SOPHISTICATED THINKING: LOWER ORDER THINKING SKILLS

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ABSTRACT

The twenty-first century has brought about a new type of society, the information-based society. Although this type doubtless provides a lot of opportunities for development and self realization, which are the top needs, according to Maslow hierarchy, we cannot but notice the existing downside as well. What is being promoted as a life motto worldwide is the combination of pragmatism and hedonism, which especially appeals to the youth. Such a combination presupposes that young people faced with overload of available information prove to be unwilling to memorize this information or make sure that they understand it, since they can gain access to it whenever and wherever they want or need. On the other hand, the information-based society requires a change in the existing educational paradigm, which means that the main focus of educators is shifting towards the development of higher order thinking skills (HOTS) while ignoring lower order thinking skills (LOTS).

The second stage of our ongoing project deals with the distinction between lower order and higher order thinking skills with a special focus on the former [8]. We regard LOTS as an indispensable part of the development of sophisticated thinking. To prove our hypothesis we have conducted a qualitative study. Two groups of second-year bachelor students of the Higher School of Economics, who participated in the first stage of our project devoted to the development of a disposition towards critical thinking, continue to be involved in it. It is vital to note that these students are learning English as their second language. Having received the results of the first phase we thought it necessary to adjust the key concepts emphasizing the significance of LOTS and step-by-step process of developing them. For that purpose, during the first three-month cycle the students of both control and experimental groups worked with the book by John Grisham "*The Pelican Brief*" while for the second cycle we chose short stories by Alice Munro. The text-based approach was applied to teaching the students of both groups (ex-control and experimental). Special techniques were used to measure the students' level of understanding and the ability to apply the given information. In the course of the experiment we have found out that the more advanced the students' comprehension level became the better their ability to remember new words got. However, in the experimental group LOTS proved to be deeper and more logically developed. Whereas in the control group, despite a significant shift, LOTS remained more shallow and context-based. The development of HOTS and the influence of LOTS on this process will be the focus of the third stage of our project.

Keywords: sophisticated thinking, lower order thinking skills, higher order thinking skills, information-based society, comprehension level, reflection.

INTRODUCTION

The 21st century presented educators with a lot of challenges, the most urgent of which was establishing a new set of skills indispensable for the life in the information-based society. This set includes creativity, collaboration, metacognition, motivation, information and media literacy, leadership, social and cross-cultural skills. Among those, however, scholars tend to pay particular attention to the development of critical thinking. Critical thinking has been defined by many psychologists and educators in different ways (J. Dewey, R. Ennis, R.F.West, M.E.Toplak and K. E.Stanovich - to mention a few). Despite all the differences, what most of them agree upon is that critical thinking includes the following skills:

- analyzing arguments, claims, or evidence;
- making inferences using inductive or deductive reasoning;
- judging or evaluating; and
- making decisions or solving problems [7].

It is important to point out that the enumerated skills belong to the group of higher order thinking skills, or HOTS. We cannot stress it enough that it is the development of HOTS that modern educational tradition has of late been focusing on, while ignoring lower order skills and dismissing them as something insignificant and interfering with abstract knowledge. Lower order thinking skills, or LOTS, involve such skills as memorizing, recalling the knowledge one already has, understanding what one knows, etc. However, at present some scholars, among them Doug Lemov, argue that "... foundational skills like memorizing multiplication tables enable higher order thinking and deeper insight because they free students from having to use up their cognitive processing capacity in more basic calculations. …The more proficient you are at "lower-order" skills, the more proficient you can become at higher order skills" [4]. This means that HOTS and LOTS are interconnected and HOTS cannot be developed and enhanced separately from LOTS, since LOTS are the simple thinking processes that serve as a basis for more complex ones which will never take place without them. Without LOTS a thinking process stops being the one it is. Instead, it is likely to turn into a process of reproduction. Thus, in our view, one has to speak about a particular type of thinking that includes both groups of skills. We call it sophisticated thinking.

Sophisticated thinking is a balanced combination of well-developed lower order and higher order thinking skills where LOTS become interiorized and do not hinder the development of HOTS. Sophisticated thinking enables the transition from, as Presseisen puts it, "simple to more complex operations, from observable to abstract dimensions, and from an emphasis on working with known materials toward an emphasis on creating or inventing new, previously unknown approaches or materials" [6].

THEORETICAL FRAMEWORK

The original attempt to distinguish between LOTS and HOTS was made in the 1950s by Benjamin S. Bloom. In his work *Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook I: Cognitive Domain* [1] he singled out six categories in cognitive domain and provided definitions for each of them:

1. Knowledge. This category includes different types of knowledge such as terminology, specific facts, conventions, trends and sequences, classifications and categories, criteria, methodology, principles and generalizations, theories and structures.
2. Comprehension. This refers to translation, interpretation, and extrapolation.

3. Application. This category refers to the "use of abstractions in particular and concrete situations"
4. Analysis. This category involves analysis of elements, of relationships, and that of organizational principles.
5. Synthesis. The category represents production of unique communication; production of a plan or proposed set of operations; derivation of a set of abstract relations.
6. Evaluation. This means evaluation in terms of internal evidence and judgments in terms of external criteria.

The first three categories from the list are traditionally associated with LOTS, whereas the last three are considered to be HOTS. Thus, it makes sophistication grow from the basic skills to the highest level.

In 2001 Lorin W. Anderson along with David R. Krathwohl revised the original taxonomy. They changed the names of major categories into verbs and used gerunds to interpret the meaning of each category, underscoring in this way the active nature of thinking process. For the purpose of our project, we use the taxonomy described in A Revision of Bloom's Taxonomy: An Overview by David R. Krathwohl [3]:

1. Remember (retrieving relevant knowledge from long-term memory): (1) Recognizing, (2) Recalling.
2. Understand (determining the meaning of instructional messages, including oral, written, and graphic communication): (1) Interpreting, (2) Exemplifying, (3) Classifying, (4) Summarizing, (5) Inferring, (6) Comparing, (7) Explaining.
3. Apply (carrying out or using a procedure in a given situation): (1) Executing, (2) Implementing.
4. Analyze (breaking material into its constituent parts and detecting how the parts relate to one another and to the overall structure or purpose): (1) Differentiating, (2) Organizing, (3) Attributing.
5. Evaluate (making judgments based on criteria and standards): (1) Checking, (2) Critiquing.
6. Create (putting elements together to form a novel, coherent whole or making an original product): (1) Generating, (2) Planning, (3) Producing.

We find the amended taxonomy more suited for the ongoing study as it implies the idea of overlapping of categories. The revised version is not as strict and rigid a hierarchy as the original one, since, according to Krathwohl, the scope of each category in the former is broader and some cognitive processes represented in its categories might be more cognitively complex than the ones in the higher level category (the process of Explaining in Understand versus the process of Executing in Apply).

Such an approach allows us to consider the last three categories (HOTS: Analyze, Evaluate and Create) to be of the same level of difficulty and to be interacting with one another which is of great significance for our study. However, HOTS are not the current focus of our research and will be dealt with in the third stage of the project. LOTS, though overlapping, can be separated quite distinctly and they serve as the primary target of the second stage of our study.

STUDY

This is a three-stage ongoing project which was started in September in Moscow, Russia. The first stage lasted over three months and the results were described in Sophisticated

thinking: text, task and situation by Tikhonova E.V., Kudinova N.A., Golubovskaya E.A. [8]

In the course of the first stage of the project we were guided by the definition of critical thinking given by D.F.Halpern [2] who stated that critical thinking is not a by-product of standard instruction in a content area, and gaining positive effects is possible only through systematic educational effort. Thus, we focused on critical skills development within a language classroom based on students' work with a literary text, which provides opportunities for reflection and broad analysis.

The main hypothesis was that in language education the critical thinking skills can be developed and transferred via embedded instructions. There were 80 participants, 38 female and 42 male, aged 18. They were willing and enthusiastic about taking part in this study. The participants who were second-year bachelor students studying at C1 level at the National Research University Higher School of Economics, were randomly divided into two groups. The first group received critical thinking instructions embedded in a system of tasks to the thriller by J. Grisham "The Pelican Brief". The second, control group did not receive similar instructions, they were taught within the frameworks of the communicative approach without reading "The Pelican Brief"[8].

Before the start of the study, the pre-test based on Watson-Glaser Critical Thinking Appraisal (W-GCTA) [9] was conducted to evaluate the initial level of critical thinking development. Then those groups participated in a twenty-four-subsession course. At the end, the participants took the post-test (W-GCTA) to obtain the information on the influence of the techniques used during the study on the level of critical thinking skills of the participants.

The experiment showed the shift towards the improvement of critical thinking skills. However, the change was not dramatic due to the short time period (three months) and, also, the focus of the first stage was mainly on involving the students into the process of thinking and changing their disposition towards critical thinking and processing information.

In the course of the study we could observe that while attempting to work with the cognitive component of critical thinking the participants faced problems due to the lack of certain skills. For example, when trying to analyse the text (which is the instance of higher order thinking) they struggled to identify the necessary parts, to infer the meaning from the context, etc (which are the instances of lower order thinking). Moreover, it was found out that even though the students came across the same information over and over again, they appeared to be unable to memorize this information since the ability to do it was lost due to the students' belief that remembering was a simple operation that can be done quickly if the need be. In addition, the students tended to regard reproduction of somebody else's point of view as a thinking process on account that this idea seemed reasonable to them. They did not even try to think it over by themselves. Thus, this current situation made us think about the necessity of developing LOTS as an indispensable basis of sophisticated thinking.

The hypothesis is that the development of LOTS will (a) enable the participants to regard the thinking process as a process in itself but not as the reproduction of somebody else's ideas; and (b) will determine the development of critical thinking as well.

A literary text continues to be a stimulus for the development of critical thinking skills, as it was pointed out a literary text is "a text which demonstrates a propensity for the use of

literary language" [5]. The main characteristic of the literary language is polysemy, or the concept of multiple meaning which allows the existence of different levels of understanding and interpretations of the text and the capacity to "extend the text beyond its apparent surface" [5].

For the purpose of the second stage of our project we chose the collection of short stories *Runaway* by Alice Munro for our students to work with. We find these stories particularly suitable for the development of LOTS for a particular reason. The stories in question are devoted mostly to the interpersonal relationship - the subject which traditionally appeals more to female readers rather than to men. However, since the first stage facilitated the development of the disposition towards critical thinking and processing information and, as it was mentioned above, we observed a definite increase in the students' desire to work with a text, we assumed that the members of the experimental group irrespective of their gender will take equal interest in the short stories by A. Munro. To confirm the hypothesis we suggested that the control group of the first stage start reading the stories as well. In this way we can see the influence of disposition on the way the participants regard the material, on their willingness to work with it, and on the development of LOTS.

PARTICIPANTS AND PROCEDURE

The second stage of the study was also conducted at the National Research University Higher School of Economics among undergraduate students. All 80 participants (38 female and 42 male) were second year students at C1 level, aged 18-19.

All participation was voluntary. After the explanation of the purpose and the nature of the study the participants of both groups (control and experimental) were given instructions of LOTS development embedded in a system of tasks to the collection of short stories *Runaway* by Alice Munro. This collection consists of six stories, three of which describe the same woman at different points in her life (*Chance, Soon, Silence*).

The second stage of the study includes two sessions: (1) learning session (subdivided into 24 subsessions due to the number of language classes twice a week during the three month-period); (2) post-test (W-GCTA). Before the first stage of the study the participants passed the pre-test (W-GCTA) as a metric for the level of critical thinking skills development. This time the results of the first stage post-test (W-GCTA) were used as a pre-test measurement.

LEARNING SESSION

Both groups took part in a twenty-four-subsession course. The sessions were similar in pedagogical components and duration. After the end of the learning session all the participants were proposed to fill in a questionnaire on their impressions of the activities they did.

For each session the students were to read a part of a story and do a set of pre- and while-reading activities. After-reading tasks were completed in class. All sets of tasks were designed according to the categories of Anderson and Krathwohl Taxonomy.

The format of the paper does not allow us to include all the tasks, thus, we are giving several examples:

1. The tasks aimed at the development of thinking skills that correspond to the Remember category which presupposes retrieving the previously learned material.

Before reading the story *Soon*: Recall what happened to Juliet in *Chance* and what she gained by the end of that story. For the story *Runaway*: Collect the evidence proving that Sylvia has developed a crush on Carla.

2. The tasks aimed at the development of thinking skills that correspond to the Understand category which involves the ability to construct meaning from the given material.

For the story *Silence:* Summarize Juliet's trip to Denman Island. For the story *Silence:* Describe Juliet's feelings towards Mother Shipton.

3. The tasks aimed at the development of thinking skills that correspond to the Apply category which relates to the ability to use the given material in particular situations. For the story *Runaway:* Draw a story map indicating the setting (place and time), characters, conflict, plot (event 1, event 2, event 3, etc.), and resolution/end.

INTERPRETATION OF THE PRE- AND POST-TEST W-GCTA SCORES

The Watson-Glaser Critical Thinking Appraisal (40-item paper and pencil) psychometric test of critical thinking and reasoning was selected as a measurement tool for its ability to investigate all areas of critical thinking skills, their depth and quality. The five subtests of the test (inference; recognition of assumptions; deduction; interpretation; evaluation of arguments) require different, though interdependent, applications of analytical reasoning in a verbal context with scores reported on three subscales [9]. The final score of each participant is the sum of all correct answers to the items of the paper (from 1 to 40 on the five subtests). The higher is the score the better is the result. Further the scores are graded through the following categories:

A – Well above average performance, 91st percentile and above,
B – Above average performance, 71st – 90th percentiles,
C – Average, 31st – 70th percentiles,
D – Below average performance, 11th – 30th percentiles,
E – Well below average performance, below 10th percentile and below.

According to the overall performance on the first test, the students from the experimental group got the following ratings (see Table 1). 80 % of the students from the experimental group demonstrated an average critical thinking ability, 15 % - below average thinking ability and only 5 % - above average thinking ability.

Table 1. Overall performance on the W-GCTA (experimental group)

0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
E	**D**		**C**				**B**		**A**
	3	3	13	10	4	5	1	1	

In the control group (see Table 2) 80 % of participants demonstrated average critical thinking abilities, 17,5 % - below average performance and 2,5 % - above average.

Table 2. Overall performance on the W-GCTA (control group)

0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
E	**D**		**C**				**B**		**A**
	5	2	13	6	6	7	1		

After the learning session, the repeated W-GCTA test was offered to the participants (each participant received a test with new scenarios, all the necessary recommendations on how to deal with the test were given). At this stage, the following results were obtained in both groups (see Tables 3 and 4).

Table 3. Overall performance on the W-GCTA (experimental group)

0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
E	**D**				**C**			**B**	**A**
	1	1	9	8	8	9	3	1	

As seen from the statistics for the experimental group, three students of subgroup D have moved to group C subgroup, while 2 students from subgroup C moved to subgroup B. Besides, the internal gradational subdivision was reconsidered within the group of students who had been initially placed into C.

Table 4. Overall performance on the W-GCTA (control group)

0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
E	**D**				**C**			**B**	**A**
	3	3	10	6	8	9	1		

In the control group some changes of subdivision were also made. The number of students in subgroup D goes down alongside the increase in the number of students in subgroup C and the internal gradational subdivision of its members.

DISCUSSION AND CONCLUSION

The results obtained at this stage of the study confirm our hypothesis. The students of the experimental group took more interest in working with a literary text. We could see it through most of the students' reluctance to search for the abridged versions of the stories on the Internet or use such sites as Sparknotes (online study guide for literature). While the students of the control group, though divided into different subgroups depending on the development of their critical thinking skills after learning session, showed less interest in text work and were more unwilling to do the tasks aimed at the Remember category. The second hypothesis was also confirmed. The stories appealed to the students of the experimental group irrespective of their gender, whereas the male students in the control group voiced complaints about the stories being more suitable for girls.

During a set of post-study interviews with the participants it was ascertained that the experimental group relied mostly on extracting information from the text. They assured that "reading between the lines" appealed to them most. The control group, however, preferred to work with the factual information, which does not involve much of the thinking process. Thus, it is the disposition towards the process of critical thinking and processing information that we find important to start the development of critical thinking skills with.

Having provided the development of critical thinking skills in participants (the urge to get an insight into the subject or problem the first stage of our study formed the basis for developing cognitive strategies. Since at the end of the first stage of our study the students

formed the disposition towards the process of thinking, the second stage led to significant shifts in the development of their cognitive processes, though at the LOTs level. While the students of the control group showed only budding interest in actual work with information. Instead of doing the given tasks some participants from the control group tried to a general assessment of characters. As rule, such evaluation was rather stereotypical and not supported by any proof found in the text because very often they struggled to remember a particular fact or situation, or sequence of events. The reason for such unreadiness is that they clearly underestimated the importance of completing the tasks that were connected with structural organisation of the text and memorization. By contrast, the students of the experimental group did not try to alter the information, on the contrary, they were inclined to take into consideration extralinguistic factors connected with the events of the text and find supporting arguments in the text for their opinions.

Therefore, we suppose that our study plays an important part in optimizing the development of sophisticated thinking as a balanced combination of well-developed lower order and higher order thinking skills where LOTS become interiorized and do not hinder the development of HOTS. At this three month stage we managed to gain a significant shift in the participant's' disposition towards the process of thinking, to show them that the cognitive process involving the simple operations seemingly unrelated to the text analysis is an indispensable part of thinking. Furthermore, the results of the experiment state that HOTs without developed LOTS are more likely to be a mere imitation of a thinking process and reproduction of somebody else's viewpoint, and it is vital to encourage students to do more detailed work with given information.

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