DEVELOPING VERBAL AND ANALYTICAL REASONING OF IT SPECIALISTS ON THE BASIS OF THE THESAURUS CENTERED APPROACH

Shylinska I. F.
Candidate of Pedagogical Sciences,
Associate Professor at the Department of Foreign Languages
and Information Communication Technologies
West Ukrainian National University
Peremoha sq., 3, Ternopil, Ukraine
orchid.org/0000-0002-0700-793X
inna.shylinska2012@gmail.com

Piatnychka T. V.
Candidate of Philological Sciences, Associate Professor,
Associate Professor at the Department of Foreign Languages
and Information Communication Technologies
West Ukrainian National University
Peremoha sq., 3, Ternopil, Ukraine
orchid.org/0000-0001-7597-1897
piatnuchka@ukr.net

The article is devoted to the problem of developing verbal and analytical reasoning of students majoring in Information Technologies on the basis of the thesaurus centered approach in the process of studying a foreign language. Related work information is analyzed. The basic concepts of the study, namely, individual lexicon, subject field lexicon, thesaurus, subject field thesaurus are defined according to the current approaches. The importance of the lexicon and thesaurus in the structure of the linguistic personality is analyzed. The role of the individual lexicon in the process of personal and social development is revealed. The essence of the thesaurus centered approach and the expediency of its use while studying a foreign language is analyzed. The stages of designing the thesaurus type dictionary as a means of developing verbal and analytical reasoning of students majoring in Information Technologies are described, among which are the following ones: modeling the subject field knowledge system of IT specialists; designing the glossary of the subject field terminology and vocabulary; introducing the conceptual articles of terms; developing a bilingual dictionary in which the words and phrases are introduced, which are included into the conceptual articles of the terms. Examples of the components of the thesaurus type dictionary of IT specialists are presented. The proposed dictionary serves as the basis for developing verbal and analytical reasoning of IT specialists while studying a foreign language. The process of such development involves the comprehension of the conceptual sphere of the subject field, which forms the basis of the subject field lexicon of IT specialists; knowledge of semantic and functional peculiarities of the subject field lexicon; mastering the algorithms of word sense-making and semasiological interpretation of the subject field matter.

ФОРМУВАННЯ ЛЕКСИКОНО-АНАЛІТИЧНОГО МИСЛЕННЯ ІТ-ФАХІВЦЯ НА ОСНОВІ ТЕЗАУРУСНО-ЦІЛЬОВОГО ПІДХОДУ

Шилінська І. Ф.
кандидат педагогічних наук,
доцент кафедри іноземних мов та інформаційно-комунікаційних технологій
Західноукраїнський національний університет
пл. Перемоги, 3, Тернопіль, Україна
orchid.org/0000-0002-0700-793X
inna.shylinska2012@gmail.com

П'ятничка Т. В.
кандидат філологічних наук, доцент,
доцент кафедри іноземних мов та інформаційно-комунікаційних технологій
Західноукраїнський національний університет
пл. Перемоги, 3, Тернопіль, Україна
orchid.org/0000-0001-7597-1897
piatnuchka@ukr.net

Ключові слова: *лексикон, тезаурус, лексиконо-аналітичне мислення, тезаурусний підхід, ІТ-фахівець.*

Статтю присвячено проблемі формування лексиконо-аналітичного мислення майбутніх фахівців галузі «Інформаційні технології» на основі тезаурусного підходу у процесі вивчення іноземної мови. У представленій роботі описано сучасні підходи до висвітлення окресленої проблематики, а також до визначення основних понять дослідження, а саме: індивідуальний лексикон, професійний лексикон, тезаурус, професійний тезаурус. Проаналізовано роль лексикону та тезауруса у структурі мовної особистості, значення індивідуального лексикону у процесі професійного становлення фахівця. Проаналізовано сутність тезаурусно-цільового підходу, доцільність його застосування під час вивчення іноземної мови студентами спеціальностей ІТ-галузі. Зазначено, що терміносистема ІТ-галузі характеризується постійним лексичним оновленням, тому потребує упорядкування і стандартизації термінологічної лексики для створення єдиного інформаційного простору і забезпечення ефективної комунікації між фахівцями і науковцями різних країн. Описано етапи розроблення словника тезаурусного типу як засобу формування лексиконо-аналітичного мислення майбутнього фахівця галузі «Інформаційні технології», з-поміж яких виокремлено такі, як: моделювання системи знань предметної сфери ІТ-фахівця; розробка глосарія термінів і спеціальної лексики ІТ-галузі; представлення понятійних статей термінів; створення двомовного словника, у якому представлено слова і словосполучення, які входять до складу понятійних статей термінів. Наведено приклади складових компонентів словника тезаурусного типу фахівця галузі «Інформаційні технології». Запропонований словник слугує основою розвитку лексиконо-аналітичного мислення ІТ-фахівця під час вивчення іноземної мови. Означений процес формування лексиконо-аналітичного мислення передбачає осмисленість концептосфери предметної галузі, що становить основу фахового лексикону ІТ-фахівців; обізнаність із семантичними та функціональними особливостями фахового лексикону; засвоєння алгоритмів лексичного смислоутворення та семасіологічного тлумачення фахового тексту. Представлено алгоритм усвідомлення смислу слова ІТ-фахівцем під час професійної мовленнєвої діяльності й алгоритм осмислення тексту.

Problem statement. In recent years, many scholars have focused their attention on the problem of the individual lexicon development as one of the most relevant in linguistics, psychology, philosophy.

Lexicon is an ideal combination of all possible dictionaries that becomes of particular importance in the era of information explosion and time deficit [2, p. 7]. Nowadays, lexicon is transforming from an academic guide of static information (knowledge) storage into a fundamental dynamic research on the problems related to the conceptual area of a certain field of knowledge. Lexicon is continually developing and is open by its nature. In the semantic field of lexicon, cyberspace of the global network is being investigated and the new projects are being implemented.

Specific features of the lexicon units and the principles of their organization, which make it possible to retrieve and recognize immediately the auditory perceived word from a person's long-memory, were studied by A. Zalievskaia, Y. Kubriakova, M. Garman, W. Levelt [9, p. 10]. The thesaurus centered approach to developing subject field lexicon was offered by T. Serova, L. Shishkina [7].

As a result of psycholinguistic studies the concept of the lexicon as a dynamic functional system, which is capable of self-organization and restructuring, has been developed. The lexicon is defined as a lexical component of human speech organization [9, p. 75], as a system of codes and code transitions that provides sense-making and sense conveying as well as understanding of the perceived message [9, p. 66].

Since personal and social development depends on information knowledge, which is acquired by a person from natural language (words) through learning or experience, the lexicon is considered as a means of access to a single information thesaurus (memory), where the language and encyclopedic knowledge, necessary for personal development, is stored [10, p. 165].

The first language lexicon words and the second language lexicon words are stored separately but they are connected [3, p. 58].

Taking into account the above-mentioned, developing a foreign language subject field lexicon in English classes at University, and thus developing verbal and analytical reasoning of students, is an important task of the professional training, in particular, in the field of Information Technologies, in which new concepts and terms are constantly appearing due to the rapid development of this field.

The introduction of a new lexicon into a modern language causes creation of different dictionaries and guides. **The purpose** of the paper is to substantiate the stages of designing the thesaurus type dictionary as a means of developing verbal and analytical reasoning of future IT specialists while learning a foreign language.

Thus, foreign language training of students majoring in IT **is the object** of the research. **The subject** is creating a dictionary of the thesaurus type for future IT specialists, which includes the system of concepts of IT field.

Theoretical background. A characteristic feature of a person as a linguistic personality is his/her acquired vocabulary with a certain frequency of the use of words according to the specific syntactic models. If syntactic models are typical for the representatives of a certain language community, then the individual lexicon can show his/her belonging to a certain society, level of education, character, etc.

Russian linguist Y. Karaulov [5, p. 56] distinguishes three levels in the structure of the linguistic personality, namely, associative-semantic (structural systematic) level, which shows a person's language proficiency in everyday communicative situations; linguo-cognitive level at which the actualization and identification of knowledge and ideas of a person takes place; motivational level, which includes recognition and characteristics of the motives and goals of an individual. According to this scheme, the lexicon is functioning at the associative-semantic level, whereas the thesaurus is reflected at the linguo-cognitive one.

The basis of the subject field lexicon of a future specialist is formed while studying at University in the process of acquiring the conceptual-categorial apparatus of a specific field. The subject field lexicon of a specialist is an integral part of his/her internal lexicon, as a means of accessing the information thesaurus (structured knowledge) that is used during the processes of speech perception and production.

Thesaurus is commonly defined as a semantic dictionary with an orderly set of terms representing the amount of human knowledge of a specific subject field and containing a list of concepts, their interpretations and relationships [6]. The subject field thesaurus is considered as an open system of such interrelated processes as accumulation, storage and expansion of information, knowledge, and experience, which forms the basis for education, activity, and development of personality and society [1]. Due to the knowledge of the subject field lexicon, a specialist is able to comprehend and process the amount of the important information, referring to the subject field, which is associated with a certain word.

According to the thesaurus centered approach [7] the words are perceived and used by a person due to the relations between them at the paradigmatic and syntagmatic levels. Thesaurus, as a vocabulary of concepts and relations, consists of four main parts: classification part, in which the logical-semantic structures of the subject themes and subthemes are introduced; contextual part, which defines the main thematic concepts; ideographic part, in which the vocabulary articles of the main thematic concepts and

words are introduced, and the fourth part is presented by the bilingual dictionary [7]. Each of these parts performs its own functions. Thus, the function of the classification part is the structural representation of the knowledge system of a certain subject field and systematization of the basic concepts and terms of this field. Contextual part is aimed at learning terms and definitions, thus, promoting the development of the terminological competence of a future specialist. The main part of the thesaurus is presented by the ideographic part, which contains the conceptual vocabulary articles of terms. These articles are created on the basis of paradigmatic (synonymy – antonymy, gender – type, part – whole) and syntagmatic (action – subject of action, action – object of action, action – tool, subject – characteristics, quality, etc.) relations of the term. The meanings of the words, their peculiarities, and some word-combinations are introduced in the fourth part of the bilingual dictionary.

Results and discussion. The process of developing verbal and analytical reasoning involves understanding the basic concepts of the subject field, which form the basis of the subject field lexicon of IT specialists; knowledge of the semantic and functional peculiarities of the subject field lexicon; mastering the algorithm of the word sense-making and semasiological interpretation of the subject field matter.

Due to the fact that IT field terminology is characterized by continuous vocabulary updating, it needs to be systemized and standardized in order to create a unified information space and provide efficient communication between specialists and scientists from different countries. On the basis of the analyzed printed and electronic dictionaries a number of requirements for the creation of the thesaurus for IT specialists as a means of developing their verbal and analytical thinking were determined and the main stages of its creation were defined according to the thesaurus centered approach. To design the thesaurus, it is necessary to determine its morphology, hierarchy, and interrelationships between the concepts [8]. In our case, lexical units should be selected in accordance with the requirements of the curriculum and subject field of IT specialists; the subject field vocabulary and terminology should be organized and structured on the basis of the logical and conceptual relations between the words. Subject field dictionaries, English textbooks / manuals, textbooks for specialized courses, scientific journals (printed and electronic versions) were used in order to select vocabulary and terminology of students majoring in information technology.

At the first stage of designing the thesaurus type dictionary, knowledge system of the subject field of IT specialists was modeled. Having analyzed syllabuses and curricula and taken into account the recommendations of the teaching staff of the Faculty of Computer Information Technologies, six main themes of the subject field were determined, which served as a basis for developing subject field lexicon of IT specialists. They are as follows: *Hardware design, Computer software, Networks, Programming, Data Security, New developments in IT.*

The structure of each subject theme contains concepts that show the essence of this theme and are logically interrelated at the paradigmatic level. The concepts of the lower level specify the concepts of the higher level.

At the second stage of the thesaurus creation, the glossary of the subject field terminology and vocabulary was developed. In order to select lexical units, specialized dictionaries, texts of scientific and subject field literature of IT specialists were analyzed. The criteria for selecting keywords are semantic significance, dominance, frequency of use, a high degree of generalization, and logical semantic relationships between words. Based on these criteria, 170 terms of IT field, which were most often used and entered into paradigmatic and syntagmatic relations with other words in the analyzed texts, were selected.

An example of term definition, which is introduced in a glossary, is given below:

bandwidth $_n$ – the quantity of data that can be transmitted through a network, which is measured in bits per second.

The conceptual articles of terms were introduced at the third stage of designing the thesaurus. These articles were developed according to the principle of vocabulary systematization based on the key words. This means that all lexical units in logical-semantic relations with a certain keyword make a special group, which shows the essence of the concept [6].

With the help of keywords a student can understand the semantic content of information and interprets it. The comprehension mechanism provides a mental analysis of both the content of speech, and the structural organization of speech statement. On the basis of this mechanism, the analysis of the speech situation, programming, planning and control over the results of speech activity is carried out.

Thus, the algorithm of comprehension of the subject field matter, which includes analysis, generalization, semantic interpretation, and understanding the meaning of the content, can be introduced as the following sequence of actions:

1) finding the main ideas of the text, its keywords and phrases, on the basis of which the semantic meaning of the text can be understood;

2) reducing the text content to concise and important logical statements;

3) determining the main concept in each statement, making associations between these concepts;

4) defining the semantic logical sequence of the text ideas from smaller to larger abstractions in the

process of interpreting the text, and, finally, making the sense of the text.

The above-mentioned themes (Hardware design / Computer software / Networks / Programming / Data Security / New developments in IT) have become the headlines of conceptual vocabulary articles containing keywords. On the basis of the keywords, the lexical units are selected according to their paradigmatic associative relationships, that is, synonymous, antonymic, hyponymic, as well as subjective, objective, attributive, and functional relations between terms. An example of conceptual vocabulary article **Computer Networks** can be seen below as follows:

Computer Networks

Antonym Synonym

Biological networks Communication networks

Types

By geographical area: Personal Area Network, Local Area Network, Metropolitan Area Network, Wide Area Network

By architecture: Client server network, Peer-to-peer network

By topology: Bus networks, Star networks, Ring networks

By connection: Wired networks, Wireless networks

Actions: to access, to apply, to connect, to control, to log on, to make up, to manage, to protect, to provide, to set up, to transmit

Objects: adapter, cable, computer, hub, router, server, port

Subjects: administrator, customer, hacker, operator, provider, technician, user

Quality: cheap, fast, high-speed, large, reliable, secure

Acquisition of the subject field lexicon by IT specialists on the basis of the logical-semantic structures of the themes and the conceptual vocabulary articles of the terms promotes using these lexical units whose semantic content is faithfully interpreted by all the participants of the communication. Mastering the algorithm of the word sense-making during the process of the subject field speech activity can be represented as the following sequence of actions: physical perception of the word → understanding its direct, objective meaning → defining its meaning in the context → understanding its semantic meaning → correlation with the existing amount of knowledge of IT specialist → emotional and mental understanding of the word meaning.

Knowledge of the functional peculiarities of the subject field lexicon helps to distinguish between direct or close to direct (*desktop, corruption data, real mode*) and figurative (*mouse track, daisywheel*) meanings of commonly used words that are used by IT-specialists in their subject field speech. In addition, this knowledge provides for distinguishing between the paradigmatic and syntagmatic structural meanings of commonly used words, which can be used for the nomination of specific concepts due to the semantic narrowing of their meanings in relation to the specific terminology.

A necessary condition for understanding between specialists from different countries is unambiguous interpretation of terminology. Thus, the fourth part of the thesaurus type dictionary of future IT specialists involves designing a bilingual English-Ukrainian / Ukrainian-English dictionary in which the words and phrases, which are included into the conceptual vocabulary articles of terms, are introduced. According to the lexicographic approach, there can be full equivalence, partial equivalence, or zero equivalence between source and target language lexical units [4, p. 122]. In a case of zero equivalence, calque/loan/verbal way of translating is used or a term can be translated applying a descriptive method.

While designing the dictionary we followed such lexicographic principles as: consideration of the subject field basic concepts, frequency of words in the subject field texts, word-formation value of the lexical units and their ability to combine with other words, informativeness.

Conclusions. Thus, the efficiency of professional communication depends on the orderly system of lexical units, which is reflected in the mind of IT specialist, his/her ability to choose the most appropriate word of his/her individual internal lexicon for a particular situation.

The development of verbal and analytical reasoning of IT specialist depends on two interrelated subsystems: words (knowledge) that have been previously acquired and new words (knowledge), which are being acquired on the basis of previously acquired knowledge. Expansion of the semantic system of a specialist, the introduction of new senses into it takes place in the process of verbal sense-making. As a result, already known objects and phenomena acquire new senses and become a part of the existing semantic system of sense relations. This process is implemented through analytical and synthetic activity on the basis of the main mental activities and operations (analysis, synthesis, comparison, generalization, classification).

The use of the thesaurus type electronic dictionary in IT-specialists's translation activity is a promising direction for further research.

ЛІТЕРАТУРА
1. Абдулмянова И. Формирование профессионального тезауруса личности как цель профессионального образования. *Вестник Томского государственного педагогического университета.* 2010. Вып. 2 (92). С. 36–39.
2. Лексикон нонклассики. Художественно-эстетическая культура XX века / под ред. В. Быч-

кова. Москва : Российская политическая энциклопедия, 2003. 607 с.

3. Farahian M. Mental Lexicon: Its Organization and Representation. *BRAIN. Broad Research in Artificial Intelligence and Neuroscience.* 2011. Vol. 2, Issue 4. P. 56–59. URL: https://www.edusoft.ro/brain/index.php/brain/article/viewFile/245/378.

4. Головащук С. Перекладні словники і принципи їх укладання. Київ : Наукова думка, 1976. 122 с.

5. Караулов Ю. Русский язык и языковая личность / отв. ред. Д. Шмелев. Москва : Наука, 1987. 263 с.

6. Караулов Ю. Лингвистическое конструирование и тезаурус литературного языка. Москва : Наука, 1981. 363 с.

7. Серова Т., Шишкина Л. Экологический немецко-русский лексикон-тезаурус. Пермь : Перм гос. ун-т, 2009. 358 с.

8. Тюнников Ю. Методологические вопросы формирования тезауруса проектирования содержания ДПО. *Вестник Сочинского государственного университета туризма и курортного дела.* 2011. № 3 (17). С. 142–153.

9. Залевская А. Слово в лексиконе человека : Психолингвичтическое исследование. Воронеж : Изд-во Воронежского ун-та, 1990. 206 с.

10. Залевская А. Введение в психолингвистику : учебник для студентов вузов, обучающихся на филологических специальностях. Москва : Рос. гос. гуманит. ун-т, 2000. 382 с.

REFERENCES

1. Abdulmianova, I. (2010). Formation of the professional thesaurus of personality as the goal of professional education [Formirovaniie professionalnogo tezaurusa lichnosti kak tsel professionalnogo obrazovanniia]. *Vestnik TSPU,* 2 (95), 36–39 [in Russian].

2. Bychkov, V. et al. (2003). In V. Bychkov (Ed.). Lexicon of non-classics. Artistic and aesthetic culture of the 20th century [Leksikon nonklassiki. Khudozhiestvienno-estetichieskaia kultura XX vieka]. Moscow: Rossiiskaia politichieskaia entsiklopiediia [in Russian].

3. Farahian, M. (2011). Mental lexicon: its organization and representation. *Broad Research in Artificial Intelligence and Neuroscience*, 2 (4), 56–59 [in English]. Retrieved June 19, 2018 from https://www.edusoft.ro/brain/index.php/brain/article/viewFile/245/378

4. Holovashchuk, S. (1976). Translational dictionaries and the principles of their compiling [Perekladni slovnyky i pryntsypy yikh ukladannia]. K.: Naukova dumka [in Ukrainian].

5. Karaulov, Y. (1987). In D. Shmieliov (Ed.). Russian language and linguistic personality [Russkii yazyk i yazykovaia lichnost]. Moscow: Nauka [in Russian].

6. Karaulov, Y. (1981). Linguistic constructing and the thesaurus of the literary language [Lingvistichieskoie konstruirovaniie i tezaurus litieraturnogo yazyka]. Moscow: Nauka [in Russian].

7. Serova, T., Shishkina, L. (2009). Ecological German-Russian lexicon-thesaurus: dictionary [Ekologicheskii nemetsko-russkii leksikon-tezaurus: slovar]. Perm: Perm. state tech. University [in Russian].

8. Tiunnikov, Y. (2011). Methodological issues of developing the thesaurus for designing the content of DPO [Metodologicheskiie voprosy formirovaniia tezaurusa proiektirivaniia sodierzhanii*a DPO*]. *Vestnik SSUT i KD*. 3 (17), 142–153 [in Russian].

9. Zalievskaia, A. (1990). A word in the lexicon of a person: Psycholinguistic study [Slovo v lieksikonie chielovieka: Psikholingvistichieskoie issliedovaniie]. Voroniezh: Publishing House of Voroniezh University [in Russian].

10. Zalievskaia, A. (2000). Introduction to Psycholinguistics [Vviedieniie v psikholingvistiku]. Moscow: RGGU [in Russian].