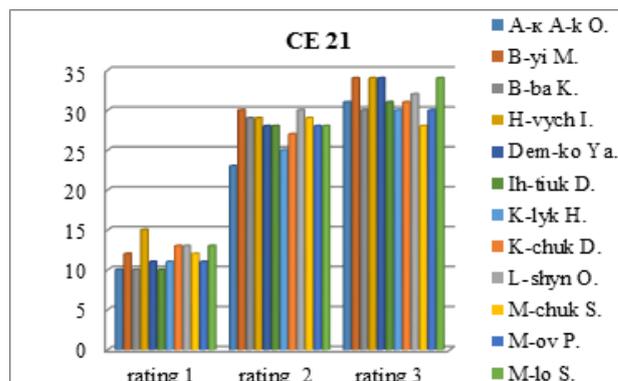


Figure 2. Ratings of students of the group Town Planning and Development

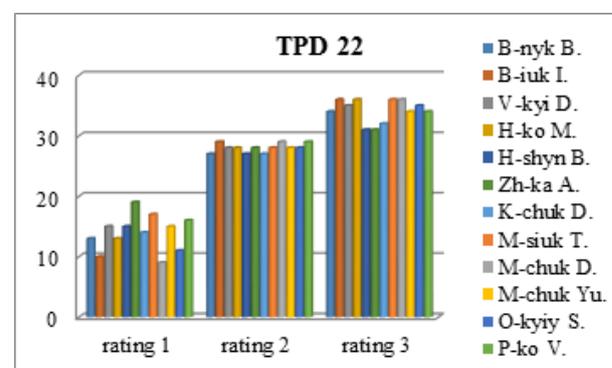
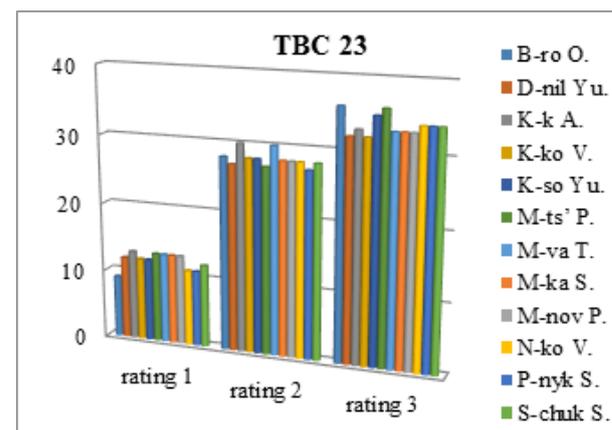


Figure 3. Ratings of students of the group Technology of building and construction



Graphics in Figures 1, 2, and 3 verify the tendency of a gradual increase in students' indexes in working over the content of sketch construction projects.

7. Conclusion

The lexico-grammatical competence formation in the framework of such principles of communicative-cognitive approach as the principle of integrated kinds of speech activity, the principle of systematicity, the principle of functionality in correlation with the principle of information transfer, the principle of unity of training, education and development, the principle of the cognitive gap, principle of authenticity is realised with the help of the system of exercises according to the model which includes four stages of language units acquisition (presentation, language practice, communicative practice, feedback) and tasks of its formation (cognitive or intellectual development, language) with transition notes in the form of pictorial schemata, table, schemes based on authentic construction projects of leading construction firms “Brown and Caldwell”, як “Kiku Obata”, “Thomas Miller and Partners”, “ABHT”, “CH2MHILL”. The lexico-grammatical competence formation is verified with the pedagogical experiment in which the students’ points and ratings before the experimental test, control test and after the experimental test have been gradually increased. In terms of pedagogical implications for ESP language and communication courses, lexico-grammatical competence of civil engineering students can promote communicative competence to narrow the gap between the university and the workplace.

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