
CONTRASTIVE STUDY OF TERM FORMATION BASED ON SIMPLE NOUNS IN MATHEMATICS (CORPUS BASED STUDY)

Marianna Hudcovičová

The University of Ss. Cyril and Methodius in Trnava, Faculty of Arts, Slovakia,
marianna.hudcovicova@ucm.sk

Abstract: The article deals with a contrastive analysis of mathematical terms, i.e. simple nouns. The research focuses on the term formation within the word class of nouns. Origins of the English and Slovak terms are analysed, described and compared. It is expected that Latin and Greek languages are the original languages of terms in both languages. Furthermore, Slovak terminological equivalents are compared with the English ones in term preference the Latin/Greek term or the native term if exists. According to term formation processes, the following suffixes representing bound morphemes are analysed: -ics, -ity, -ment as well as the Slovak suffixes of the Slovak terms representing possible equivalents. Terms are analysed according to principles for term formation. The following principles should be followed in the formation of terms and appellations, as far as possible and as appropriate to the language: transparency; – consistency; – appropriateness, linguistic economy; – derivability and compoundability; – linguistic correctness; – preference for native language. Data are collected from the Slovak National Corpus 10.0, i.e. English –Slovak Parallel Corpus 4.0 en, Slovak –English Parallel Corpus 4.0 sk and the British National Corpus. The research is based on both languages and comparison of terms in both parts of the corpus. Specific trends and tendencies in the strategies of term formation are analysed. Subject of analysis is the terminological level of mathematics in the Slovak and the English language. The methods of quantitative and qualitative analysis are applied, contrastive and comparative approaches are used. Terminology records of terms are examined from lexico - grammatical point of view and on the basis of term-formation tendencies in each analysed language. i.e. Slovak language and English language. Records include entry, identification number, reference to the term, synonyms, subject field, formula, abbreviation, context, reference to the context, definition, reference to the definition. Furthermore, the statistical value ARF (average rate frequency) is taken into consideration in order to identify the frequency of the suffixes. It is a statistical tool representing the average occurrence of words in the corpus. Outcomes on contrastive analysis of terms/simple nouns are discussed and illustrated in the table.

Keywords: contrastive study, English language, Slovak language, term formation, term,

1. INTRODUCTION

The main objective of the paper is to describe term formation of the selected simple terms of nouns used in mathematics in the English and Slovak languages. The research focuses on terminology work. Pavel and Nolet also define terminology in two ways, terminology can be understood either as a collection of special words belonging to a certain subject field, art, author or social entity, or as a linguistic discipline concerned with the scientific study of the concepts and terms used in specialised languages (Pavel, Nolet, 2001). Stefaniak describes terminology work as follows: “The aim of terminology work is, firstly, to give translators timely terminological support: to find a correct equivalent, to clear the meaning of a concept, to coin a brand new term or to help them choose the right equivalent in a given context, out of many equally correct terms, based on the criteria of consistency, accuracy and clarity. Secondly, the aim of terminology work is to manage the existing terminology resources. This work is both of a descriptive and prescriptive nature ...” (Stefaniak, 2017. p. 109).

The definition according to which the term is „Vocabulary element naming a term defined by definition and a place in the system of concepts of a specific scientific field, technology, economy and other activities” (Masár, 1991, p. 29). Novicki defines the term as: “1. The term is a special case of a name (naming), 2. The definition is a special case of description, 3. The name is usually described, although we could define it, 4. We usually define the term, although we could describe it” (Nowicki, 1986, p. 39). Basic principle for designating the mathematical terms is disambiguation: one concept - one term. Naturally, this principle is typical for one closed mathematical discipline; in different disciplines, the same term can designate different concepts (Čižmár, 2009, p.8).

“Terminological activities can result in a variety of terminology products, such as terminology standards, SPL dictionaries, glossaries, terminology databases, etc. Terminology products and terminology services, such as terminology consultancy and training services, terminology information and documentation, outsourcing of terminological tasks, information services, etc., are usually used as tools for the implementation of a national policy” (UNESCO, 2005. p. 4). Similarly, Horecký also sees the difference between terminology and nomenclature. Horecký defines terminology as a collection of specialised terms used in the scientific disciplines. Consequently, in

terminology understood in this way, a nomenclature as an individual group of terms naming certain things or concepts classified according to the field system is identified. (Horecký, 1956).

Bozdechová (2016) mentions various procedures of term-formation, namely “metaphorization, word-formation, the formation of multi-word terms of different structural types, and the formation of acronyms or abbreviations” which can also be “accompanied by borrowing and loan translation”. She stresses that these procedures usually appear in combinations. Some of these procedures are widely used in certain languages, while others remain rather marginal. Metaphorization is typical feature of fixed expressions. The primary requirement in the creation or implementation of each term, name, title, designation, etc., into practical life should be its unambiguousness. It means that multi-meaning or otherwise complicated words should be avoided” (Sokolovský, 2004).

2. STRUCTURE OF TERMS

Two basic groups of terms can be identified on the basis of the number of the constituents, i.e. a) one word terms, b) multi-word terms. Each group contains its types and subtypes. Subject of analysis are one word terms. They are divided into non-derived and derived terms. Research focuses on one word derived terms. One word derived terms can be formed by prefixes, suffixes or simultaneously by prefixes and suffixes. The base word represents the background for derivation

3. METHODS

The methods of contrastive analysis have been applied. It is a systemic, synchronic comparison of the English and Slovak languages aiming at establishing similarities and differences expressed in terms of correspondence and equivalence between the terms consisting of simple derived nouns in the English language and their Slovak counterparts. In terminology research, the following methods have been used: term and symbol observation, term excerption, conceptual analysis, term analysis. Terminus Plus states that terminological analysis is “The analysis of terms in context and of the concepts designated by them within a given subject matter in order to determine their interrelationships” (TERMIUM Plus, 2012). Methods of term recordings are included. The layout of the terminology record is taken from Cabré (1999) and contains 1. entry, 2. identification number, 3. reference to the term, 4. synonyms, 5. subject field, 6. formula, abbreviation, 7. context, 8. reference to the context, 9. definition, 10. reference to the definition, 11. degree of equivalence, 12. author of record and 13. date of record in both languages. Example of the terminology record is in the table 1. Data are collected from an electronic corpus the Slovak Academy of Sciences called from the Slovak National Corpus 10.0, i.e. English –Slovak Parallel Corpus 4.0 en. Current version par-sken-4.0 is available in the amount 556 mil. tokens (261 mil. Tokens for the Slovak part, 295 mil. tokens for the English part).

4. WORD FORMATION PROCESSES / TERM FORMATION PROCESSES

According to Kvetko (2015) term formation processes are based on the word formation processes. Word formation or word building is the process of building new words by means of existing elements of language according to certain patterns and rules. We distinguish these ways of word formation in English: principal processes: affixation, compounding and conversion. Shortening, back-formation, blending and word manufacture or coinage fall into minor processes.

Derivation is the most common process to form new words in English language. It is defined as a process of adding affixes to words to create new words. In this group we differentiate prefixes and suffixes. Prefixes are added to the beginning of the word (such as prefix bi- in bilingual). Then suffixes are added to the end of the word (such as suffix -ish in greenish). Infix is an affix that is incorporated inside another word. Affixation means building a new word by adding a derivational affix to a derivational base. (Lančarič, 2016, p.81).

Siegel in Štekauer (2000) distinguishes two classes of affixes. This classification is based on the different phonological and morphological behaviour of the two classes. Class I and Class II affixes.

Class I prefixes (+boundary) include e.g. in-, con-, de-.

Class II prefixes (# boundary) include e.g. anti-, pro-, circum-.

Class I (+boundary) suffixes are Latinate ones -able, -en, -ate, -ion, -ity, -y (noun forming)

Class II (# boundary) suffixes are -ness, -less, -ly, -al (noun forming).

Class I suffixes, introduced by +boundary, admit phonological changes (divide vs. division), and cause a rightward shift of the main stress (telegraph vs. telegraphy). Class II suffixes are introduced by # boundary which blocks phonological changes (divide vs. dividing); therefore, they never cause stress shift. Morphologically, these classes differ in that class II affixes may only attach to words while class I affixes may combine with stems. If both class I and class II affixes occur in a word, a class II affix generally follows a class I affix (Štekauer, 2000).

Words can be modified in their form, meaning or function. A suffix usually changes not only the lexical meaning of a word but also its word class (and grammatical meaning). Kvetko (2015) presented the following classification of noun-forming suffixes.

1. -or: actor, visitor, director, instructor
2. -er, -eer: speaker, reader, writer, profiteer
3. -ist: scientist, satirist, journalist
4. -ess: hostess, princess, actress
5. -ty, -ity: cruelty, certainty, oddity, stupidity
6. -ure, -ture: failure, closure, exposure
7. -dom: freedom, gangsterdom, officialdom
8. -age: passage, shrinkage, postage
9. -ance, -ence: appearance, preference, reference
10. -hood: likelihood, brotherhood, neighbourhood, manhood
11. -ing: reading, opening, lining
12. -ion, -sion, -tion, -ation: operation, action, competition
13. -ness: consciousness, willingness, goodness
14. -y, -ery: enquiry, expiry, robbery, slavery
15. -ship: censorship, kinship, ownership
16. -ment: government, management, refreshment
17. -t: complaint, restraint

From above all suffixes, only a few selected ones are analysed: -ics, -ity, -ment. Translationality is the feature belonging to the background of the term. The request is accepted mainly for the terms of Greek and Latin origin. (Masár 2000).

The most frequent noun forming suffixes in the Slovak terminology are presented by Masár (p. 30, 2000). Specific suffixes are classified into sections based on creation of various entities:

A. Persons

In order to form the names of persons, the following native and borrowed suffixes are used:

Native:

1. -teľ: doručovateľ, zlepšovateľ
2. -č: volič, triedič
3. -ník, -nik: tlmočník, požiarnik
4. -ca: sprievodca, správca
5. -ár, -ar, -iar: pripravár, mliekar, guliár

Borrowed:

6. -ista: klavirista, humanista
7. -átor: moderátor, koordinátor
8. -ér: montér, masér
9. -ant: projektant, frekventant
10. -ent: referent, dirigent

B. Objects

The most frequent suffixes are:

1. -č: vyorávač, zhrnovač
2. -ačka: skúšačka, miešačka
3. -ok: nátláčok, odpilok
4. -ina: záclonovina, stavebnina
5. -dlo: čerpadlo, kružidlo
6. -áreň, areň, iareň: skrutkáreň, dozrievareň
7. -ňa: predajňa, výhrevňa
8. -ovňa: briketovňa, strojovňa

C. Features

They are necessary and often occurred in terminology.

1. -osť: prilnavosť, prchavosť, trhavosť
2. -ota: čistota, mokrota, tučnosť

D. Processes

The following native and borrowed suffixes are used:

Native:

1. –ie: zhodnocovanie, tmelenie, plnenie
2. -ba: liečba, plavba, platba
3. –ka: zväžka, vyvárka

Borrowed:

3. –izácia: matematizácia, paletizácia, privatizácia
4. –cia, -ácia: difrakcia, resekcia, diferenciácia
5. –encia: konkurencia
6. –zia: disperzia, invázia
7. –áž: betonáž, senáž

The suffix –stvo, -ctvo is used to form names of jobs, features, ranks, functions, institutions, states (e.g. betonárstvo, učiteľstvo, dobročinnosť, veliteľstvo, ministerstvo, vlastníctvo, šialenstvo).

5. DISCUSSION AND FINDINGS

According to the frequency, the most productive suffix from the selected ones in the English-Slovak Parallel corpus 4.0 en was –ity. It occurred in the 30 terms. Terms are divided into groups according to suffix and the type of equivalent.

A) Suffix -ity

Into the first group we can include Slovak terms with suffix –ost', the equivalent terms are of Latin origin: *entity-entita, integrity –integrita, priority- priorita, linearity-linearita, specificity- špecifickosť, functionality – funkčnosť, validity- platnosť*.

Into the second group we can include Slovak equivalents with the suffix –ost' of the native origin, e.g. *possibility- možnosť, equality- rovnosť, proximity - blízkosť, reciprocity – vzájomnosť, probability – pravdepodobnosť, ability – schopnosť, similarity - podobnosť, irregularity - nepravidelnosť*.

The third group contains equivalents of the Latin origin and Slovak origin with the suffix –ost': *quantity - kvantita, množstvo, compatibility- kompatibilita – vzájomnosť*.

The fourth group contains terms with suffixes ita, -ost'. The Slovak equivalent term of the Latin origin has the suffix –ita, similar to the English –ity, whereas the Slovak term of the native origin has the suffix –ost', e.g. *variability – variabilita - rôznorodosť, superiority – superiorita - nadradenosť*. The group entails terms of the English language and two Slovak synonymous terms: *proportionality-proporcionality, proporčnosť, complementarity - komplementárnosť, komplementarita*.

The fifth group entails suffix –ita and other suffixes, e.g. *disparity- disparita - rozdiel, causality – kauzalita - príčinná súvislosť*. In the case of the last English term, the Slovak term of native origin is represented by the compound term.

B) Suffix -ment

The sixth group represents the terms with the suffix –ment and the Slovak term is of Latin origin with the suffix ment: *argument - argument, element - element, fragment - fragment*.

The seventh group entails Slovak equivalents with the native suffix –ie, e.g. *measurement - meranie, assessment- hodnotenie, statement – vyhlásenie*.

C) Suffix -ics

The terms belonging to the eighth group are derived by the suffix ics in the English language. The Slovak equivalents suffix is –ika, e.g. *statistics-štatistika, mathematics- matematika, arithmetics- aritmetika*.

6. ACKNOWLEDGEMENTS

The article has been written within the project KEGA 006UCM-4/2021 Odborná komunikácia a terminologická gramotnosť v cudzojazyčnom vzdelávaní v strednom odbornom školstve.

Table 1 Terminology record of the term argument

1 (TER) argument	3 (IDC)	1 (EQU) argument	3 (IDN)
3 (ZDR/TER) The open parallel corpus http://opus.lingfil.uu.se/ , PHP korpus		3 (SOU/TER) The open parallel corpus http://opus.lingfil.uu.se/ , the PHP manual corpus	
4 (SYN)		4 (SYN)	
5 (VO) PV – MAT		5 (SF) NS – MAT	
6 (SKR) M		6 (ABBR) M	
7 (KON) Ak vaša funkcia môže nadobudnúť buď argument 2 alebo 3, použite nasledovné:		7 (CON) If your function can take either 2 or 3 arguments, use the following:	
8 (ZDR/KON) The open parallel corpus http://opus.lingfil.uu.se/ , PHP korpus		8 (SOU/CON) The open parallel corpus http://opus.lingfil.uu.se/ , the PHP manual corpus	
9 (DEF) Nezávisle premenná matematickej funkcie.		9 (DEF) A set of statements that serve as premises, together with a statement as the conclusion, such that the conclusion is supported to follow from the premises.	
10 (ZDR/DEF) Encyklopedia.sk, http://www.encyklopedia.sk/index.php		10 (SOU/DEF) NELSON, D. 2003. Dictionary of Mathematics. London. Penguin Books 2003.	
11 (MIE/EKV)		11 (DEG/EQU)	
12 (AUT) Hudcovičová	13 (DAT) 26.1.2023	12 (AUT) Hudcovičová	13 (DATE) 26.1.2023

REFERENCES

- Bozdechová, I. (2016). Word-formation and Technical Languages. [book auth.] p.o. et al. müller. word-formation: an international handbook of the languages of europe. s.l. : walter de gruyter, 2016, vol. iii, 127., pp. 2251-2266.
- Cabré, T. M. (1999). Terminology. Theory, Methods and Applications. amsterdam/philadelphia: john benjamins publishing company, 1999. 247 p. isbn 90 272 1634 7
- Cífbiková, I. (2012). Terminologický manažment verejnosprávnej tematickej oblasti. žilina: žilinská univerzita v Žiline, 177 p. isbn 978-80-554-0559-9
- Čižmár, J. (2009) Matematická Terminológia v školskej praxi. in: medzinárodný vedecký seminár „nové trendy v univerzitnom matematickom vzdelávaní“. trnavská univerzita, Trnava
- Devlin, K. (2011) Jazyk Matematiky. jak zviditelnit neviditelné. argo, dokořán, praha. isbn 978-7363-364-6

- Džuganová, B. (2002) Terminológia ako vedná disciplína. in: kultúra slova [online]. 2002, vol 36, no 3, p. 129-139. issn 0023-5202 [cit. 2022-22-11]. available on: <<https://www.juls.savba.sk/ediela/ks/2002/3/ks2002-3.pdf>>
- Horecký, J. (1956) základy slovenskej terminológie. bratislava: vydavateľstvo Slovenskej Akadémie vied, 1956. 148 p.
- Horecký, J. (1962) K Herminológii matematickej jazykovedy s 193 in československý terminologický časopis, orgán československej ústrednej terminologickej komisie pri prezídiu čsav roč. i – č. 4
- Horecký, J. (1994) semantics of derived words. prešov. p.j.šafárik university, 1994.
- Johnson T., & Neill, H. (2018) mathematics. a complete introduction, john murray learning, london
- Jones, C. et al. (1999) matematika na dlani. príroda. bratislava, 1999
- Jurčacková, Z. (2002) terminológia: základné zásady, metódy a ich aplikácia. bratislava: centrum vedecko-Technických informácií sr, 2002. 72 p. isbn 80-85165-85-6
- Kvetko, P. (2021) Translation Studies. Univerzita Sv.Cyrila a Metoda v Trnave, Trnava. 4. vydanie. 2021. isbn 978-80-572-0194-6
- Kvetko, P. (2015) english lexicology. univerzita sv.cyrila a metoda v trnave, trnava. 2015. isbn 978 80 8105 639 0
- Kudashev, I. (2013) Quality Assurance in Terminology Management. Recommendations from the Termfactory project [online]. Helsinki: University of Helsinki, palmaia centre for continuing education, Kouvola, 2013. 248 p. isbn 978-952-10-7757-9 [cit.2022-09-20]. available at: <https://puolukka.rd.tuni.fi/projectglossary/download/qa_in_tm_kudashev.pdf>
- Laluha, S. et al. (2012) Matematika. maturita. prijímacie pohovory. eurolitera. bratislava
- Lančarič, D. (2016) English Lexicology. kirsch. numbrecht.
- Masár, I. (2000) Ako pomenúvame v slovenčine. sav bratislava.
- Masár, I. (1996) Public Relations. in kultúra slova
- Medek, V. et Al. (1975) Matematická Terminológia. spn. Bratislava.
- Nelson, D. (2008) penguin dictionary of mathematics. 2008. Penguin Books. isbn: 0141030232
- Olejár, M. et al. (2019) Zbierka vzorcov z matematiky. snowmouse. Bratislava
- Pavel, S. – nolet, d. (2001) Handbook of Terminology [online]. ottawa: public works and government services canada, 2001. 172 p. available at: <http://publications.gc.ca/collections/collection_2007/pwgsc-tpsgc/s53-28-2001e.pdf>. isbn 0-660-61616-5
- Pavlič, G. (2001) Školská encyklopédia matematiky. príroda. Bratislava.
- The Penguin Dictionary of Mathematics, (2003) Penguin Books, London
- Sageder, D. (2010). Terminology today: a science, an art or a practice? some aspects on terminology and its development. in: brno studies in english [online]. 2010, vol. 36, no. 1, p. 123-134. issn 0524-6881
- Sedlačíková, B. (2012) historie matematické lingvistiky. akademické nakladatelství cerm. brno.2012 isbn 978 7204 815 1
- Sokolovský, I. (2004) Dejiny a Reformy verejnej správy na slovensku. in: teória a prax.
- Stefaniak, K. (2017) Terminology Work in the European Commission: ensuring high-quality translation in a multilingual environment. [online]. in: svoboda, t. – biel, Ľ. – ľoboda, k. quality aspects in institutional translation. berlin: language science press, 2017. p. 109–121. isbn 9783946234838
- Štekauer, P. (2000) rudiments of the english language. slovacontact. prešov isbn 80 88876 04 4
- Termium plus: the Government of Canada's Terminology and Linguistic Data Bank. [online]. [cit.2022-28-11]. available on: <<https://www.btb.termiumplus.gc.ca/tpv2alpha/alpha-eng.html?lang=eng>>
- Trnka, B. (2014). rozbor nynější spisovné angličtiny. karolinum. praha isbn 987-80-246-2434-1
- UNESCO. (2005) guidelines for terminology policies. paris: unesco, 2005. 39 p. [online]. [cit. 2022-09-20]. available at: <http://www.unesco.org/new/en/communication-and-information/resources/publications-and-communication-materials/publications/full-list/guidelines-for-terminology-policies-formulating-and-implementing-terminology-policy-in-language-communities/>

Standards:

- iso 704: 2009. terminology work – principles and methods
- iso 22128:2008. terminology products and services
- iso 1087-1:2000. terminology work — vocabulary — part 1: theory and application
- slovak national corpus 10.0
- slovak-english parallel corpus 4.0
- english-slovak parallel corpus 4.0