

Elasticity of Knowledge in Communication: A Case of the Teacher and Student Interaction

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Abstract

Lack of knowledge makes a barrier for human communication. Similarly, a poor quality of knowledge of the communicating parts also impairs effectiveness of communication. In this paper, *the elasticity of knowledge* is proposed to be viewed as an aspect of its quality. Only the propositional knowledge on some subject is considered. The simplest form of its representation—a list of concepts—is viewed. Knowledge elasticity is defined in terms of the response sensitivity of the communicating parts to the change in a message. In particular, a question and an answer are viewed as the messages; the change of answer in response to the change of question is considered. The idea of the knowledge elasticity in communication might be compared to the idea of elasticity applied in economics (e.g., elasticity of the supply and demand). A process of the teacher and student communication is considered in terms of elasticity in more details.

Introduction

Knowledge is one of the factors considered in describing the models of human communication; David Berlo provides one of such models (Berlo, 1960). It is commonly admitted that lack of knowledge on the subject of communication makes a barrier for communication. More generally, effectiveness of communication depends upon the features of knowledge on the subject of communication of the sender and receiver. In this paper, it is assumed that a special feature of knowledge, its elasticity, is one of the factors influencing the process of communication and its effectiveness.

Elasticity of knowledge in communication might be interesting for various research areas of communication; this paper focusses on the area of instructional communication (Mottet, 2006; Walton, 2014). Elasticity of knowledge until now was not considered neither in the research area of instructional communication, nor in any other domain of communication.

The purpose of this paper is to introduce the idea of knowledge elasticity into the description of the communication process. In more details, the purpose is to analyse one of its cases—*knowledge elasticity in teacher and student communication*; and, in particular, in the *process of communication in assessing the student knowledge*.

The Idea of Elasticity of Knowledge

The concept of elasticity is a widespread idea in modern life and science. In the *theory of elasticity*, it is considered in scientific terms. In economics, elasticity is considered as *responsiveness of a dependent economic variable to changes in influencing factors*. For example, demand is said to be elastic when it responds quickly to changes in price. In this paper, elasticity is defined similarly: *The knowledge is elastic if it responds sensitively to the change of action exerted on this knowledge*. Question and answer as action and reaction are proposed to be used for its external observation. Definition of elasticity then is modified as follows: *Knowledge is elastic if it responds sensitively to the change of the question about its content*.

Only a few research works consider elasticity of knowledge—as a scientific term—directly (Budrevicius, 2014).

In this paper, only the propositional knowledge on some subject is considered. The simplest form of its representation—a list of concepts—is viewed. A question used to explore the knowledge might be formulated as follows: “What terms describe the topic <a title of the topic>?” A system of concepts allows representing the basic knowledge. Such a way to represent knowledge allows simple estimation of its change: assuming that a different set of concepts (terms) represents the different knowledge, a change of terms in the set indicates a change of the knowledge. Two questions having a similar meaning might be asked to observe a change of the knowledge; the second question should only slightly (just-noticeably) differ from the first one to remain within limits of the considered topic. It might be formulated, for example, as follows: “What terms belong to the topic <a title of the topic>?” The answer should indicate, correspondingly, a slight change of the knowledge—a part of the listed terms in the answer, generally, should be different. Several or more pairs of questions should be employed to assure that sensitivity of the response is a regular phenomenon.

Not all knowledge—even of an expert—is elastic. This feature is applicable only for the knowledge belonging to the *domain of elasticity*. The domain might cover all considered

subject area or only its part. In case of the teacher and student interaction, its content might be described, for example, by a lecture title. The elasticity domain might be determined experimentally. Preliminary, existence of a particular domain of elasticity might be assumed taking into account quality of the considered knowledge: It is natural to expect that the top-quality knowledge should be elastic. Taking into account definition of elasticity, it is natural to require that knowledge in the domain of elasticity should be: a) full (complete, all-inclusive), and b) sufficiently detailed. Generally, domains of elasticity might be found considering knowledge about things we know very well; it is natural to think that experts, advanced researchers, highly qualified professionals, and best students might possess elastic knowledge in the domain of their competence.

Implementation of the difference between two questions is essential for observation of the elasticity reactions. Elasticity is a *relative* feature: The same knowledge for a stronger action—when there is a bigger difference between two questions—might behave as *inelastic*. The difference therefore should be *relatively small*. The same requirement might be obtained taking into account the idea of *response sensitivity* used in the definition of elasticity. The difference between two questions is not physical; it is semantic—defined in terms of meaning. Physically, e.g. in terms of number of words in their formulations, the questions might differ significantly. Here is an example of two *just-noticeably semantically different* (jnsd) questions:

- a) “What are the main terms of your topic?”
- b) “What are the most important terms of your topic?”

The just-noticeable difference is implemented here by means of replacing the word *main* by a phrase *most important* which has more or less equivalent meaning. The difference, therefore, is really very small and possibly it might be treated as just-noticeable. Its final evaluation, however, might be obtained only by means of analysis of the answers of at least several respondents.

Elasticity of Knowledge in the Process of Communication

Berlo (Berlo, 1960) provides a SMCR (Sender-Message-Channel-Receiver) model of communication (see Figure 1); the model includes knowledge as a one of the factors describing the process of communication.

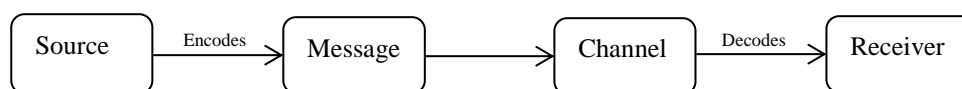


Figure 1. A SMCR model of communication.

Berlo defines a set of factors related to Source, Receiver, Message and Channel. The factors related to Source and Receiver are as follows:

Communication skills – it is the individual’s skill to communicate (ability to read, write, speak, listen etc...);

Attitudes – towards the audience, subject; e.g. for the student the attitude is to learn more;

Knowledge – about the subject one is going to communicate;

Social system – it includes the various aspects in society like values, beliefs, culture, religion, etc...;

Culture – of the particular society; it also comes under social system.

For an effective communication to take place the source and the receiver needs to be in the same level.

There are following factors related to Message:

Content – the matter, e.g. text of the message;

Elements – include various things like language, gestures, body language etc.;

Treatment – the way in which the message is conveyed;

Structure – how it is arranged or split into various parts;

Code – how it is sent (language, body language, gestures, music, etc.).

Factors related to Channel are as follows: The five senses which we use, that is, hearing, seeing, touching, smelling, tasting.

In this paper, knowledge is the central idea for describing communication; therefore, the process of communication might be presented as it is shown in the Figure 2.

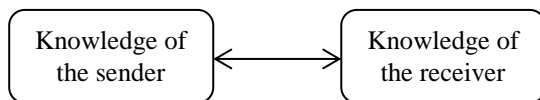


Figure 2. Process of communication presented in terms of knowledge.

Considering the model in terms of elasticity, there might be the following four basic cases:

- Knowledge of the sender and receiver are elastic (e.g., as in communication of two experts);
- Knowledge of the sender and the receiver are inelastic (e.g., as in communication of two students);
- Knowledge of the sender is elastic and knowledge of the receiver is inelastic (e.g., when a teacher communicates with (to) a student);
- Knowledge of the sender is inelastic and knowledge of the receiver is elastic (e.g., as a student communicates with (to) an expert).

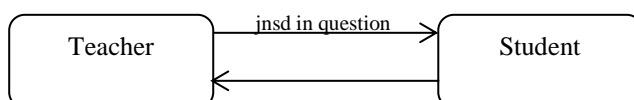
It should be noted that provided examples describe only a typical or more probable state of affairs.

Knowledge Elasticity in the Teacher and Student Communication

Knowledge of a teacher—as a rule—is elastic; knowledge of a student on the studied subject, generally, should be elastic only in the final phase of learning, when the student usually is supposed to have a full knowledge on the studied subject.

Completeness of knowledge, however, is not a sufficient reason for some teachers to grade performance of a student excellently. A teacher may want to get more evidence on the quality of the student knowledge. He might ask additional questions for this purpose. For example, he might slightly change his previous question trying to determine *how sensitively the student responds to the change of the question*. The student is expected to *respond sensitively*—to change his answer correspondingly. This situation naturally may be treated in terms of elasticity: It may be assumed that the student demonstrates *elasticity* of his knowledge.

Using above provided definition of knowledge elasticity, and the way of its observation by means of the *just-noticeably semantically different questions* (jnsd), the situation of teacher and student communication may be presented as it is shown in the Figure 3.



jnsd in answer

Figure 3. Model of the teacher and student communication for observation of elasticity of the student knowledge; “jnsd” stands for a “just-noticeable semantic difference”.

Below, an example of the typical elasticity reactions—presented in terms of the teacher questions and answers of the student—is provided to illustrate this situation in more details.

The subject area under consideration is *Information management*. Three students are considered to illustrate different degrees of knowledge elasticity. The following two questions (similar to those mentioned earlier) are used to explore elasticity of the knowledge:

- a) “What are the main terms of the topic *Information management*?”
- b) “What are the most important terms of the topic *Information management*?”

The students are asked not to look at their previous answer to prevent its influence. The elasticity reactions are as follows.

Inelastic (rigid) knowledge (elasticity is close to 0%). Answers of the 1st student:

- a) “*Information, management, information resources, information maturity, information policy, information culture, information strategy*”;
- b) “*Information, information resources, information maturity, information policy, information culture, information strategy, management*”.

All terms in this case are almost exactly the same, only one word is added in the second answer. Knowledge of the student, therefore, might be viewed as almost *fully inelastic*.

Medium elasticity of knowledge. Answers of the 2nd student:

- a) “*Information, data, knowledge, information resources, collecting, processing, storing, dissemination, using, management*”;
- b) “*Information collecting, processing, analysis, storing, dissemination, using*”.

There are four different terms in the two answers; the general meaning of the two answers, however, is quite similar; the grade of knowledge elasticity, therefore, might be treated as *medium*.

Highly elastic knowledge (close to 100%). Answers of the 3rd student:

- a) “*Information, management, knowledge, information science, intelligence, non-material wealth, resource*”;
- b) “*Perspectives, information management, innovativeness, non-concreteness, uncertainty, non-materiality*”.

There are nine different terms in the two answers; hence, the answers are almost entirely different. Nevertheless, both answers still belong to the domain of *Information management*. It might be concluded, therefore, that a small change in the meaning of question causes a significant change of the answer. This reaction, consequently, might be treated as indication of the *highly elastic knowledge* of the student.

Considering the provided example, it should be noted that the procedure applied for estimation of the semantic difference between the answers is very rough; it should be improved.

To summarize, the example demonstrates manifestation of the different degrees of the student knowledge elasticity and how it may be estimated. The example is not meant to estimate efficiency of the teacher and student communication; it should be a further task.

Conclusion

Phenomenon of the knowledge elasticity in communication has not attracted attention of researchers until now. Its description and method of observation is provided in this paper. Several main cases of communication processes are singled out on the basis of the different grades of knowledge elasticity of the communicating parts.

A simplest way to represent knowledge—a system of concepts—is considered. This choice allows simplifying observation of the elasticity. The method of the *just-noticeable semantic difference* is used to explore the knowledge elasticity. For illustration, an example of the knowledge elasticity in teacher and student communication is analysed.

Other means of knowledge representation should also be considered in the future explorations of the knowledge elasticity in communication. Measurement of elasticity is essential for a further research. The scale of order is used for a qualitative evaluation of elasticity. Indicator of the change in the meaning of the answer—the number of different terms and words—is applied; it should be further refined to develop a more detailed scale of the order; for example taking into account inclusion of terms into one another.

As a next step of research, might be analysis of dependence of the efficiency of the teacher and student communication on the grade of elasticity of the two communicating parts. Described ideas might facilitate a further research in developing communication models based on the idea of knowledge elasticity.

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