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Topical Issues of Linguistics and Teaching Methods in Business and Professional Communication

**ENGINEERING DISCOURSE AND ITS ROLE IN SHAPING
MODERN ENGINEERING EDUCATION**

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Abstract

The present paper considers principal attributes of the civil engineering discourse terminology. Engineering discourse is understood as some information field based on the scientific worldview and comprising denotative content of an engineering activity. It developed from the applied discourse analysis and applied linguistics and is related to the area of specialized languages. The paper contemplates a problem that the discourse of engineering science is currently dominating in the engineering education discourse while other essential discourses are virtually excluded. The purpose of this study is to direct the change in how engineering is practiced, taught and structured. Outlining the workings of the constitutive discourses can unshackle architecture and engineering from its current limitations as the ability of critical thinking is essential for future engineers. New engineering discourse will go beyond the constraints imposed on it by business and science. The urgent need for engineering discourse that is socially sensitive, inclusive, environmentally-oriented is acute and its role in engineering education is invaluable.

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1. Introduction

Professional discourse studies have come into spotlight during the last two or three decades and have developed as a discipline tackling the issues by numerous discourse analysts and specialists in applied linguistics in an academic manner. According to numerous studies, professional discourse developed from the applied discourse analysis and applied linguistics and could be attributed to the area of specialized languages or languages for specific purposes. However, while teaching English for Specific Purposes (ESP), the use of texts only cannot be considered sufficient as speech utterances can be demonstrated to students only in the dynamics of communication.

In this respect, the fundamental work “The Construction of Professional Discourse” (Gunnarsson et al., 1997) is regarded as the most prominent referential anthology. In this book, the authors outlined the following features of professional discourse: explicit goals and occurrence in professional situations involving communicative event itself; the place of communication and the participants; professional discourse is of expert type and consists of terminology, conventional patterns and text genres; professional discourse is always conventionalized; professional discourse is a part of a “socially organized and structured set of activities within a workplace units” (Gunnarsson, 1997, p. 8).

The study of professional discourse has been developing along with the related spheres of workplace discourse, institutional discourse, organizational discourse, and corporate discourse. Professional discourse is understood as a complex multidimensional phenomenon integrating communication parties, communicative situation and text itself and represents the abstract invariant description of structural and semantic aspects realized in specific texts.

It should be noted that the notion and term of “discourse” do not have unambiguous interpretation that, in its turn, complicates the study of language formations in the light of discourse. In the language theory, discourse is assumed as the speech, being a purposeful social act, as a component, being a constituent part of people interaction and their cognitive processes that should be studied in conjunction with the lifeforms. The meaning of the term “discourse” has undergone significant changes over the last few decades. First, during the 1960s, it meant a connected sequence of speech acts or sentences, basically it was synonymous to the term “text”. Nowadays, this term is referred to as a complex communicative phenomenon that comprises not only the text but the world picture, guidelines, points of view, professional opinions, so-called extralinguistic factors that are of paramount importance for text comprehension. Gradually, the term of “discourse” has been incorporated into the learning theory of foreign languages and acquired saliency since the theory and practice of language teaching has been text-oriented.

In Russian linguistic studies, the issue of separating engineering communication into specific discourse structure has never been practically set. The term “engineering discourse” was first coined in 1999 (Avdeyeva, 1999) and later explicitly elaborated (Ptashkin, 2015). The subject of separation engineering discourse was first brought up in connection with the methodology of teaching Russian as a Second Language. In the works of Avdeyeva (2014), there was implemented the serious research in the sphere of description of engineering reality from the perspective of cognitive mechanisms and the pragmatics of real facts of engineering activity. Starting from extralinguistic factors organizing engineering activity, a researcher is moving towards the description of speech culture of an engineer

(Sidelnik et al., 2016). Engineering discourse is understood as some information field based on the scientific worldview and comprising denotative content of an engineering activity.

2. Problem statement

The rapidly developing construction industry is considered one of the most important determinants of modern society development defining the urgent need for investigating the communication and specific features of discourse in this sphere. In this context, the study of professional discourse, in particular, in construction sphere, is seen as the most actively developing trend of the modern discourse theory shaping the relevance of the present study. In this paper, the author expresses the concern that the discourse of engineering science is presently dominating in the engineering education discourse, thus other discourses, important for the daily practice of engineering are virtually excluded. Moreover, engineers are presently working under the inappropriate constraints imposed on their profession by the discourses of science and commerce, which have been allowed to determine and delimit the sphere of engineering. This resulted in a serious limitation in an engineer's capability to research to social effects of their performance and to reflect upon their professional identity and practice (Stonyer, 2002). The hypothesis can be made that the discourse of engineering education and practice is subject to change so that the profession of an engineer can realize the objectives outlined explicitly in professional codes of ethics.

3. Research questions

The object of the present study is the basic discourse forming the key terms, notions and lexis attributed to the professional discourse in the sphere of architecture and civil engineering. In construction sphere of physical output producing the main commercial and non-commercial assets, buildings and structures ready for operation and maintenance, the key denotation is the activity of construction specialists whereas architecture is seen as the art of designing buildings and structures solving aesthetic and social issues.

4. Purpose of the study

The analysis presented in the paper seeks to open the ways to change in how engineering is practiced, taught and structured. It is argued that outlining the workings of the constitutive discourses can unshackle architecture and engineering from its current limitations, i.e. freeing the discourse and allowing engineers to think critically.

5. Research methods

In the present paper, the method of discourse analysis has been applied, this method helps enhance collective understanding of teaching and learning processes, as well as the social, political and historical factors that affect those processes. Discourse analysis is applied as a method of inquiry to wrestle with the issues of context, definitions of text, and notions of professional discourse. Its main purpose is to investigate the functions of language and how the meaning is being constructed in various contexts that

comprise political, cultural, social, and historical backgrounds of the discourse, in particular, engineering discourse, which is considered in this study.

6. Findings

Architectural and engineering discourse is a functional and terminological variety of scientific-professional communication represented by means of thematically interlinked texts of the subject area called “Construction”. Architectural and civil engineering discourse, in whole, is marked by cognitive, thematic and structural integrity whereas genre variations of architectural and engineering discourse are distinguished by the level and specifics of the actualized general discourse features (Boettcher & Kim, 2022). It should be mentioned that in the framework of the research, the terms “architecture” and “construction” are considered in the united field terminology as architecture and construction are closely interlinked.

As for any other discourse, architectural and engineering discourse has a field structure whereas in the center of this structure there are the genres fully corresponding to the primary function – professional communication of the society of architects and engineers, such as explanatory notes to drawings, scientific paper, lecture, monograph, educational tutorials of engineering students, etc.

The following could be related to the peripheral genres (Petrova, 2015): practical recommendations for non-specialists, i.e. the Internet-forums created by civil engineers and architects for the purposes not related to work and social interaction, the messages of non-specialists in construction in the Internet-forums, such as texts discussing the issues of construction and refurbishments of apartments, houses, summer cottages, as well as advertising texts written by the professional society of marketing professional in construction industry.

As the previous studies have shown (Tenopir & King, 2004), engineers spend more than the half of their working time on various types of professional communication, e.g. participation in business meetings, discussions, reading reports, scientific articles, electronic mail for the peers and clients, preparing presentations or claims for projects, technical documents and notes to drawings, developing software complexes, etc. The studies of Australian researchers specialized in engineering education (Johnson et al., 1996; Sokolova & Bystrova, 2021) have enumerated the following kinds of engineering discourse: management of engineering activity that presupposes understanding of technical and financial issues; supporting technological advances and innovation is process, systems and products; industrial design comprising ergonomic and aesthetic issues; engineers must be able to determine whether the system or product design is appropriate; the knowledge of sociology, understanding the place of engineering in cultural and social contexts; environmental challenges being a discursive complex itself; philosophy and ethics, etc.

Engineering is a broad multi-disciplined activity that should be directed into well-determined channels, the same as building blocks and bricks must be standardized to compatible and reliable forms. Thus, the importance and timeliness of national and international regulations, standards, protocols, and procedures can hardly be overstated. Engineering research must be focused on innovation and technological advances aimed at developing new processes, technologies, systems and improving the outcome and productivity. At the same time, focusing on production excludes the issue of distributing the

benefits of engineering, the problem comprises the other related discourses of business or politics. That means competing discourses are to be named and articulated whereas their relationships must be debated and openly investigated.

Modern engineering practice is being shaped in some ways that are not directly fall into the terms of the dominant discourse. The drastic shift from hand-on practice or field experience towards the development and technological advancement is taking place nowadays. Thus, development of engineering professional discourse is presently oriented towards the analysis of existing engineering practice based on the design activity. The design activity itself commences from the selection of the issue that is commonly controlled by political or corporate managers. This stage is followed by determining the features of an acceptable solution and generating alternative approaches to solution of the issue. These alternatives then are to be reviewed against the specifications and a preferred solution is to be selected, documented, disseminated to the relevant participants of the design process and implemented. At the final stage, the design outcomes can be reviewed if necessary. The process of design includes continuing adjustment, refinement and amendment of the problem definition, product as well as production process. Engineering educators and engineers have been struggling to locate design adequately within the framework of the discourse, whereas the importance of developing design skills has been greatly affected by the development of cutting-edge information technologies. The scene of engineers' work is becoming a scene of professional discourse in the modern engineering workplace. It is worth mentioning some features of the occurring shift of contemporary engineering work.

The first principal feature of engineering practice is the paperwork supporting engineering systems and processes as well as the documented products, e.g. technology and maintenance manuals, safety procedures, application instructions, etc. (Aranda et al., 2020). Here, the contribution of modern information technologies comes invaluable as global markets have generated the urgent need for a functional and user-friendly engineering support. Some honorable mentions of globally used software packages include Coins, Foundation, PENTA Enterprise Construction Management, e-Builder Enterprise, Procore, Prolog, On-Screen Takeoff and others.

The second feature is the rising need for so-called "soft skills" or communication skills of architects and engineers imposed by simplified management structures, the necessity to communicate directly with clients and an ever-increasing complexity of multifunctional engineering work. Team cooperation for engineers and architects is essential, moreover engineers are supposed to work effectively with other professional across hierarchies and disciplines. The gap between the outcomes of engineering practice and professional engineering education is commonly interpreted by employers as the shortage of management and communication or interpersonal skills. Unfortunately, these skills are commonly seen as inappropriate and irrelevant by engineering tutors, so not much attention is paid to the development of communication skills in the curriculum of third-level engineering education. However, in the course of their day-to-day work, engineers are often asked to give explanations, justifications, persuade management or clients, or argue and give plausible arguments supporting the selection of an engineering solution. Thus, engineers usually assume that the engineering fact are self-explanatory and there is no need to speak outside their own professional discourse. Nevertheless, engineers must work effectively

across disciplines, so they are supposed to be aware of the discursive nature of constructs and to be able to present, explain and provide arguments justifying their validity and significance.

The profession of an engineer today is focused on re-engineering. Nevertheless, the situation is unlikely to change unless the engineering discourse includes social, economic, political, and environmental issues. Engineering education will greatly benefit from the awareness of social responsibility in engineering, e.g. creating facilities for people with reduced mobility, public amenities, recreational zones, etc. The analysis of the problems that engineers face today usually commences when the key parameters have been determined and set by others, and this places some constraints and limitations. Engineering students usually apply the material of engineering science to well-defined realistic issues and tasks (Beddoes, 2014). However, political issues, for example, are assumed as risky and outside the scope of engineering concern, and often omitted by academics.

Also, engineering practice can be successfully integrated into engineering education by introducing the period of placement, practical training, industrial experience, partaking in student construction brigades, etc. (Klassen & Case, 2022). The approach has proven effective by the existence of persistent cooperative courses in engineering regardless the shortage of funds and sometimes poorly coordinated efforts involved in organization of these courses.

Another interesting practice applied in American engineering institutions is the use of teacher discourse moves (TDMs) encouraging students' learning and engagement in educational process. Mostly, the instructors guide students in active learning activities by using authoritative discourse approach. As opposed to it, TDM is characterized by high dialogic, interactive discourse and improves interaction between instructors and students immensely (Alkhoury et al., 2021).

Nowadays, background learning plays a crucial role in engineering education as young scholars are learning to take part in engineering discourse by using the words, visuals, narratives and routines that enable them to think, communicate and interact effectively (Martin & Betser, 2020). The major purpose of engineering education is identifying the processes by which future engineers acquire fluency in engineering discourse, and how lecturers and instructors can guide them through this process. Thus, involvement in out-of-school activities, e.g. an optional course of informal design, help students to gain interest and learn skills in engineering design.

The shift in policy thinking related engineering education, which was marked by the US National Academy of Engineering report, is of paramount importance. The emphasis of the leaders in engineering education has shifted from fostering engineers based on current socioeconomic demands to actively envisioning and forming the characteristics of engineers in the future (Cao et al., 2021).

7. Conclusions

Thus, it is possible to conclude that multifactorial and polysemantic nature of the notion "discourse" has determined its broad diffusion. Regardless its multidimensional formation, discourse is characterized by the openness. Discourse comprises thematic or logic-conceptual blocks that conceptualize the various fragments of this and that sphere of communication.

As discussed above, the situation with professional engineering and architectural discourse is gradually and slowly changing. While the concepts of diversity, consultation and globalization are

dominating, one can observe communication between those supporting the prevailing discourse and its challengers. New engineering discourse will go beyond the constraints imposed on it by business and science. The urgent need for engineering discourse that is socially sensitive, inclusive, environmentally-oriented is acute and its role in engineering education cannot be overestimated.

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