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# LOGICAL COMPREHENSION OF CONCEPT AND CORRESPONDING TERM

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Expressed issue in the article "Logical comprehension of concept and corresponding term" is often detected in high schools and universities. Teaching in higher educational institutions is very complicated difficult due to small vocabulary of students, lack of knowledge of common international terms. Besides, this situation worsens because of perfunctory reading and perfunctory listening, lack of concepts the concept comprehension skills. Generally, poor language skills are typical for contemporary youth all over the world. Its main reason includes screen mania, screen addiction. As we know English language itself includes most international terms of Greco-Latin origin, that is why, knowledge of English could at least partially help in improvement of vocabulary. That is why, 80-90% of students of the most faculties do not know or vaguely know even the terms which occur in many various fields.

We have to do the special works aiming to develop the skills of comprehension and memorization of words in students, although all these should be provided in school.

Activities promoting comprehension of concept proper itself/ as such i.e. meaning Comprehension is impeded with poorly developed formal-operative i.e. logical-conceptual thinking, i.e. infantilism of thinking. For most of students (people in general) just pre-logical-conceptual thinking level - syncretic, concrete operational, i.e. figurative-associative thinking is leading (what is really natural for age of 6-10). That is why, at the everyday life consciousness level of every day consciousness even clear scientific concepts seem become fuzzy. Besides, we have the other results of screen mania: giving priority to perception over thinking, concrete and picturesque thinking and poor conceptual-abstract thinking.

It is necessary to develop students' critical logical-conceptual thinking as far as possible. The more so, that it is needed also to be adequate citizens of democratic society. And vice versa, concrete and figurative-associative thinking makes the best basis for formation of easily controllable, consumer society.

In order to develop critical logical-conceptual thinking, logical tasks should be included in the curriculum of a specific field, integrated with the issues of the field. Such tasks will also contribute to promote deeper studying of the field.

Such interactive exercises may be provided on the various levels regarding the students' readiness, knowledge and intellectual skills. Scientific research or creative seminars belong to the highest level. If the students' readiness is low, the learning process should be provided similar to the sixth-seventh years of school – aiming development of literacy skills.

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# ცნების და შესატყვისი ტერმინის გააზრება

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სტატიაში, „ცნების შესატყვისი ტერმინის გააზრება“ აღნიშნულია საკითხი, რომელიც ხშირად იკვეთება უმაღლეს სასწავლებელში. სწავლებას ძალიან აძნელებს სტუდენტების მწირი ლექსიკური მარაგი, მათ შორის გავრცელებული საერთაშორისო ტერმინების არცოდნა. ამას ემატება ტექსტების ზერელე წაკითხვა და ზერელე მოსმენა, ცნების გააზრების უნარჩვევათა არქონა. საზოგადოდ, ენობრივ უნართა სისუსტე თანამედროვე ახალგაზრდებს მთელ მსოფლიოში ახასიათებს, რისი მთავარი მიზეზია ეკრანომანია, ეკრანზე ადიქცია. როგორც ვიცით ინგლისური ენა მოიცავს ლათინურ-ბერძნული წარმოშობის საერთაშორისო ტერმინების უმრავლესობას, ამიტომ ინგლისურის ცოდნა კარგად ლექსიკის სიმწირეს ნაწილობრივ მაინც გააწონასწორებდა. ყოველივე ამის გამო ფაკულტეტების დიდ უმრავლესობაზე სტუდენტების 80-90 %-მა არ იცის ან ძალიან ბუნდოვნად იცის ისეთი ტერმინებიც კი, რომლებიც მრავალ სხვადასხვა დარგში გვხვდება, მაგალითად: სტატიკა/დინამიკა, ინვარიანტი/ვარიანტი/ვარიაცია, სემანტიკა, ექსპრესია, მედიაცია/მედიატორი/მედიანა და მისთანა. ამის შემდეგ ძალიან ძნელდება სპეციფიკური დარგობრივი ტერმინების სწავლა და შესატყვის ცნებათა გააზრება.

ჩვენ იძულებულნი ვხდებით, სპეციალური სამუშაოები ჩავატაროთ, რათა სტუდენტებს სიტყვების გააზრებისა და დამახსოვრების უნარჩვევები განვუვითაროთ (წესით ეს ყოველივე სკოლაში უნდა გაკეთებულიყო).

ამას ძალიან უშლის ხელს ანალიზური, ფორმალუროპერაციული ანუ ლოგიკურ-ცნებითი აზროვნების სუსტი განვითარება ანუ აზროვნების ინფანტილიზმი. სტუდენტების (საზოგადოდ ადამიანების) უმრავლესობისთვის წამყვანია ლოგიკურ-ცნებითი აზროვნების წინარე დონე _ სინკრეტული, კონკრეტულოპერაციული ანუ ხატობრივ-ასოციაციური აზროვნება (რომელიც 6-10 წლის ასაკშია ბუნებრივი). ამიტომ საყოფაცხოვრებო, ყოველდღიური ცნობიერების დონეზე თვით მკაფიო სამეცნიერო ცნებაც კი გაბინდულია. ამას ემატება ეკრანომანიის სხვა შედეგები: აღქმის უპირატესობა აზროვნებასთან შედარებით, კონკრეტულ - სურა-

თოვანი ცნობიერება და ცნებით-აბსტრაქტული აზრის სისუსტე.

აუცილებელია სტუდენტების კრიტიკული ლოგიკურ--ცნებითი აზროვნების შეძლებისამებრ განვითარება. მით უმეტეს, რომ ეს საჭიროა აგრეთვე დემოკრატიული საზოგადოების სრულფასოვანი მოქალაქეობისთვისაც. და პირიქით, აზროვნების კონკრეტულობა და ხატობრივ-ასოციაციურობა საუკეთესო საფუძველს ქმნის ადვილად მართვადი, მომხმარებლური საზოგადოების ჩამოსაყალიბებლად. კრიტიკული ლოგიკურ-ცნებითი აზროვნების განსავითარებლად კონკრეტული დარგის სასწავლო პროგრამაში ჩართული უნდა იყოს ლოგიკური ამოცანები, დარგის საკითხებთან ინტეგრირებულად. ასეთი ამოცანები თვით კონკრეტული დარგის უფრო ღრმად შესწავლასაც შეუწყობს ხელს.

ამგვარი მეცადინეობა განსაკუთრებით ბუნებრივად ჯდება აქტიური მზაობის მეთოდიკაში. სტუდენტებისთვის სახალისოცაა, რადგან აქტიურ განხილვას, დისკუსიას, კამათს აღძრავს ხოლმე. პარალელურად პროფესორი აფასებს სტუდენტების როგორც ზოგად სააზროვნო უნარჩვევებს, ისე სპეციალური დარგის ფაქტობრივ ცოდნას. ცხადია, გაცილებით შედეგიანი იქნებოდა, ამგვარი მუშაობა სკოლაშივე რომ დაწყებულიყო.

**შემოსულია რედაქციში:**
ოქტომბერი, 2021
**რეცენზირებულია:**
დეკემბერი, 2021

***საკვანძო სიტყვები:*** დარგობრივი ტერმინი, ცნების გააზრება, აქტიური მზაობის მეთოდიკა, კრიტიკული ლოგიკურ-ცნებითი აზროვნება.

Teaching in higher educational institutions is very complicated difficult due to small vocabulary of students, lack of knowledge of common international terms. Besides, this situation worsens because of perfunctory reading and perfunctory listening, lack of concepts the concept comprehension skills. Generally, poor language skills are typical for contemporary youth all over the world. Its main reason includes screen mania, screen addiction [1]. There are two more additional reasons: poor quality of school education and easiness of entering higher educational institutions; very poor command of English in spite of ten-year learning at school. English language itself includes most international terms of Greco-Latin origin, that is why, knowledge of English could at least partially help in improvement of vocabulary. That is why, 80-90% of students of the most faculties do not know or vaguely know even the terms which occur in many various fields, such as: **statics / dynamics, invariant /variant / variation, semantics, expression, mediation / mediator / median** and similar. Due to above mentioned, learning of the sectoral terms and understanding of the corresponding concepts becomes very difficult.

We have to do the special works aiming to develop the skills of comprehension and memorization of words in students, although all these should be provided in school.

1. Terms analysis (what also promotes comprehension of corresponding concepts)

1.1. Teaching of the most frequent affixes: -, **im-/in-/ir-, re-, dis-, pro- pre-, post-, in-/intra-, ex-, inter-, quasi-, pseudo-, sub-, meta-, term-, marg-, pan-, co-/con-/com-, bio-, -chron-, -phon, -strat-, -scop-, -port-, -philia, -duction, multi-, poli-, mono-, di-/du-, bi-, quart-, penta-, kilo-, milli-, deci-, deca-** etc.

1.2. Breaking up of words into the forming parts (simple morphological analysis) and comparing with the other words, for example: **sub+sensor, post-modernism, aqua+tory** – compare with **aqua=rium aqua+rium and terri+tory; im+pression – compare with press, pressing…**

2. Psychology and Concept Acquisition Method

Concept can be acquired by natural/ inductive or artificial/deductive way. Natural/ inductive acquisition of concept starts with learning some of the examples of concept and formation of the functional equivalent (image, pre-concept) thereof. Further it may or may not go on by consolidation of the examples (i.e a part of concept volume) centralized around this concept prototypes (combined concept) or it may continue with formation of fuzzy concept, or comprehension of true, full value concept. This includes comprehension of concept's content, i.e. comprehension of its explanation or definition and learning of its volume. This way children acquire lots of concepts, for ex.: "animal", "plant", "pyramid", "cylinder", "minute", "month", "century"… Acquisition of these concepts commences in practical, householding situation, but further is should complete at the level of logical-conceptual thinking. As for artificial/deductive acquisition of concept, it has an opposite direction: it starts with learning its theoretical or general explanation/ definition and further passes to examples.

Anyway, for full acquisition of concept it is essential to get aware of:

(1)positive, negative and marginal examples of concept; just standard, typical examples are not enough, it is necessary to comprehend negative and positive marginal examples as well [5]; why do each of these examples belong or not belong to the concept volume according to the essential features as forming parts of concept content; ex.: for the concept of "bird", the typical positive examples include sparrow, raven, seagull… negative examples - butterfly, grasshopper, bet…,

marginal examples - penguin, ostrich… Those who cannot prove whether each of these animals are birds or not, do not know the concept of "bird" properly. This important psychological rule was also discovered in practical pedagogic aspect by well-known practicing teachers, ex.: "If you want to comprehend a subject thoroughly, explore its difference from the other subjects mostly similar to it and its similarity to the subjects which mostly differ from it" (K.Ushinsky)

(2) how this concept relates to the other, earlier learnt concepts; which of 4 logical relations is there between concepts and why; which concept is opposite thereto; i.e. it is required to consider counterexamples and compare them with the other concepts. Ex.: the concepts of "animal" and "bird" have the general concreteness interrelation; the concepts of "bird", "reptile" and "mammal" – mutual exclusion interrelation; the concepts of "bird" and flying/volatile animal – the logical relation of partial intersection;

(3) how this concept may be used in the various concrete situations, for solving of the various problems. Besides, it is not sufficient to learn and remember such ready applications, what makes the standard tasks. It is also necessary to have transfer skills, i.e. use in the new, unknown, problematic situations, i.e. solving of nonstandard problems. Ex., for the concept of "bird" such problems may include independent learning of Archaeopteryx, formation and examination of logical hypotheses (not retrieving, reading and memorizing of articles about Archaeopteryx). Further this topic will lead to the bird's evolutional origin, genesis.

(1) and (2) correspond to the second level of Bloom's taxonomy, but (3) – to the third level. [7]

Although, almost all the children or uneducated people and the great part of adult population act in different way, not on the logical-conceptual thinking level, but figurative-associative one. This causes the typical errors of thinking. In such case, concept's content, i.e. its essential features are not decisive for acquisition of concept, but accidental perceivable marks (halo-effect is a good example thereof). It is apparent even in word-formation of languages (collective error of the entire nation, what is natural for the ancient times of cultural genesis development of thinking, when the words were formed). Ex., in the Latin language-culture for the concept of "reptile" such random, garish feature is used as wriggling. In spite of its randomness, it became a basis for formation of the Latin word "Reptilia", although some reptiles do not wriggle (ex. tortoises or dinosaurs) and some other animals just wriggle (ex. worms). Also in the Georgian language-culture for the concept of "bird" such random, garish feature is used as ability of flying. In spite of its randomness, it became a basis for formation of the Georgian word „ფრინველი", although some birds cannot fly (ex. ostrich, penguin) and many other animals can fly (ex. bets, some fishes, many insects). Correspondingly, in the psychological experiments of acquisition of concept, most of the respondents make the typical mistakes of thinking: they attach decisive importance to ability of flying and they consider that worms are reptiles. Also, it is wrong to identify human to the concept of "biped": many people have one leg (some of them – since birth), besides, many species of animals are biped (ex. birds).

All above causes deficiency of natural/ inductive acquisition of concept: concept is fuzzy and intellectually defective, logically weak and indistinct. On the other hand, artificial/deductive acquisition of concept has its own deficiencies, namely, risk of concept formalism: an individual can explain/define a concept (remembers i.e. has memorized the text and can recall and formulate it in case of need), knows some examples of the concept and remembers some ready applications. But all these belong to the fist level of Bloom's

taxonomy, as this individual has no abilities of (1), (2) and (3) without which, knowledge of a concept is empty. As the experiments prove, even in case of artificial acquisition of concept, full-fledged acquisition of concept is achieved upon passing deductive knowledge to inductive, veristic, intuition knowledge [6].

Teaching should be provided by the natural, historical way of cognition, which is mainly inductive. Ex., geometry is the most deductive school subject, but it is better to teach it inductively. Advantages of the inductive and deductive ways are unified by the method of active readiness of teaching [4] which avoids deficiencies of each of them. So, the basis of the constructivistic three-phase teaching includes the first, preparative phase which is purely inductive; as for deduction, it mainly occurs in the second and third phases.

3. Activities promoting comprehension of concept proper itself/as such i.e. meaning

Comprehension is impeded with poorly developed formal-operative i.e. logical-conceptual thinking, i.e. infantilism of thinking. For most of students (people in general) just pre-logical-conceptual thinking level - syncretic, concrete operational, i.e. figurative-associative thinking is leading (what is really natural for age of 6-10) [2]. That is why, at the everyday life consciousness level of every day consciousness even clear scientific concepts seem become fuzzy [3]. Besides, we have the other results of screenomania: giving priority to perception over thinking, concrete and picturesque thinking and poor conceptual-abstract thinking [1].

There is a worse, deeper reason as well. Students are not trained to real learning since their childhood. They even do not know difference between the true learning and superficial mechanic memorizing with further reproduction of this memorized material; they have undeveloped self-criticism and meta-cognition principles: Do I really understand this topic or not? Is my knowledge firm and clear or fuzzy and fragile ? Is this knowledge connected with the earlier learnt material or not? What does remain misunderstood? (D. Perkins calls such questions “Pandora’s” questions [8]

Just this prevents students of many kinds of faculties from learning and passing exams. Just this provokes problems of learning as well as passing exams for students of different specialties. At the figurative-associative level of thinking a concept is figurative and integral. It is not analytically divided into separate features. Conclusion is made on the basis of not logical reasoning and essential features, but associations and inessential garish features (namely, in the social relations it causes halo-effect). Poor abstract and formal logical thinking also cause confusion and defenselessness in nonstandard situations. For example, here is a half-joking problem: “Tsikalat and Nijablatis spend every night together. Nijablatis will spend the whole next month in Bumbutka. Where will Tsikalat spend night the day after tomorrow?” They reply: “I don’t know, I don’t know them… I have not ever heard such thing…why should I know… what does Bumbutka mean? …”

It is necessary to develop students’ critical logical-conceptual thinking as far as possible. The more so, that it is needed also to be adequate citizens of democratic society. And vice versa, concrete and figurative-associative thinking makes the best basis for formation of easily controllable, consumer society [1].

For the purpose of development of critical logical-conceptual thinking the concrete educational programs should include logical activities integrated into its contents. Such activities can promote gaining of deeper knowledge in the concrete field as well. Let’s consider the examples thereof given here below:

2.1.Choose the features from those given here below which are essential for the learned concept / phenomenon / process Z.

2.2. Let us suppose that we had learned some subject X, but today we learned another one - Y. What kind of logical relation is between these subjects:

a) general-private concrete; b) private concrete-general; c) similarity identity; d) part-whole;

e) partial intersection; f) mutual exclusion.

2.3. Well-known activity for comparing of subjects X and Y, for which Venn diagram is used usually. But Venn diagram is not suitable for this activity, but for 2.2., as it is inconvenient (sometimes due to lack of space) to insert phases into ellipses. For 2.3. activity rectangular scheme, i.e. comparison table is more convenient:

| | **subject Y** | |
|---|---|---|
| **subject X** | | |
| | | |

All attributes of subject X goes into the left columns, those of subject Y – into the right column, but all common for both of them – into the middle one.

2.5. Please, find a logic error in this reasoning: … … … …

Or: Has this conclusion of reasoning any sufficient logical basis or not?

And here we give the choices (a), (b), (c), (d), providing that one of them is correct. These choices shall help students in verbal formulation of the error.

2.6. It is widely believed that … … … …. Please, find the argument proving this opinion: I. … … II. … … III. … … (three arguments are given)

The choices shall be as follows: only I; only II; only III; only I,II, only I,III; only II,III; all tree ones; none of them.

Or an opposite task: which argument prejudices this opinion, i.e. which is a counterargument? Or – which argument completely denies this opinion, i.e. which is a counterexample?

2.7.What may be concluded from the learned paragraph of the reader? – and there the choices are given. Further these choices are analyzed:

- Which of these choices are proper true as such, but here inadequate?
- Which is close to the right answer, but fuzzy and incorrectly reasoned?
- Which has false content itself regardless of problem's question and context?
- Which is true itself, but fruitless due to excessive generality (lack of concretion)?

2.8.Which widely believed stereotype falsity is shown in the learned paragraph?

2.9.Which of the following choices makes not a result of the main conclusion of the given paragraph, but its preliminarily required logical basis?

2.10.The following scheme (tree diagram or any other) is a short summary of the given paragraph

- What kind of process the upper arrow of this scheme points to? Lower arrow?
- Why are three words in bold and set into a frame?
- Is upper/lower position in this scheme important? Or right/left position? What does it correspond to?
- Which of the following words should be written in the blank of this scheme? Instead of the mark?
- If we extend this scheme, what could be above/below/right/left?

2.11. Which feature was used for classification in this paragraph? Which other feature could be

used for classification? Name the advantages of the first classification, second classification.

2.12.Think up the new example which: I. explains the considered regularity; illustrates the considered regularity; II. Makes exception to the regularity.

2.13. High, metacognitive level task: which of the intellectual actions in the last two paragraphs was the main one?

a) analysis; b) synthesis; c) induction/ generalization; d) deduction/concretization; e) analogy;

f) contrast/opposition; g ) evaluation; i) comparison…

There are some more types of activities. Each of them shall be enclosed the reasoning. Correct choice is not sufficient.

Such exercises may be very naturally used for the method of active readiness [4]. It is also amazing for students, as it usually causes active discussions, considerations, disputes. At the same time, professor can assess general intellectual skills of students as well as their factual knowledge of major special field.

Naturally, such activities would be even more efficient being commenced in school.

4. Text Comprehension / Understanding

Weakness of logical thinking immediately shows itself in underdevelopment of literacy skills, namely, in weakness of understanding and comprehension of the read text, the more so, if the text is of abstract content. Students are accustomed to superficial reading/listening without comprehension, i e. only reading/ listening of words. They even often incorrectly read the words and cannot understand the resulted inadequacy and continue such superficial reading. Ex., instead of "discourse" they read out "discussion", instead of "authoritarian" – "authoritative" etc. and cannot understand that they read out absurd. According to the classical research of L. Levi-Bruhl, ignorance of logical contradiction is a feature of the primitive or lagged thinking; according to Z. Freud, it is typical for sleeping consciousness, but according to Jean Piaget – for infantile thinking [2].

More often occur incomprehension of text content and making superficial associative conclusions. Ex., a group of students of the psychology department reads the new short text: Thinking is a main cognitive force of human. It is the activity of human's consciousness aimed at solving problems/tasks (in its broad sense), as opposed to thoughts which run associatively and nondirectionally: in possible sequence of ideas, images, senses, memories, phrases, idea-suggestions (stream of consciousness).

After that the lector asks the question: "So, what is typical for thinking?" The students reply: "Associative stream, sequence of ideas, images, senses, memories, phrases…" No one of this group of 30 students understands that this answer is incorrect, although the text is before their eyes. The lector has to hint them using the scaffolding method: "Find the word "which" in the text. What does it refer to?". "Find the words "as opposed to" in the text. What does it refer to?". But most of the students still cannot understand. The next stage of scaffolding becomes needed:" This text aims to contrast two concepts. What concepts are they?" etc.

Now, let's imagine a traditional lecture. The lector reads the long monologues and considers that:

1) all the students are listening to his monologues without distracting attention;

2) natural rhythm/tempo of thinking of all the students is the same as the lecture's rhythm/ tempo;

3) the students know all the terms they hear;

4) the students comprehend content of the sentences they hear;

5) the students comprehend relations between the thoughts, implications, illusions etc.

All five assumptions are groundless. Besides, there is a pure psychological methodological argument: true, high quality learning through passive listening is generally impossible. In the best case, such way only the lowest level of knowledge may be acquired, i.e. informing, only the first level of Bloom's six-level taxonomy. The second level – understanding and comprehension and the third level – applying/transfer (never mind of the upper levels) remain unachievable. But who may need unsensible and useless knowledge?

Proceeding from above, it is clear that the traditional lecture method is ineffective. For low/ moderate readiness students the most/great part of the lecture remains uninterpreted, so even the lowest level knowledge, factual informing cannot be achieved. As for high readiness students, passive listening to the lecturer is boring and annoying for them. Besides, they are almost prevented from asking lots of questions and discussing the thoughts they may have in the course of lecture. Inter alia, one of the main reasons of low quality school education is essentially similar – passive and superficial, unsensible learning.

For lecture purposes, it is better to provide students with the entire lecture text (digital version or hardcopy) with the accompanying illustrations, schemes, diagrams, tables and other visual aids which they would read before lecture and keep it on the lecture-seminar where they would work with these text and visual aids to achieve their comprehension in interactive, dialogical, problematic modes.

Such interactive exercises may be provided on the various levels regarding the students' readiness, knowledge and intellectual skills. Scientific research or creative seminars belong to the highest level. If the students' readiness is low, the learning process should be provided similar to the sixth-seventh years of school – aiming development of literacy skills. As the saying goes, "better late than never". Without these skills learning in university is like building a sand castle.

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