



# Knowledge Construction and Knowledge Transfer in Technical Writing

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## Abstract

*Modern research and practice reveal that writing in a foreign language in both learning and professional settings has become a major means of international communication. The focus of this paper is the process of integrated and purposeful teaching and learning to undergraduate students of engineering sciences such aspects of technical writing as knowledge construction and knowledge transfer. These two key aspects form the concept of technical writing and are of major importance in the process of teaching and learning English for Engineering. The paper provides a comparative analysis of the two aspects with the purpose to evaluate their roles in the process of teaching and learning technical writing. Special emphasis is put on the importance of integrated use of both techniques in the classroom, where technical writing is viewed not only as a purely 'mechanical' process, but also as a means of communication. A case study was carried out in two undergraduate student groups at the Latvia University of Agriculture that revealed the following: a) classroom instruction is most effective if supported by authentic examples; b) practice and theory should permanently overlap; c) exposure to authentic settings and out-of-class practice is more effective than fixed classroom procedure.*

*Keywords: English for Engineering; technical writing; knowledge construction; knowledge transfer; technical communication.*

## 1. Introduction

In the process of communication, the main purpose is to convey certain information to the target audience (reader or interlocutor) in a way that the message performs successfully its communicative task. The tasks may vary from one communicative situation to another, as well as is dependent on the audience background (e.g. age, education, professional interests, etc.). This variety of contexts determines the linguistic properties of the message, beginning with the lexical and finishing at the level of discourse.

Modern technological progress together with social and cultural changes has transformed the ways and means of communication in a foreign language, modified its purposes and broadened the environments where the communicative events take place. The focus of the present paper is to consider the approach to teaching and learning written technical communication (also known as Technical writing) to undergraduate students of Civil Engineering at the Latvia University of Agriculture. The key issue is to search for a balanced approach to the learning process that would enable the students learn both the mechanics and the communicative aspect of technical writing.

## 2. Materials and Methods

The purpose of this article is to analyse the concepts of knowledge construction and knowledge transfer in application to technical writing classroom. The author seeks to single out the aspects that can be applied in the classroom to enhance the undergraduate students' learning of technical writing and technical communication.

The present study is based upon the research on technical writing (Schneider, Windsor, Miller), technical communication (Blake and Bly, Lay et al.), teaching ESP writing (Dudley-Evans, St John). The research tools are: theoretical literature analysis, comparative analysis, case study, observation, testing, data analysis. The research outcomes would help to tailor the approach to teaching technical writing and communication to undergraduate students' needs.

## 3. Knowledge Construction and Knowledge Transfer in Technical Writing

First of all, one should get an understanding of the concept of "technical writing" and "technical communication". Miller defines it as a specific type of foreign language writing, which is above all



subject to strict formats and mechanics and the use of field-specific terminology [1]. Meanwhile, technical communication is the study of how to represent complex technical, scientific and professional information [1], i.e. the former comprises just a part of the latter, the latter being a much broader notion that goes far beyond 'constructing' the message. Collier and Toomey give a more comprehensive definition of the same concept. 'Technical Communication is a process of gathering, organizing, presenting, and refining information. It is also a process of persuasion that often appeals to objectivity to convince an audience. Finally, it is a process shaped by the contexts in which it occurs and that is improved when it recognizes these contexts. [2]

At this point, one can notice the principal difference between the two key notions discussed in this paper: technical writing and technical communication. Though sometimes these terms may be used interchangeably, for the present study it is essential to distinguish one from another. Primary concern of Technical writing is the 'structure': formats, conventions, precision in terminology; while that of Technical Communication is more social: message transfer to the target audience in a variety of contexts.

In addition to mechanics, technical writing involves another very important process which is called 'knowledge construction'. As it was already said, the goal of any technical text is to transfer knowledge to the reader, but before this knowledge is transferred, it has to be constructed. Knowledge of terminology and lexical accuracy are not enough to produce a quality piece of writing. The writer should apply his own knowledge and experience, process it through the prism of formats and mechanics – and only then one can get an informative written text that brings the message, not just a collection of facts. 'Knowledge is not found ready-made in nature. Instead, knowledge is constructed in the interplay between nature and the symbol systems we use to structure and interpret it' [3].

As long as teaching writing is concerned, there two 'traditional' approaches in use: process and genre (or product) [4]. The former sees writing as a multi-level, circular process, some stages of which repeat and overlap. In more simple terms, it studies *how* to produce a piece of writing. Meanwhile, the genre approach is aimed at the written message as a 'product', where one normally follows certain genre patterns, lexical conventions, style and register conventions, etc. This approach is widely used in ESP (English for Specific Purposes) classroom in order to develop the students' awareness of the requirements imposed by the genres applicable to their field: e.g. technical description, user manual, summary, etc. Major advantages of the approach are that the students are exposed to sample texts that they can analyse from the lexical and stylistic point and further follow these patterns when they 'build-up' their own pieces. One can emphasise the following key aspects that the learners need to be aware of at this stage:

- formats and mechanics – technical accuracy and following conventions;
- precision in the use of terminology;
- clarity and brevity – clear organisation and usefulness of information;
- technical-technological culture awareness – understanding of target situation requirements [5]

Dudley-Evans and St John support another approach, which shares most features with the genre one, yet puts more emphasis on language construction at the level of discourse: Social constructionist approach. This approach is more focused on the context and the target situation and target audience, i.e. besides following the genre conventions, students also learn how to meet the requirements and expectations of the reader in various communicative situations. The scholars suggest the following steps in the approach to teaching and learning writing [4]:

- using model texts to develop rhetorical awareness;
- practise specific genre features;
- develop the awareness of the needs of the target situation and target audience;
- process and evaluate writing.

This brings us to the next level – technical communication and knowledge transfer.

As it was mentioned before, the key purpose of technical communication is to present the information to the audience precisely, objectively and non-ambiguously, taking into account the requirements of a unique communicative situation/event.

By precision one should understand first of all the use of proper terminology. As long as technical language is concerned, term precision is of greater importance than the linguistic or stylistic. Technical text carries a straightforward message, which is also usually free from any national and cultural



peculiarities [6]. However, in order to communicate the message most effectively, one may need to tailor the message to the peculiarities of the target reader: e.g. change the units of measurement, use description if the target notion does not exist in the target culture, etc.

The notion of objectivity is less concerned with the knowledge construction, but brings to the foreground the communicative aspect, namely, the target audience. Technical communication happens in different environments, in a variety of contexts and settings, and each communicative act is unique by itself. Moreover, the contexts tend to change nowadays quite rapidly, following the developments in society, economics and technology. Thus, how can one meet all the requirements and produce a quality written message then?

Lay et al [8] claims that there is no absolute objectivity, because the audiences may be homogeneous and still have multiple needs and interests, or 'multiple' yet with similar needs. The scholar suggests to 'translate' the needs of one group or audience into the needs of another. At this point, the same constructed knowledge and the same written message is transformed and transferred to the target audience in the way that it meets the target needs of the former. This is how technical communication functions.

#### 4. Discussion and Conclusions

The question posed at the beginning of the case study was: is it possible to combine and balance the teaching of technical writing and technical communication techniques to inexperienced undergraduate students of Engineering Sciences to make learning more efficient? The study embraced the population of 53 Freshmen studying Civil Engineering at the Latvia University of Agriculture. The university has a long tradition of teaching Technical English, though there is no separate course in technical writing in the curriculum. Technical writing and communication are taught as an integral part of the course "English for Engineering", which provides a comprehensive approach to the acquisition to language learning (i.e. gives equal priority to all four language macroskills).

The key issues to be addressed were two: 1) the balance of theory (teaching writing techniques, formats, mechanics, etc.) and practice (learning communication techniques); and 2) the proportion of authentic materials and out-of-class practice in technical communication versus fixed classroom procedures backed up by textbook tasks. It should be noted that the course 'English for Engineering' is based on the Cambridge textbook series by M.Ibbotson – Professional English in Use and English for Engineering – that expose the learners to a variety of authentic and authentic-like materials. However, for the focus skill of the present study, which is technical writing, they offer rather limited practice. Therefore, additional materials are being used regularly, most of which do not come from textbooks. Instead, the students are offered to deal with a real-life situation that fits their professional and personal interests as a group of learners.

This type of writing practice involves using e-mail and the Web resources, such as, for instance, discussion groups within social networks. Another widely used 'authentic' practice is making reports in the classroom using PowerPoint and other tools: this type of task not only provides writing practice, but also develops critical thinking and communication skills (as the task is carried out as both individual and pair- or group work). Finally, students with high motivation and advanced research and linguistic skills have an opportunity to write a research paper for the annual student conference that takes place at the Latvia University of Agriculture. It goes without saying that this kind of practice is a perfect combination of knowledge construction and knowledge transfer and, moreover, it functions in a real communicative situation for a real audience.

The student population of this year's study were regularly exposed to three types of writing practice:

- fixed authentic-like classroom practice – after having had a piece of theory and instruction from the teacher, the learners fulfil a textbook task following the formats and mechanics that they have just learned about;
- semi-controlled individual in- or out-of-class practice – students perform on the given topic, technique, etc. individually or in pair or groups without teacher's guidance; the result is evaluated upon the task completion;
- free out-of-class practice – the learners may do additional activities in fully authentic settings (e.g. in discussion groups), which are not evaluated, yet much appreciated and shared in class.

Observation during first six months (the course begins in September and lasts till the end of May) revealed that, in general, the learners' motivation to perform writing activities is rather high in the face



of a rather common opinion that writing is the least favoured skill among all macroskills. However, as long as learners saw the purpose for writing, knew what and how to do – i.e. had been properly instructed about formats and mechanics – and the topic met their professional interests, they were always eager to perform that kind of written task. Individual and pair- or group work is traditionally very popular with the students of Engineering sciences: they enjoy sharing knowledge and experience with peers, moreover, they have good time management and information organising skills. Due to their profession peculiarities, teacher instructions on knowledge construction in technical writing are always understood and serve as a proper basis for further activities aimed at following the pattern. When it comes to knowledge transfer, teacher instruction should by no means be neglected, for the reasons mentioned above. The observation and the analysis of the students' written work proved that, though at times the communicative task may be done only partly, the formats and mechanics of the genre are followed quite precisely. Clarity and brevity are the terms that characterise most precisely the works of the student population.

Discussions with the learners supported the argument made during observation: the majority rather enjoys performing brief and clearly formulated written tasks that fit their interests. However, fixed classroom practice is the least favoured type of activity. Among the arguments they mention is 'insincerity' (i.e. artificiality) and the 'threat' of formal evaluation. Pair and group work are the learners' favourites among classroom activities: they give a chance to share knowledge, brainstorm ideas and compare their work to that of others. Thus, the aspect of competition plays an important part in learners' motivation. This argument fully supports the previous one: the task is motivating if it has a real objective and audience, as this guarantees feedback. Finally, the learners shared their surprise at the fact that individual out-of-class (and uncontrolled) practice is not only exciting, but is perhaps most useful. They do not only get new information and knowledge, but also construct their own and share it with other users of the same resource, develop critical thinking, and communication skills in authentic settings. Finally, the learners admit that the absence of 'frames' and teacher's control makes this activity more motivating, and the possibility to discuss their experience and achievements instead of formal evaluation from the teacher's part makes the process more 'exciting'.

In conclusion, the author would like to make a few remarks:

- Pre-experienced learners need regular instruction about both knowledge construction and knowledge transfer techniques, as this is a transition from controlled to free practice that will enable them to employ their knowledge and skills also outside the class.
- Authentic materials should comprise major part of all the course materials. They prove to be more motivating for students. Authentic-like materials are useful at the stage of formal instruction, because their role is to support and illustrate theoretical basis. However, the choice of authentic materials should be fully dependent on the interests of the target population and take into account their linguistic and professional experience.
- Classroom procedure that embraces both controlled and semi-controlled practice appeals to the learners and increases their motivation. Besides, out-of-class practice as an additional element of the learning process should be offered to students. More advanced and motivated students develop their knowledge and skills this way most efficiently.

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