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Teaching Leo Vygotsky’s Theory of Sociocultural Development with the Use of Literature and Information Technology

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Abstract

This work continues the tradition of integrative education combining scientific, artistic, and information-technological approaches to teaching. The author teaches the psychological theory of L. Vygotsky and its application to education by analyzing an episode of N. Nosov’s story Schoolboys. Fifty one graduate students who were current or prospective school teachers and took the author’s distance web-based psychology courses participated in the study. Their task was to recognize illustrations of Vygotsky’s psychological concepts in the episode of the story. The results showed: 1) the subject aspect of the text (solving an arithmetic problem) was more comprehensible from the point of view of Vygotsky’s theory than the social aspect (bringing the child up); one and the same theoretical concept was recognized with the smaller probability if it was included into a social context; 2) well familiar/comprehended theoretical concepts were recognized with greater probability than poorly familiar/comprehended concepts; the concept of learning motivation, specifically, intrinsic motivation was the hardest to identify. The author concludes that teaching psychology via fiction stories is seminal for developing the students’ semantic thinking and in-depth social perception. Results of the study will be useful for enhancing instructional strategies to train and educate school teachers.

Keywords: integrative education, teaching/learning psychology online, psychology of arts/literature, learning motivation, social perception, semantic thinking

1. Introduction

This work continues the tradition of integrative education. In the last century, some outstanding supporters of integrative education declared it as a synthesis of scientific and artistic knowledge [1, 2]. Nowadays, this tradition receives a new incentive. Since computers are widely used in all the areas of human activity and technical possibilities of communication are rapidly increasing, the information-technological component becomes an essential part of the integrative approach to teaching and learning. Programs of distance learning are springing up around the country involving natural sciences as well as social disciplines. Transition of such subjects as psychology and education from a traditional classroom to a virtual one becomes quite usual.

The idea of using works of fiction for the research and educational purposes is not new. For a long time, fiction stories have been successfully used for practicing and teaching psychoanalysis [3, 4, 5] and transactional analysis [6]. Also, they were incorporated into educational process within the framework of sociocultural psychology [7]. Later, contemporary educators applied this approach to their practices [8, 9].

With transition of such a discipline as psychology to Internet-based courses, works of fiction and art may become an important part of computerized instructional methodology [10, 11]. The author’s recent attempt of incorporating such methodology into psychology in its application to education will be discussed in this work.

2. Theoretical Frame

According to Vygotsky, the following fundamental notions are needed for understanding how humans develop under influence of their sociocultural environment. These notions are: lower vs. higher psychological processes/functions, mastery of cultural tools, and mastery of one’s own psychological processes and behavior [12]. Such a conceptual apparatus seems to be very suitable for describing the phenomenon of teaching-learning, specifically in childhood. That’s why Vygotsky’s theory and neo-Vygotskian approach as well as their application to education are widely recognized nowadays.

All human psychological functioning consists of processes. In contrast to lower psychological processes, which are inborn, involuntary, and isolated, higher psychological processes are culturally formed, voluntarily controlled, and united with other processes. Development of higher psychological processes goes on due to the use of cultural tools, among which psychological or mental tools occupy an important place. Mental tools include
language, writing, counting, pictures/drawings, and system of signs – everything what children acquire when adjusting to their environment. Ingrowth into civilization is based on mastery of these cultural tools which in their turn help children to develop and master their higher psychological processes. These tools also are called mental tools because they serve specifically to the purpose of developing mental functions.

Significant adults (e.g. parent, teachers) become transmitters of cultural knowledge to young generations. Transmitting mental tools to pupils is mediation. Adults mediate mental tools helping children to master psychological processes; complex and meaningful perception, voluntary attention, conceptual and verbal thinking, semantic memory, problem solving etc. As special adults teach us mental tools, they promote development of new motives for exploring reality and learning. Any child is an active seeker of new information and enthusiastic learner by his nature; s/he is always propelled by some kind of motive for performing her/his activity. Involving children in joint activities, adults stimulate the development of intrinsic learning motivation in children that is, their interest in learning for its own sake, as well as self-regulation over one’s own mental functioning and behavior.

In connection with Vygotsky’s and his followers’ point of view on learning motivation, some definitions given by contemporary scholars also need to be considered. When describing students’ motivation to learn, they define intrinsically motivated individuals as undertaking an activity “for the enjoyment it provides, the learning it evokes” [13]. If extrinsically motivated individuals perform in order to receive rewards or avoid punishments external to the activity itself and “do something only because it leads to a separable desired outcome” [14], then intrinsic behavior does not require a reward and results in high-quality activity anyway [15].

When teaching mental tools, an adult exteriorizes and presents them to the child “in the form of external device” [16]. The explanations, instructions, and demonstrations of new knowledge and skills are the most common forms of external mental devices. Mastering them, the child internalizes and turns them into internal mediators of his/her mental processes. Exteriorization and internalization are two sides of a coin.

The very mechanism of development was depicted by Vygotsky as a square in which a learner stimulated by a knowledgeable helper (parent, teacher, or advanced peer) moves from the bottom base up to the top base. This metaphorical construction is called zone of proximal development (ZPD). The notion of ZPD is essential for evaluating human learning ability.

These are brief definitions and descriptions of Vygotskian concepts expanded by his followers which will be discussed in our two step study.

3. Study One

This research was conducted at the Graduate School of Education at Touro College, a statistically average American educational institution. The research took place in connection with the distance web-based course entitled Child Development and Learning in Cultural Context with students who were current or prospective school teachers. We called their group the A-group. For this course, a new method of teaching was developed based on the union of psychology, literature and information technology in its application to education.

3.1. Participants of the A-group

31 students participated in our study in spring and summer of 2015. All of them were enrolled in a distance online course designed and instructed by the author of this study. For 6 participants (approximately 20%) this was their first exposure to an online course. Seven participants were males, while 24 were females. With regard to ethnicity, 22 students (70%) were white, 3 students (10%) were black, 5 individuals (16%) identified themselves as Latinos (Hispanic), and one individual (approximately 1%) – as an Asian American. Three participants were exchange students from Asian countries for whom English was not a native language. He average age of participants was approximately 30 years. The demographic data were collected from the students’ postings and photos submitted to an “Introduce Yourself” forum at the course’s Discussion Board in the beginning of the semester.

3.2. Instrumentation

We used an episode from the Russian writer Nikolai Nosov’s story Schoolboys which was translated into English and adapted to American culture [17].

The episode, located in the chapter two of the book, presents a scene from the family life of a 10 years old boy Victor. The parents having come together at the end of their working day try to help their son with arithmetic. Vic is struggling with an arithmetic problem, in spite of its similarity to another one that the teacher discussed earlier in the classroom. It is a late evening, and the boy is tired and sleepy. However, his father demands the son
to complete his homework to be ready for the next school day. Finally, when seeing that Vic cannot solve the problem on his own, the father solves it for him.

It seems that the family is preoccupied with the arithmetical problem. However, in fact, they were solving two problems: social and subject. The parents explain arithmetic to their son at the same time bringing him up. The family builds its relationship while working on the math problem.

The writer described the story’s characters very realistically and in much detail: their behaviors, dialogues, and Vic’s secret thoughts triggered by the family’s conversation. The readers may uncover a multifaceted world of relationships between the father and the son and find out the child’s genuine point of view on the situation.

In the last decade, when using this episode in her child psychology courses, the author of this study empirically discovered that the episode was quite appropriate for exploring college students’ comprehension of major Vygotskian theoretical concepts. In the previous multiple discussions of the episode with the students, it was found which fragments of the episode illustrate Vygotskian concepts. These findings became a basis for creating a method to analyze and interpret our study participants’ answers.

3.3. Procedure

Experimental task was a part of a homework assigned in our online course taken by the students. They worked independently; collaborative activity was forbidden. First, they read a chapter from Y. Karpov’s book Vygotsky for Educators, so that they learned Vygotsky’s concepts and their definitions. (These concepts are described in Theoretical Frame.) Second, using an experimental protocol given to them, they prepared the assignment. They did their work on the computer screen which allowed them to easily manipulate with the text file using Microsoft office software.

The instruction given to the students consisted in the following. “You are offered the text with an episode from the life of a Russian boy Victor, a character of the popular book Schoolboys by N. Nosov. In this episode Vic is trying to solve an arithmetic problem similar to another one, which the teacher had discussed earlier in the classroom. Vic’s mother and father are helping him. Your task is to find in the text all possible illustrations of Vygotskian concepts. You are provided with a file containing your experimental protocol in the form of a two-column table. The text of the episode is in the left column. The right column is empty. The characters’ actions and their words may serve as key elements. When you find such a key element (word, phrase, or sentence), put it in bold font. In the right column, please, specify the name(s) of the Vygotskian concept(s) corresponding to this key element. Do not forget to point which key-element the found concept relates to.”

3.4. Data analysis

3.4.1. Development of the rules for interpreting data

For more convenience in interpreting the students’ data, the text of the episode was divided into 12 fragments. To distinguish the fragments, we used the following criteria:

1. Each fragment illustrates at least one Vygotskian concept; there are no “empty” fragments

2. A new fragment begins when a character begins a new activity or a new character appears.

3. Each fragment represents one main concept even if it includes some others.

Six fragments were semantically simple. We call a fragment semantically simple if all its sentences pertain to one and the same concept. Six other fragments were more complex and might represent more than one concept each. In semantically complex fragments, there were combinations of words or whole sentences related to the concepts different from the main one; they might illustrate some previous fragments.

Table A containing rules for interpreting students’ data is presented in Appendix A.

3.4.2. Types of the answers

Students’ answers were classified into three categories: correct, incomplete, and wrong. An answer was considered correct if the concept chosen was connected to the correct fragment and a brief explanation of one’s opinion was provided. An example of the correct answer is presented in Table 1. Such the concept as mental tool vs. absence of a mental tool is the best for the fragment presented. The concepts of exteriorization and internalization which always accompany acquisition of mental tools are also appropriate.
Table 1. An example of a correct answer

<table>
<thead>
<tr>
<th>Fragment of the text</th>
<th>Corresponding concept and explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our teacher had given us one of those nasty problems, and I hadn’t the faintest idea how to do it.</td>
<td>Vic has no mental tool to solve the problem because he did not internalize that appropriate strategy which his teacher had exteriorized earlier.</td>
</tr>
</tbody>
</table>

An answer was considered incomplete if a) the correct concept was found, but the key phrase/sentence in the corresponding fragment was not specified and no connection was indicated between the two or b) a wrong concept was connected with the fragment. In Table 2 an example shows the case when the appropriate concept was connected with the fragment, but the key phrase/sentence in the fragment was not indicated. Also, no explanation was given, so it remained unclear what the father exactly mediated. Actually, he mediated some social knowledge and attitude necessary for Vic to become a responsible person and a good schooler.

Table 2. An example of an incomplete answer

<table>
<thead>
<tr>
<th>Fragment of the text</th>
<th>Corresponding concept and explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>“He must stay up until he finishes,” said Dad. “Next time he’ll know better than to leave his homework undone so late.”</td>
<td>Dad mediates.</td>
</tr>
</tbody>
</table>

Another example of an incomplete answer is presented in Table 3. Key-phrases in the fragment are specified correctly, but the concept was chosen mistakenly: it does not correspond to this fragment. When the teaching occurs in a classroom, the teacher, according to Vygotsky, should indeed make students move from the bottom to the top of their ZPDs. However, such a process was not shown in this particular fragment. What is really shown here is the father’s mediation of some social knowledge about how education should occur and teachers should act, and what students should expect from their school teachers.

Table 3. An example of an incomplete answer

<table>
<thead>
<tr>
<th>Fragment of the text</th>
<th>Corresponding concept and explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Didn’t they explain the problems to you at school?” Dad asked. “No,” I said, “they did not.” “That’s strange! When I studied at school, the teacher always explained the problem first in class and then gave us examples to do at home.”</td>
<td>The teacher works with her students’ ZPDs.</td>
</tr>
</tbody>
</table>

An answer was considered wrong if a) a named concept was not connected to any specific fragment that is, concepts scattered through the text at random not being tied to any fragments or b) no fragments and no concepts were found at all.

3.4.3. Mathematical analysis

We used the following simple mathematical analysis of data. An average value of each type of answers for all fragments of the text was computed according to the following formula:

$$A = \frac{1}{n} \sum_{i=1}^{n} x_i$$

where A is the average or arithmetic mean; n is the number fragments; xi is the number of correct answers for each fragment [18].

Average standard deviation of each type of answer for all fragments of the text was computed according to the following formula:
\[
\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (x_i - \mu)^2}
\]

where \(\sigma\) is the standard deviation, \(\mu\) is the arithmetic mean, and \(N\) is the number of fragments [19].

3.5. Results and their interpretation in the A-group

3.5.1. Distribution of the students’ answers

The students’ data for twelve fragments of the episode are presented in Table 4. The numbers of the fragments are located in the left most column of the table. In the next column concepts illustrated by the fragments are presented. The other columns contain the average values for the three types of the answers: correct, incomplete, and wrong. The data for those fragments of the text in which the characters solved a social problem are represented in darker rows; in the other rows, the data for the fragments in which characters solved arithmetic problem can be found. In the two bottom lines, average values and their standard deviations for all the three types of answers are shown.

Table 4. Distribution of the three types of students’ answers in the A-group

<table>
<thead>
<tr>
<th>Frag. №</th>
<th>Main concepts illustrated in the fragments</th>
<th>Correct answers</th>
<th>Incomplete answers</th>
<th>Wrong answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>No mental tool</td>
<td>15</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>2.</td>
<td>Lack of self-regulation</td>
<td>15</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>3.</td>
<td>Mediation</td>
<td>5</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>4.</td>
<td>Mediation</td>
<td>7</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>5.</td>
<td>Mediation</td>
<td>13</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>Mediation (exteriorization-internalization)</td>
<td>15</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>7.</td>
<td>ZPD</td>
<td>6</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>8.</td>
<td>Lack of self-regulation</td>
<td>3</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>9.</td>
<td>Mediation: (exteriorization-internalization)</td>
<td>3</td>
<td>18</td>
<td>10</td>
</tr>
<tr>
<td>10.</td>
<td>Mediation</td>
<td>7</td>
<td>21</td>
<td>3</td>
</tr>
<tr>
<td>11.</td>
<td>Mental tool</td>
<td>4</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td>12.</td>
<td>No motive</td>
<td>2</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td><strong>Average (A)</strong></td>
<td><strong>7.92 = 25.6%</strong></td>
<td><strong>12.92 = 41.8%</strong></td>
<td><strong>10.08 = 32.6%</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Average Standard Deviation (σ)</strong></td>
<td><strong>5.12</strong></td>
<td><strong>4.2</strong></td>
<td><strong>5.84</strong></td>
</tr>
</tbody>
</table>

The “Correct answers” column has the smallest average number of 25.6%. The result is disappointing, so, there must be certain causes for it. First, an analysis of a literary passage from psychological point of view is not an easy task. It is not easy even for some professionals, so expectations should be realistic when we work with novices. Second, our students might not be prepared in general for solving such problems.

For many years, importance of story or word problems was ignored in American education. Several generations of school students were deprived of an opportunity to develop valuable cognitive skills. As experts state, even today word problems used in elementary and middle school for teaching such a discipline as, say, mathematics are still scarce and trivial [20, 21]. Perhaps, our students’ school years passed under the slogan of rejection of word problems. The situation is improving, but slowly.

3.5.2. Comprehensible and non-comprehensible concepts

Below we discuss those correct answers from Table 4, which are located out of the confidence interval \([A-\sigma) – (A+\sigma)\], that is [7.92-5.12; 7.92+5.12].

The greatest quantity of the correct answers was related to the concepts of mental tool (fragment № 1), self-regulation (fragment № 2), and mediation (fragment № 6). 13 or 15 (out of 31) students found fragments which illustrated these concepts. These concepts were the most comprehensible. The smallest quantity of the correct answers was related to the concepts of self-regulation (fragment №8) and motivation (fragment №12). Only 2 or 3 students recognized them. Motivation happened to be the least comprehensible Vygotskian concept for our students.
Fig. 1 shows the students’ distributed answers in recognizing the most and the least comprehensible concepts. Every broken line connects the three vertices which correspond to the three types of answers. The numbers near the vertices display the quantity of each type of the answer. The grey line represents the fragment in which Vic shows no strategy for solving the arithmetic problem. The black line represents the fragment in which Vic expresses no interest in learning how to solve such a problem: he lets Dad do it for him. The grey decreasing line represents relatively successful recognition of the concept mental tool, while black increasing line represents students’ poor recognition of motivation.

![Graph showing distribution of students' answers in recognizing the most and least comprehensible concepts](image)

Fig. 1. Distribution of the students answers in recognizing the concepts of mental tool and motivation

Events, characters, and their relationships were portrayed in Nosov’s story quite realistically and with a great attention to details. Therefore, causes of poor recognition of some concepts should rather be searched in the readers’ perceptions than in the story text.

Works of fiction are catalyzers of human personal experience. To some extent, they function as projective tools. We suggest that the students projected their personal and professional experience onto the text and better recognized concepts with which they were more familiar. As school teachers, who transmit knowledge and skills to their pupils every day, our students well recognized mediation and everything associated with it, like exteriorization-interiorization and mental tool. It looked like our study participants were unfamiliar with motivation.

In pedagogical practice, much attention has been paid to students’ motivation [22, 23, 24, 25, 26]. Modern libraries, traditional as well as electronic, are full of valuable articles about types of motivation, its effects on learning, strategies of motivating children, and even strategies in helping children to motivate themselves. Teachers are provided with various methodological manuals and instructions for helping their pupils’ to become intrinsically motivated learners. Against the background of all this abundant information, our result looks strange.

The first explanation that comes to mind is that most participants of the study did not recognize motivation in the text because they were short of it themselves. It is well-known that in today’s society, even in the most advanced countries, many of those who become educators do not actually have a pedagogical talent; they even were not the best students in their school years. (A few countries, such as Finland, are an exception.) Why do people decide to work at school? – There are many reasons: family traditions, no interest or inclinations for other specialties, the offered benefits, an opportunity for a rapid administrative career, and even accidental circumstances. However, like in other creative professions, teaching is best when the teacher is talented what means that s/he is strongly intrinsically motivated. Many of those who become educators, probably, are not so motivated [27, 28].

However, another interpretation can also be valid. Participants of our study demonstrated so-called “defensive blindness” to motivation in the text because, being school teachers, they are unsuccessfully preoccupied with developing of their pupils' intrinsic motivation. Intrinsic motivation promotes learning in-depth and for its own sake. Indeed, the task is complicated (if realizable at all). Reality does not comply with the administrative requirements. How to develop intrinsic learning motivation of children which are exposed to consumer world with its striving for materialistic rewards? It is doubtful that the classroom instructor alone can remake mentality of pupils, especially, if s/he has some problems with motivation her/himself. How can a teacher, even diligent and skillful one, develop interest to learning in children whose families have never cared of it? Motivation seems to be a really hot point in today’s education.

With regards to other Vygotskian concepts, the situation was more ambiguous. For example, self-regulation split itself into the opposite categories – the most and the least comprehensible. In the fragment № 2, Vic did not
control his physical state when he, being tired and sleepy late in the evening, was trying to do his homework: 15 (out of 31) students identified “lack of self-regulation” in this fragment. In the fragment № 8, his father failed to control his emotions when he was edifying his son; only three students mentioned “lack of self-regulation” in dealing with that fragment. It looked like the students’ perception and ability to identify illustrations of the concepts depended on the context. The concept was well recognizable in the context of the characters’ subject activity and poorly recognizable in the context of their social relationships.

3.5.3. Connection between concepts and fragments

The average number of incomplete answers was 41.8% (see Table 4). This category embraced such answers in which either the fragment of the text or the Vygotskian theoretical concept was identified, but no connection between them was found (see Tables 2 and 3).

Our analysis showed that the quantity of answers in which the students found the concept but did not find the corresponding fragment was negligibly small in comparison with the quantity of answers in which the fragment was recognized but corresponding concept was not. In other words, dealing with the story text as it is, in terms of everyday notions, was much easier for our students than comprehending it from psychological point of view. This result is shown in Table 5. “C” and “F” are short designations of the “concept” and “fragment” respectively. The values “0.75” and “12.16” represent average values of the two types of incomplete answers.

<table>
<thead>
<tr>
<th>Types of incomplete answers</th>
<th>№№ 1</th>
<th>№№ 2</th>
<th>№№ 3</th>
<th>№№ 4</th>
<th>№№ 5</th>
<th>№№ 6</th>
<th>№№ 7</th>
<th>№№ 8</th>
<th>№№ 9</th>
<th>№№ 10</th>
<th>№№ 11</th>
<th>№№ 12</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>F is identified; C is not</td>
<td>10</td>
<td>9</td>
<td>15</td>
<td>15</td>
<td>10</td>
<td>13</td>
<td>17</td>
<td>21</td>
<td>16</td>
<td>10</td>
<td>12.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C is identified; F is not</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0.75</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Generally, the fragment-concept relationship reflects the connection between concrete and abstract thinking. A fragment represents concrete text content, while a concept is an abstract verbal symbol in which the content is embodied. “Concrete” and “abstract” are two sides of the process of thinking; they exist in unity. A poor connection between the two may indicate some flaws in formal-logical thinking. The fact that the concepts are identified with a lower probability than the fragments, and if identified are isolated from the fragments, may indicate poor analytical skills.

3.5.4. Failure to perform the assignment

The average number of wrong answers was 32.6% (see Table 4). The answers which we named “wrong” were actually a rejection to perform an assignment. The most realistic explanation consists in the following: the assignment that students had to perform – comprehension of the text from psychological point of view – demanded a higher level of cognitive preparedness. It was natural to expect that, if the students had difficulties with scientific language, they would answer in a simple everyday language. A few participants did so; the others preferred to give up, and large portions of the text in their protocols remained unused. However, this problem seems to be cognitive rather than linguistic. The semantic structure of the text, namely presence of two aspects in it – subject and social – was too hard for many of them.

3.5.5. Subject problem vs. social problem

In the story’s episode, two major aspects are presented in which Victor and his parents act. They solved the subject problem in the fragments №№ 1, 2, 5, 7, 9, and 12, and they solved the social problem in the fragments №№ 3, 4, 6, 8, 10, and 11. In the first case they did homework in arithmetic; in the second, they built family relationships and parents mentored and instructed their child (see Table 4).

In Fig. 2, average values of the three types of answers in regard of the arithmetic and social problems solved by characters in the episode are presented.

Incomplete answers constituted the largest quantity of answers for both aspects of the episode. Predominance of incomplete answers, as was already said above, points at difficulties which participants of the study might experience when they were connecting the concrete content of fragments with the theoretical Vygotsky’s concepts. It is seen from the graph below that there was more incomplete and wrong answers than correct ones when students were analyzing both subject and social aspects of the episode. They definitely had difficulties comprehending the episode from the psychological point of view.
3.6. Discussion

The result concerning the poorly recognized concept of motivation in the text of the episode, specifically, intrinsic motivation indeed may reflect lack of intrinsic motivation in students. However, a simpler explanation also is possible. As it was already mentioned, the students were dealing with an unusual word problem. The fragment illustrating lack of Vic’s intrinsic motivation was the last one in this episode. Perhaps, our study participants, when performing a difficult assignment, just became tired and could not work productively with the last part of the text.

Also, as we assumed, difficulty of the assignment caused a relatively high quantity of wrong answers. However, another possibility cannot be excluded: the wrong answers might be caused by a dissipation of students’ attention. Today’s teachers often point to troubles with concentration of attention among schoolers of all grades what may prevent children and youngsters from productive study in the classroom.

As we have suggested, the greatest quantity of incomplete answers in our study reflected some deficiencies in students’ analytic skills and semantic thinking. At the same time, a simpler explanation exists. What looks like a poor ability to connect the concrete description with the abstract concept may be caused by ignoring the instructions given for performing the assignment.

It should be noted that American students’ educational experience often leads them to contemptuous attitude towards instructions. That’s because the practice exists, specifically, in the area of social sciences, to issue the grades for submission rather than for the quality of work. So that students do not develop a habit for preliminary exploring requirements and following them for their farther coursework. Therefore, there was a possibility that our study participants could arbitrary limit themselves by pointing to just one element of the pair – a fragment or a concept – instead of searching for a correspondence between the two.

The average numbers of the correct, incomplete and wrong answers constituted 25.6%, 41.8%, and 32.6% consecutively (see Table 4). The number of correct answers namely 25.6% was the smallest of the three. Of course, we have taken into consideration that the assignment was unusual for the study participants and they had a poor experience in solving story problems. However, we still were dealing with adults who in their previous years developed necessary skills to learn new topics. The assignment was difficult but still possible to complete. We conjectured that there existed some extraneous factors which might prevent students from successful work with the assignment.

What if students are additionally motivated for qualitative performance of the assignment? What if favorable conditions for their work with the text are provided by excluding most extraneous factors from the experimental situation? May all this help to promote students’ greater effectiveness?
4. Study Two

An analogous study was conducted with another group of students who took the same online course at a different time. We called it the B-group. The main research purpose was the same – to explore how students comprehend concepts of Vygotsky’s theory. A supplementary purpose was to exclude extraneous factors which may negatively affect students’ activity in the study and provide better conditions for their work.

This study was based on the following assumptions:

1. If the story problem given to the students is unusual or difficult for them, it is necessary to additionally motivate them for solving it.

2. To avoid the students’ fatigue or dissipation of attention, it is necessary to help them to correctly organize their intellectual activity.

3. To make students work at a par with their potentials, it is necessary to make them understand that reading and following instructions is essential for their success.

To motivate the students, the assignment was presented in the syllabus as one of the most important projects of the course. For excluding such extraneous factors as fatigue, dissipation of attention and disparagement of instructions, we made changes in the research procedure and instructions.

4.1. Participants of the B-group

20 students of Touro Graduate School of Education participated in our study in the fall semester of 2015. We call them the B-group. They were enrolled in the author’s distance online psychology course Child Development and Learning in Cultural Context. Six of them (30%) were online beginners. Seven (35%) participants were males, while 13 (65%) were females. With regard to ethnicity, 12 students (60%) were white, 4 students (20%) – black, and 4 students (20%) – Latinos. For three (15%) individuals English was not a native language; one of them was an exchange student from Eastern Europe. The average age of participants was approximately 30 years. The demographic data were collected from the students’ postings and photographs submitted to the “Introduce Yourself” forum on the Discussion Board.

4.2. Procedure

In the B-group, assignment also consisted of two stages: reading the chapter of the book devoted to Vygotsky’s theory and analyzing the episode from Nosov’s story mentioned above with the purpose of finding illustrations for basic Vygotskian concepts in it. The students posted their answers into a given protocol which differed from the previous one: the text of the episode was divided into three parts.

The four basic changes of instructions consisted in the following:

1. The course syllabus announced that this homework was one of the most important projects of the course, and its weight constituted 10% of all the coursework (unlike other homework assignments whose weight constituted 3%). (The A-group received 3% for the same assignment.)

2. The students were requested to perform this assignment «not in one sitting», but within three days working with one portion of the text daily, and the portions’ order should be kept one and the same.

3. The students were requested to attentively read instructions before they start performing the assignment. They were informed that, if their work did not follow instructions, it would be returned for a revision; if the revised work still did not meet requirements, it would not be accepted, and no passing grade would be issued.

4. The students were recommended to search for illustrations of concepts as well as their absence in the text of the episode.
4.3. Results and their interpretation in the B-group

4.3.1. Distribution of the students’ answers

Main concepts illustrated in the fragments and distributions of the three types of students’ answers are presented in Table 6. Average values of the three types of answers, including their values in percentages, as well as their standard deviations are shown in bottom lines.

<table>
<thead>
<tr>
<th>Frag.№</th>
<th>Main concepts illustrated in the fragments</th>
<th>Correct answers</th>
<th>Incomplete answers</th>
<th>Wrong answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>No mental tool</td>
<td>16</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Lack of self-regulation</td>
<td>17</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>Mediation</td>
<td>8</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>Mediation</td>
<td>8</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>Mediation</td>
<td>12</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>6.</td>
<td>Mediation</td>
<td>18</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>7.</td>
<td>ZPD</td>
<td>11</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>8.</td>
<td>Lack of self-regulation</td>
<td>5</td>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>Mediation</td>
<td>15</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>10.</td>
<td>Mediation</td>
<td>5</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>11.</td>
<td>Mental tool</td>
<td>2</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>12.</td>
<td>No motive</td>
<td>0</td>
<td>11</td>
<td>9</td>
</tr>
</tbody>
</table>

Average (A) 9.75 = 50 % 7.5 = 37% 2.75 = 13%

Average standard deviation (σ) 6.0 3.8 2.8

In the B-group, the category of correct answers became the largest and constituted 50%. The category of wrong answers became the smallest and received only 13%. The category of incomplete answers occupied the middle position between the two others.

Distribution of the answers in the A and B groups are presented in Fig. 3. Since groups were different in numbers of students, to make data comparable, normalized values are shown in the graph. In comparison with the A-group, the B-group’s quantity of correct answers increased approximately two times, while the quantity of wrong answers decreased more than two times. The average value of incomplete answers slightly decreased, but was still relatively high.

![Fig. 3: Distribution of normalized numbers of the three types of answers listed by the groups](image)

As it appears, taking the extraneous factors under control that is, excluding them from the experimental situation, indeed favorably influenced our study participants’ performance. Being motivated and organizing their intellectual activity reasonably, they succeeded in dealing with complicated story text much more than the students of the A-group.
None of the extraneous factors could be named necessary; they “worked” well as a unit, and their combination seems to be a necessary and sufficient condition for reliable results. When the factors were excluded, we found some changes in distribution of the three types of students’ answers. However, although the general picture much improved, the quantity of incomplete answers still stayed relatively high. Therefore, this repeatable result may be considered valid.

4.3.2. Comprehensible and non-comprehensible concepts

Below we discuss those values of the correct answers which are located beyond the confidence interval [(A-σ); (A+σ)], that is [9.75-6.00; 9.75+6.00].

The greatest number of the correct answers related to the concepts of mental tool (fragment № 1), self-regulation (fragment № 2), and mediation (fragment № 6). Fragments, which illustrated them, were identified by 16-18 (out of 20) students. Like in the A-group, in the B-group, mental tool happened to be among the most comprehensible Vygotskian concepts. The smallest number of correct answers related to the concepts of mental tool (fragment № 11) and motivation (fragment № 12). The fragment, which illustrated mental tool, was identified by 2 students, and that one, which illustrated motivation, was not identified at all. As in the A-group, in the B-group motivation happened to be the least comprehensible concept.

With the respect to ambiguous concepts, this time mental tool split itself into two opposite categories: the most and least comprehensible. The students identified it successfully if it was included into the subject context and unsuccessfully in the social context. 16 students found mental tool in the fragment where Vic was developing an arithmetic strategy and only 2 students found it where he was developing some important social skills.

The answers of participants in recognizing the concept of mental tool are shown in Fig. 4. Grey line has decreasing shape which is due to the relatively small quantity of incomplete and wrong answers with the respect to the arithmetic tool, while the black line has a convex shape meaning relatively large quantity of incomplete and wrong answers with the respect to the social tool.

![Distribution of the students' answers in recognizing the concept of “mental tool” in two illustrations of Victor's mental activity](image)

4.3.3. Connection between fragments and concepts

The quantity of answers in which participants of the study found the concept and did not find the corresponding fragment was negligibly small in comparison with the quantity of answers in which the fragment was recognized and corresponding concept was not. The average values of the two types of incomplete answers were 6.9 and 9.55. The result is identical to that one which was received in the A-group. Some members of the B-group still had difficulties in connecting concrete text with abstract concepts and could not comprehend reality of the literary episode from psychological point of view.

4.3.4. Failure to perform the assignment

The average number of wrong answers was 13% (see Table 6). It is more than two times less than in the A-group. No doubt, participant of the study analyzed the literary episode given to them more diligently and performed it more effectively when they were additionally motivated. This time, if some individuals had
difficulties identifying concepts in the fragments, they preferred rather to give an incomplete answer than not to respond all. However, to analyze the semantic structure of the text was still too hard for them.

4.3.5. Subject problem vs. social problem

In Fig. 5, the three types of answers are presented. The graph shows that the subject aspect of the episode was recognized with high probability: the average number of correct answers was 11.83 (60%).

![Graph showing the average numbers of answers for arithmetic (solid columns) and social (stripped columns) problems illustrated in the episode; the B-group](image)

It is naturally to deem the correct answers the best indicator of relatively well-comprehended content of the text. The students of the B-group seem to cope with their assignment when they were analyzing characters’ subject activity. However, like the A-group, the B-group still poorly comprehended characters’ relationships. This result may seem to be paradoxical because, according to the story, parental tutoring in arithmetic turned out to be quite useless, while their social lesson turned out to be right useful for their child.

Unfortunately, many participants of our study failed to comprehend the social aspect embodied in the episode. What have they actually missed?

In the given episode, besides teaching their child arithmetic, the parents taught him a lesson of everyday life. They edified and instructed Vic sharing with him their experience and some social skills which, in their opinion, a good schoolboy and successful learner should have. Not leaving him alone with his trouble and trying to help as much as possible, they taught him a lesson of family solidarity.

What is even more interesting is that the child was also solving some social problems. Vic was a bad performer in arithmetic, but he was a good social learner. On that evening he got even more social knowledge from the family discussions than parents think he did because he, as any kid, was sensitive to all – voluntary and involuntary, verbal and nonverbal – parental intentions and attitudes. Vic did not comprehend the arithmetic strategy, but he worked out a reasonable social strategy to deal with the irritated and jelling father not to provoke even more irritation and punishment. Vic has not yet developed self-regulation for preparing his homework, but his self-regulation in the area of family relationships was advanced.

The attempt to teach the boy arithmetic failed. The father, having scolded his son and called him “stupid”, performed Vic’s homework assignment himself. Vic just copied the solution into his notebook to bring it to school the next day. So, Vic got a chance to avoid a conflict with the teacher. This also characterizes his good social skills: to benefit from troubles.

However, it would be wrong to think that Nosov in his story portrayed the family that taught their child to cheat and shirk. When solving the problem for Vic, the father rather instills responsibility and models motivation to complete homework. Since Vic pretended that he understood how the father solved the problem, the father was not aware of the opposite side of his action. Fortunately, the family was harmonious and reasonable, and Vic would understand very soon that he has to master arithmetic.
4.4. Discussion

This study was conducted with two groups of graduate students who were current school teachers: the A-group and the B-group. They were taking the online psychology course at the same college and with the same professor (this study’s author) but in different semesters. Demographic compositions of the two groups were similar.

Participants of our study performed one and the same assignment, while the conditions for working on the assignment were different for the two groups. For the B-group a factor which additionally stimulated their motivation was included: we increased the grade for this assignment (if correctly fulfilled) five times. On the other hand, some obvious extraneous factors that might negatively affect people’s activity were excluded, such as possible fatigue, dissipation of attention, and disparagement of instructions. Being more motivated and having to organize their intellectual activity more efficiently, students of the B-group demonstrated a significant improvement in quality of their work.

Results consist in the following.

1. It required providing special conditions for students’ intellectual work to make the quantity of their correct answers reach 50%. The percentage of incomplete and wrong answers constituted the other half.

2. From the point of view of Vygotsky’s theory, the subject aspect of the text (solving the arithmetic problem) was more comprehensible than the social aspect (solving the problem of bringing up the child); one and the same Vygotskian concept was recognizes with greater probability if it was included into the subject context than into the social one.

3. In the literary text, illustrations of well familiar or well comprehended theoretical concepts were identified with greater probability than illustrations of less familiar or poorly comprehended concepts; the concept of intrinsic learning motivation was the hardest to identify.

The fact that the solution of the story or word problem was difficult for graduate students certainly pointed to some shortcomings in their school education. Low culture of solving word problems is just one explanation for not so high quantity (50%) of the correct answers obtained from students who were analyzing the literary text. However, another possible explanation should be taken into consideration – deficiency of reading skills.

Teaching English in USA has undergone many changes within the last decades. These changes weren’t always beneficent [28]. It suffices to recall “Whole Language” method which became “an alternative to any sort of linguistic analysis” [29, p.443]. No teaching phonics, grammar, or syntax. The founders and adherents of “Whole Language” reform hardly envisioned what the consequences of their instructional methodology might lead to and what influence it might have on children’s development.

Our hypothesis based on lack of reading skills seemed the most fundamental and needs an experimental verification.

5. Conclusions

Story/word problems turned out to be difficult for participants of our study. Analysis of the literary text for finding illustrations of the concepts of Vygotsky’s theory was a challenge for them. In the first study the average quantity of the correct answers was only 25.6%. It took creation of special conditions that is, additional motivation and optimal organization of the students’ intellectual labor to let them cope with the assignment and increase the average quantity of the correct answers to 50.0%.

Participants of the study had difficulties in understanding the semantic structure of the text. Not all noticed that the text had two major aspects, subject and social, and the story characters were solving the arithmetic problem as well as the problem of bringing up the child and building family relationships. The students recognized Vygotskian concepts in the text with much less probability if these concepts were included into the social context of the episode.

The concept of motive, specifically, intrinsic learning motivation, turned out to be the least comprehensible Vygotskian theoretical concept for our students: it was identified by only two individuals out of all investigated population of 51 students. Obviously, there exist some circumstances connected to motivation which prevented them from recognizing this concept in the text of the story. However, we cannot yet explain the nature of such a “mental blindness”; further investigation is necessary.

We conclude that teaching psychology using fiction stories is fruitful for developing the students’ semantic thinking and in-depth social perception. Both these psychological abilities are fundamental for those who teach and are responsible for children’s development and success in the society.
Our study has served two functions. First, it allowed to reveal the mechanisms of assimilation of Vygotsky’s psychological theory; phenomena which it describes and its ideas. Apparently they are less comprehended by students if applied to social reality than to subject one. Second, it showed effectiveness and practicality of integrative education that could recover and compensate for the shortcomings of the traditional approaches to learning.

6. Implementations

We use results of this study to enhance our online psychology courses’ content and instructional strategies to further train the students who are current or prospective school teachers. In the author’s online course Child Development and Learning in Cultural Context a few other episodes from the same Nosov’s story have been already incorporated; all of them describe in detail one or another theoretical concept of Vygotsky’s theory. Some of such assignments were arranged as discussions on the Discussion Board, and the students had an opportunity not only to perform an assignment but also to discuss the opinions with their classmates. In this case collaborative work has some advantages over the individual activity.

The idea to teach psychology using works of fiction seems productive. The best examples of the world classical and modern fiction in which the process of teaching-learning is illustrated will be offered in the author’s online psychology courses. It will help to broaden today educators’ outlook. It will compensate for the deficiency of personal and professional experience of young school teachers.

7. Limitations

Since this study was conducted in one college and the data were collected in the relatively small population, the applicability of the findings is still limited. Similar studies in the author’s courses in consecutive semesters will be conducted. It would be desirable to conduct an analogous study in the other college(s) where online Developmental Psychology course as well as theory of Vygotsky is taught to students specializing in various social sciences. It would be also be helpful to conduct the same study with students specializing in education in other countries. The issues which appeared in our single and isolated study may be clarified through the comparative approach. The research is continuing.

References:

Appendix A. The instrument for interpretation of the students’ data

The instrument for data interpretation is present in Table A. It consists of twelve components, fragments of the same key elements in each of them, and corresponding theoretical concepts. We compare every student’s experimental protocol with this table’s content to find out the correctness of the student’s answers.

Numbers of the fragments are presented in the left most column; fragments are represented in the middle column in a chronological order, and corresponding concepts are shown in the right most column. In a semantically simple fragment, everything relates to the same concept and should be considered as a correct answer. In a semantically complex fragment, most of the content is related to the main concept, and some phrases/sentences, being the inclusions of the other parts of the text into this fragment, relate to different concepts.

Some phrases/sentences of the text illustrate Vygotskian concepts with the greatest accuracy, and we called them keys. Keys and corresponding theoretical concepts are bold-faced. In semantically simple fragments, key phrases/sentences are not numbered. In semantically complex fragments, each key has the same number as the fragment which it belongs to.

Fragments of the episode presenting the social context (solving the problem of developing relationships) are darkened in the table; they are №№ 3, 4, 6, 8, 10, and 11. The other fragments present the subject context (solving arithmetic problem).

Table A. Key elements contained in the fragments and the corresponding Vygotskian concepts

<table>
<thead>
<tr>
<th>Fragments</th>
<th>The Story Content</th>
<th>Vygotskian Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Our teacher had given us one of those nasty problems, and I hadn’t the faintest idea how to do it.</td>
<td>(1) No mental tool for solving the arithmetic problem</td>
</tr>
<tr>
<td>2.</td>
<td>I sat for a whole hour staring into my book and racking my brains, but nothing helped. Besides, I was terribly sleepy by now. My eyes were smarting as if someone had thrown sand into them.</td>
<td>(2) Lack of self-regulation. Facing consequences of a poor self-regulation with respect to homework.</td>
</tr>
</tbody>
</table>
| 3.        | "That's enough," Mum said. "It's time for bed. You can hardly keep your eyes open."
"But I haven't done my problem yet!
"You ought to have done it before," said Mum. "It's no good sitting up late like this. You'll never learn anything that way. Your head doesn't work properly when you're tired." | (3) Mother mediates some social knowledge to help Vic to develop self-regulation and become responsible. |
| 4.        | "He must stay up until he finishes," said Dad. "Next time he'll know better than to leave his homework undone so late." | (4) Father mediates some social knowledge (externorizes a mental tool) to help Vic to develop self-regulation and become responsible. |

<table>
<thead>
<tr>
<th></th>
<th>Mum read the problem and began telling me how to do it, but for some reason I couldn't understand anything. (5) Mother mediates an arithmetic tool with no success.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>&quot; Didn't they explain the problems to you at school?&quot; Dad asked. &quot;No,&quot; I said, &quot;they didn't.&quot; &quot;That's strange! When I studied at school, the teacher always explained the problem first in class and then gave us examples to do at home.&quot; &quot;Maybe that's how it was when you went to school, but our teacher never explains anything. She makes us do everything ourselves.&quot; &quot;Well, that sounds strange to me.&quot; &quot;Yes, it is strange,&quot; I said. &quot;What did you do at the arithmetic lesson?&quot; &quot;We did a problem on the blackboard.&quot; &quot;Let's see that problem.&quot; I showed him the problem I had copied into my note-book from the blackboard. (6) Father mediates some social knowledge (mental tool) for Vic, so Vic would be aware of how responsible teachers should act and students should learn to become successful.</td>
</tr>
<tr>
<td>6.</td>
<td>&quot;Did they explain the problems to you at school?&quot; Dad asked. &quot;No,&quot; I said, &quot;they didn't.&quot; &quot;That's strange! When I studied at school, the teacher always explained the problem first in class and then gave us examples to do at home.&quot; &quot;Maybe that's how it was when you went to school, but our teacher never explains anything. She makes us do everything ourselves.&quot; &quot;Well, that sounds strange to me.&quot; &quot;Yes, it is strange,&quot; I said. &quot;What did you do at the arithmetic lesson?&quot; &quot;We did a problem on the blackboard.&quot; &quot;Let's see that problem.&quot; I showed him the problem I had copied into my note-book from the blackboard. (6) Father mediates some social knowledge (mental tool) for Vic, so Vic would be aware of how responsible teachers should act and students should learn to become successful.</td>
</tr>
<tr>
<td>7.</td>
<td>&quot;If it's exactly the same as the one she gave you to do at home!&quot; cried Dad. (7) &quot;And you go complaining about the teacher! This shows that she did tell you how to do the problem.&quot; (6) &quot;It isn't the same.&quot; (7) I said. &quot;That one is about carpenters building a house, and this one here is about tinsmiths making pails.&quot; (7) Vic is on the lower level of his arithmetic ZPD for solving such word problems.</td>
</tr>
<tr>
<td>8.</td>
<td>&quot;You silly boy,&quot; (8) said Dad. &quot;In the first problem you had to find out how many days it took 25 carpenters to build 8 houses, and in this one you must find out how long it took 6 tinsmiths to make 36 pails. Both problems are solved in exactly the same way.&quot; (7) The father has poor self-regulation of his emotions when he is irritated.</td>
</tr>
<tr>
<td>9.</td>
<td>Dad began explaining how to do the problem (9), but my head was so fuzzy that I couldn't make anything out (2). Dad finally lost patience. &quot;How can you be so stupid?!&quot; (8) My Dad isn't much good at explaining problems. Mum says he hasn't any pedagogical ability (9), which means he wouldn't be any good as a school-teacher. He usually begins quietly enough, but after a while he gets irritated and starts shouting at me (8), and then my head stops working altogether, and I sit there like a dummy. &quot;I don't see what is unclear,&quot; he said. &quot;It's all as clear as daylight.&quot; (9) The father tries to mediate arithmetic knowledge with no success; he cannot exteriorize his mental tool (a strategy to solve an arithmetic problem), so that Vic cannot internalize it.</td>
</tr>
<tr>
<td>10.</td>
<td>Whenever Dad sees that explaining won't help, he snatches a bit of paper and begins doing the problem himself. &quot;Look,&quot; he said, &quot;Look how easy it is. Now, what must we find out first?&quot; I watched while he worked out the first part of the problem on a slip of paper. (10) The father mediates some social knowledge (he models behavior) to help Vic to learn how to be motivated and self-regulated for completing the task.</td>
</tr>
<tr>
<td>11.</td>
<td>&quot;Is that clear?&quot; To tell the truth it wasn't the least bit clear (9), but I was so sleepy that I pretended I understood (11). &quot;There, you see!&quot; said Dad, quite pleased. &quot;You only need to use your brain a little and everything will be as easy as a piece of cake.&quot; Then he solved the second part of the problem (10). &quot;Understand now?&quot; &quot;Yes,&quot; I fibbed (11). &quot;Are you quite sure you do? Because if you don't, I can try to explain.&quot; &quot;No, it's quite clear.&quot; (11) Vic develops a mental tool (behavioral strategy and social skill) to deal with adults lacking self-regulation.</td>
</tr>
<tr>
<td>12.</td>
<td>I thought he would never finish the awful problem. But at last he did, and I quickly copied the whole thing into my folder, put it into my backpack and went off to bed. (12) Vic develops no intrinsic motive for solving the arithmetic problems. However, his extrinsic motive is satisfied.</td>
</tr>
</tbody>
</table>