A Way to Implement the Neo-Vygotskian Theoretical Learning Approach in the Schools

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Abstract: In contrast to Davydov’s version of the theoretical learning approach, Galperin & Talyzina’s version of this approach involves changes in how students are taught within the traditional curriculum rather than fundamental changes of the curriculum itself. The steps in teaching students under this approach are as follows: a) promoting students’ learning motivation in relation to the given topic; b) providing students with the subject-domain concepts; c) developing the procedure for solving subject-domain problems; d) providing students with problems that they solve using this procedure. My pilot study has demonstrated that Galperin & Talyzina’s approach can be readily implemented in traditional school curricula, leading to significant improvement of both the course and the outcomes of students’ learning.

Keywords: Neo-Vygotskian Approach, Galperin & Talyzina’s Approach

The theoretical learning approach: ideas and implementations

The theoretical learning approach has been developed by Russian neo-Vygotskians (Davydov, V.V., 1972 and 1990; Galperin, P.Y., 1985; Talyzina, N.F., 1975 and 1981) on the basis of Lev Vygotsky’s (1934 and 1986) contention of mediation as the principal avenue for children’s learning and development. Vygotsky described mediation as the process of teaching children so-called psychological tools (language, signs, concepts, and symbols) that, having been acquired, mastered, and internalized by children, come to mediate their thinking and problem solving. Systematic mediation of children starts when they go to school and begin to acquire, master, and internalize scientific concepts that then come to serve as tools mediating students’ solving of subject-domain problems.

Having adopted Vygotsky’s general contention of mediation, the neo-Vygotskians, however, have elaborated his idea of teaching scientific concepts as the principal content of mediating school students. As their studies have demonstrated, the acquisition of scientific concepts by itself does not lead to the students’ use of this knowledge for solving subject-domain problems. For example, having memorized the concepts of mammals, birds, and fish, elementary school students, when classifying animals, proceeded from surface characteristics of the animals rather than from the memorized concepts (e.g., they associated the whale with the class of fish) (Davydov, V.V., 1972 and 1990). These data have propelled the neo-Vygotskians to conclude that scientific concepts serve as mediators of students’ solving of subject-domains problems only if they are supported by the mastery of relevant procedures that underlie these concepts.1

Neo-Vygotskian studies have demonstrated that the procedures that are most relevant to subject-domain concepts are methods for scientific analysis in these subject domains (Davydov, V.V., 1972 and 1990; Talyzina, N.F., 1975 and 1981). For example, the procedure that underlies the concept of perpendicular lines relates to identifying within a given pair of lines those attributes that are necessary and sufficient for associating (or not associating) this pair of lines with the concept of perpendicular lines. The ideas and empirical findings discussed above have become the foundation for the development by the neo-Vygotskians of the theoretical learning approach to instruction. Theoretical learning is based on teaching students both subject-domain

1A similar idea has been formulated by some contemporary American psychologists (Bruer, J.T., 1993).
concepts and procedures for scientific analysis in the
given subject domains. Students then master and
internalize these concepts and procedures in the
course of their use for solving the subject-domain
problems, and they then serve as cognitive tools that
mediate the students' further problem solving.

The theoretical learning approach has been used
by Russian neo-Vygotskians for more than 40 years
to teach students of different ages (from 5-year-old
children through college students) a variety of
subjects. Numerous evaluation studies have
demonstrated that the use of the theoretical learning
programs improves dramatically both the course and
the outcomes of student learning (student learning
proceeds very quickly and with very few errors, and
the knowledge mastered is meaningful and broadly
transferable) (for reviews in English, see Davydov,
V.V., 1972 and 1990; Haanen, J., 1996; Schmittau,
American researcher, who observed Russian 3rd
grade students who had been taught mathematics
under the theoretical learning approach, reported
that they
evidenced mathematical understanding typically
not found among U.S. high school and
university students. [she] found it refreshing
to observe the degree to which . . . children . . .
understood mathematics concepts at their most
abstract level and were likewise able to
generalize them to new and unfamiliar
situations (Schmittau, J., 1993, p. 35).

Although the theoretical learning approach is
fairly well known to educators all over the world
and the effectiveness of this approach seems
indisputable, this approach has never been
systematically implemented outside Russia (the only
exception I am aware of is the implementation of
Davydov’s instructional program for teaching math
in several American schools [see Schmittau, J.,
2003]). I attribute this lack of enthusiasm among
educators about the practical implementation of the
theoretical learning approach to the fact that this
approach is known mainly through the works of
use of Davydov’s programs requires fundamental
revisions of school curricula and a profound re-
training of the teachers involved. For example, the
elementary math curriculum developed by Davydov
and his followers involves teaching first graders
algebraic relations and the scientific concept of a
number as an abstraction (for reviews, see
Schmittau, J., 1993, 2003). No wonder, Hedegaard,
an enthusiastic Danish proponent of Davydov’s
instructional programs, indicates that an “enormous
amount of work . . . will be required if such
practices are to become both routine and effective”
(Daniels, H., 2007, p. 314).

Davydov’s instructional programs, however,
represent just one of the versions of the theoretical
learning approach developed by the neo-
Vygotskians. Another version of this approach is
represented by works of Galperin and Talyzina
(Galperin, P.Y., 1985; Galperin, P.Y., & Talyzina,
N.F., 1957 and 1961, Talyzina, N.F., 1975 and
1981; for a review also see Haanen, J., 1996) that
are not well known outside of Russia. The
instructional programs of Galperin and Talyzina are
much less ambitious and much more “consumer
friendly” than Davygov’s programs, not requiring
fundamental changes of school curriculum; rather,
they involve changes in how students are taught
different topics within the traditional curriculum.
What follows is a description of the major steps in
teaching students a new topic under Galperin and
Talyzina’s version of theoretical learning:

1. Promoting students’ learning motivation in
   relation to the given topic. In order to get
   students interested in the topic to be
   learned, the teacher creates a “problem
   situation” (a cognitive conflict, in Piagetian
terms): The teacher gives a problem to
   students that seems very simple; students
   think that they can easily solve it, and
   suddenly they realize that their answers are
   wrong and may even contradict one
   another.

2. Providing students with the subject-domain
   concepts. The teacher provides students
   with major concepts related to the topic to
   be learned. These concepts are presented to
   the students in the form of written
   definitions so that students do not need to
   memorize these concepts; they are always
   available for reference.

3. Developing the procedure for solving
   subject-domain problems. The teacher and
   the students work together; they use the
   subject-domain concepts to develop a step-
   by-step procedure for solving problems in
   this subject-domain and present this
   procedure in the form of a symbolic and
   graphic model.

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2 In particular, the implementation of Davydov’s
instructional program in the former Soviet Union
revealed that “the existing cadre of Soviet teachers
could not be trusted with the implementation of this
program, which they did not and probably could not
understand” (Kozulin, A., 1990, p. 261).
4. **Providing students with the subject-domain problems.** Students solve subject-domain problems using the step-by-step procedure. To substantiate their answers, they may also refer to the list of subject-domain concepts. In the course of the use of the procedure and the concepts, the students master and internalize them.

Although Galperin & Talyzina’s version of the theoretical learning approach has been successfully implemented in many Russian schools, the question still remains whether or not this approach can be easily implemented in traditional school curricula in other countries. What follows is a description of a pilot study that I performed with U.S. students to address this question.

**Implementing Galperin & Talyzina’s version of the theoretical learning approach in American schools**

For my pilot study, I chose three academic subjects (science, math, and history) that represent the fields in which the performance of American school students is especially troubling. In the field of science, only 34 percent of American fourth-graders and 21 percent of twelfth-graders perform at or above Proficient level (National Assessment of Educational Progress, 2009a). Equally poor is the level of international standing of American students: According to the 2009 data of the Program for International Student Assessment (PISA), American fifteen-year-olds ranked 17th in science among their peers from 34 developed countries (Organization for Economic Co-operation and Development, 2010).

Similarly alarming is American students’ performance in math. According to recent data, only 39 percent of American fourth-graders and 26 percent of twelfth-graders perform at or above Proficient level (National Assessment of Educational Progress, 2009b). International standing of American students in math is even worse than in science: According to the 2009 data of PISA, American fifteen-year-olds ranked 25th out of 34 developed countries (Organization for Economic Co-operation and Development, 2010).

As for history, back in 1989 the Bradley Commission Report indicated that even Advanced Placement classes “emphasize the memorization and regurgitation of factual material” rather than teaching students “skills necessary to arrive at conclusions on the basis of informed judgment.” (Burson, G., 1989, p. 65). According to recent data, the situation in teaching history in American schools has not improved much since then: All in all, less than one-quarter of students performed at or above the Proficient level in 2010 (National Assessment of Educational Progress, 2010).

In each of these three fields I chose one topic: In science - “How to Identify What Kind of Vertebrate Animal This Is”; in math - “How to Identify What Kind of Quadrilateral This Is”; and in history - “How to Identify What Form of Government This Is.” Then I developed theoretical learning lesson plans aimed at teaching school students each of these topics and trained my graduate students, most of whom were public school teachers, in the use of these lesson plans. After training, they had to use one of these lesson plans to teach their student this topic, and then to submit a report on the lessons taught (the students had been informed that their grades for the projects would not depend on whether or not the lesson was a success as long as the lesson was properly described and analyzed). What follows is a description of typical lessons that were taught by my graduate students.

**Sample lesson 1: Teaching 5th-grade students “How to identify what kind of vertebrate animal this is”**

To motivate the students, the teacher showed them pictures of animals such as a dolphin, a penguin, and a bat, and asked them to tell which species each of these animals belonged to. Of course, the students mistakenly identified a dolphin as a fish, a bat as a bird, a penguin as a mammal, and they became very much surprised when the teacher provided them with the correct answers. As a result, they developed interest in the topic, which was expressed by one of them in the form of a question: “What then makes a bird a bird?”

As if responding to this question, the teacher provided the students with the subject-domain concepts in the form of written definitions (Fig. 1). Then the teacher asked the students to help her use these definitions to develop a step-by-step procedure to be used to tell to which vertebrate species a given animal belongs (of course, the teacher led the student discussion so that it would end up with the proper procedure). The procedure was then presented in the form of a chart (Fig. 2). After that the students were provided with the subject-domain problems. The problems were pictures of different animals with their descriptions (an example of these problems is presented in Fig. 3). Using the chart, each child analyzed the given animal and identified the species to which that animal belonged.
Summarizing her lesson, the teacher characterized it as “a complete success”. All the students solved almost all the problems correctly (on several occasions, the students made errors, but corrected these errors themselves as soon as the teacher asked them to re-check the answer). The students could defend, explain, and substantiate their answers. For example, the teacher reported how on several occasions she tried to propel students to give the wrong answer; for example, when showing the picture of a dolphin, she said: “Well, to solve this problem we do not need to use the chart. This animal is obviously a fish.” The students, however, would typically answer: “It may look like a fish but let us check.” And, having used the chart to solve the problem, students would conclude: “It only looks like a fish, but it is a mammal!”

Another advantage of the theoretical learning, as opposed to drill-and-practice or rote memorization, was that students were interested in the lesson. As one of them said happily after the lesson, “Now I understand how it works.”

Similar reports indicating great success of the theoretical learning lesson were submitted by 37 of 54 teachers who participated in the study; eleven teachers reported a successful lesson with certain reservations; six teachers reported that they experienced substantial problems when performing the lesson.

**Sample lesson 2: Teaching 7th-grade students**

“How to identify what kind of quadrilateral this is”

To motivate the students, the teacher drew a square on a board and asked students to name it. After the students correctly identified this shape, the teacher asked if this shape can be called “a rhombus,” or “a parallelogram,” or a “quadrilateral.” These questions initiated an emotional discussion among students in which different points of view were presented. Many students, for example, argued that the square could not be called “a rhombus” because “it has right angles,” or it could not be called “a parallelogram” because “all sides are equal.” The teacher used this opportunity to introduce the subject-domain concepts to the students (Fig. 4) and then suggested that students with his help use these concepts to develop a chart that would make it possible for anybody to identify correctly any quadrilateral. To his surprise, students who in the past were not excited at all about math class started enthusiastically discussing what questions in what order should be posed to identify correctly a given quadrilateral. The teacher managed to lead the discussion in such a way that it ended up with the proper procedure (Fig. 5).

After that, the teacher suggested to “test how the chart works.” The students were divided into groups of two and provided with subject-domain problems (either drawn geometric shapes or their word descriptions). In each group, one student used the chart to solve a problem, whereas the other student monitored the first student’s performance using the same chart. Then, they switched roles (the second student solved the next problem, with the first one monitoring his or her performance), and so on.

In his summary report, the teacher characterized the lesson as extremely successful. He was especially impressed not only with the almost errorless performance of his students, which they had never demonstrated before, but also with the enthusiasm and interest that students demonstrated during the lesson. The teacher reported that it was almost visible how the confidence and certainty of even the weakest students grew during the lesson. Some of the students said that they wished other topics to be taught with the use of “charts.”

Similar enthusiastic reports about their theoretical learning lesson were submitted by nineteen of 36 teachers who participated in the study; eleven teachers reported a successful lesson with certain reservations; six teachers reported that they experienced substantial problems when performing the lesson.

**Sample lesson 3: Teaching 9th-grade students**

“How to identify what form of government this is”

To motivate the students, the teacher asked them to answer the following question: “In a survey performed in one country in 1985, 21 percent of the population said that a particular government that ruled their country was the best they had seen in the last 60 years; they believed that this government returned economic prosperity to their country. What kind of government was this?” The students unanimously decided that this government was a democracy, and some even suggested that the results of the survey referred to Franklin Delano Roosevelt. Then, the teacher asked them a new question: “This country was ruled by a very religious person. His father had also ruled this country. What kind of government was this?” The students came to the conclusion that it was a monarchy. To their great surprise, it turned out that, in the first scenario, the teacher referred to the military dictatorship of General Franco in Spain, and, in the second, to the presidency of George W. Bush. Students reactions
were a mixture of embarrassment and self-defense, especially in regard to the second scenario: “But, you didn’t tell us that he was elected!”), to which the teacher said: “But, you didn’t ask me this! If you do not have enough information, you should not make a judgment! Let us learn what we should pay attention to when answering these types of questions.”

The teacher provided the students with the subject-domain concepts in the form of written definitions (Fig. 6), and then, together with the students, developed a step-by-step procedure to be used to tell to which form a given government belongs (the teacher led the student discussion so that it would end up with the proper procedure). The procedure was then presented in the form of a chart (Fig. 8).

After that, the students were provided with the subject-domain problems: descriptions of different governments, in which essential characteristics were mixed up with irrelevant ones. Using the chart, students analyzed the problems and identified which form of government was described in the problem.

As homework, each student was asked to bring for the next class a description of one government, which his or her classmate would have to analyze and identify for which form of government it was. The students were very interested in the assignment and spent time and effort to present a scenario as confusing as possible. What follows is an example of one of them: “There is a country where members of the cabinet served at the pleasure of the leader. Many people became dissatisfied with the leader, and they were very happy when he ended the set period of time for which he had been elected by them.” In this example, the student creatively used the words “members of the cabinet served at the pleasure of the leader,” “many people became dissatisfied with the leader” to confuse a classmate and make her believe that this was a non-democratic government, although the keywords “the set period of time for which he had been elected by them” clearly indicate that this was a Presidential Democracy (specifically, the student referred to the Presidency of George W. Bush).

Summarizing her lesson, the teacher characterized it as very successful, especially in comparison with “traditional” lessons on the same topic that she had taught before. In the past, she would give definitions of different governments, illustrated her explanation with examples of governments in different countries, and required that students memorize the definitions. The students were bored, did not show much interest in the topic, and could not use this information to identify the form of government in a specific country.

Now, the students were really interested in the topic. At the first class, all the students solved almost all the problems correctly with the use of the chart (sometimes, the students made errors, but corrected these errors themselves as soon as the teacher asked them to re-check the answer). All the students did the homework described above (which, as the teacher reported, had never happened in this class before). At the second class, students enjoyed exchanging their scenarios and working with the chart to solve the classmates’ problems. Several students told the teacher with joy that they had given “government” problems to their parents, and they could not solve them.

Similar reports indicating the big success of the theoretical learning lesson were submitted by 38 of 43 teachers who participated in the study; three teachers reported a successful lesson with certain reservations; two teachers reported that they experienced substantial problems when performing the lesson.

Conclusion

The poor learning outcomes of American school instruction have been a focus of attention in America since the publication of the 1983 report of the National Commission on Excellence in Education, with a title that speaks for itself: A Nation at Risk (National Commission on Excellence in Education, 1983). In 2008, the U.S. Department of Education published the report A Nation Accountable: Twenty-five Years after A Nation at Risk. The goal of the report was “to review the progress we have made” over 25 years, but the general conclusion was already formulated on the first page of the report: “If we were ‘at risk’ in 1983, we are at even greater risk now” (U.S. Department of Education, 2008, p. 1).

In an attempt to improve student learning outcomes, some American cognitive psychologists have “reanimated” the old idea of discovery (guided discovery, problem-based, or inquiry) learning. The learning outcomes of discovery learning, however, turn out to be even worse than those in “traditional” curricula (Kirschner, P.A., Sweller, J. & Clark, R. E., 2006).

Another recently advocated avenue to improving student learning at school relates to a major modification of teacher preparation programs: a replacement of traditional graduate schools programs by mastery of practical teaching techniques in the context of mentored teaching at school (Otterman, S., 2011). To substantiate this idea, one of its proponents wrote: “If I am learning to become a blacksmith, I . . . don’t read a ton of
books about how to shoe a horse. What I do is I show up and shoe horses” (Otterman, S., 2011). Thus, successful teaching, from this perspective, requires just a mastery of “good” teaching techniques but not knowledge of child psychology or understanding of the process of student learning.

It is easy to see how dangerous is this attempt to reduce the job of a teacher to that of a craftsman, and teacher education programs to vocational training (I wonder what medical doctors would say if it were suggested that students in medical schools should learn only how to prescribe medicine without studying anatomy and physiology?).

For my pilot study, I chose three topics in the academic subjects (science, math and history) in which the performance of American students is especially troubling, and developed a theoretical learning lesson plan for each of these topics. Then I trained my graduate students, most of whom were teachers in New York public schools, in the use of these lesson plans. After that, they had to implement one of these lesson plans in a classroom to teach their students, and then to submit reports on their lessons.

Based on the data reported, the theoretical learning programs can be readily incorporated into traditional curricula in American schools, which results in the improvement of the course and the outcomes of American students’ learning. To be sure, these data should be verified in additional studies with the use of more objective measures of student learning. Also, it remains to be seen if the theoretical learning programs can be successfully incorporated into school curricula in other countries. Preliminary as they are, however, these data provide another alternative to replacement of the paradigm of direct teaching by the paradigm of discovery learning, as well as to advocacy of “throwing away” all the paradigms and concentrating teacher preparation on mentoring teachers-to-be in “how to shoe a horse.”

References


Vertebrates are animals with backbones.

Warm-blooded animals are those that try to keep the inside of their bodies at a constant temperature.

Mammals are vertebrate, warm-blooded animals that feed their babies milk.

Birds are vertebrate, warm-blooded animals that lay eggs.

Cold-blooded animals are those that take on the temperature of their surroundings.

Amphibians are vertebrate, cold-blooded animals that change from a babyish, water breathing form to an adult, air-breathing form.

Reptiles are vertebrate, cold-blooded animals that have lungs.

Fish are vertebrate, cold-blooded animals that have gills.

Gills are respiration organs that extract oxygen from water.

Lungs are respiration organs in air-breathing animals.

Figure 1. Concepts for the lesson on “How to identify what kind of vertebrate animal this is.”

Figure 2. Procedure for the lesson on “How to identify what kind of vertebrate animal this is.”
Frogs eat insects and are cold blooded. They have backbones. They are born with gills, but the gills are replaced by lungs as they reach adulthood. They can be of many different colors.

**Figure 3.** An example of problems for the lesson on “How to identify what kind of vertebrate animal this is.”

**Figure 4.** Concepts for the lesson on “How to identify what kind of quadrilateral this is.”
Figure 5. Procedure for the lesson on “How to identify what kind of quadrilateral this is.”
Governments: Concepts and Definitions

**Democracy:** A form of government in which the political power is held by a leader or a political party freely elected by the citizens. The following forms of government are democratic:

- **Presidential Republic:** The leader of the country (often called president) is elected by the citizens for a set period of time. Elections are held at scheduled times.

- **Parliamentary Republic:** The citizens elect members of the legislature (parliament). Each is chosen as a member of a political party. The political party that has a majority in the legislature appoints its leader as the head of the government (usually called a prime minister). The head of the government remains in power as long as his/her party does.

- **Constitutional Monarchy:** The formal head of the state is a hereditary monarch, but he or she retains only minor power or even no power at all and his or her role is mostly ceremonials. The citizens elect members of the legislature (parliament). Each is chosen as a member of a political party. The political party that has a majority in the legislature appoints its leader as the head of the government (usually called a prime minister). The head of the government remains in power as long as his/her party does. (PLEASE NOTE: If the monarch retains real power, even if it is restrained to a certain extent by a constitutionally organized government, this constitutional monarchy is a form of Authoritarianism.)

**Authoritarianism:** The country is ruled by a leader or small elite that governs without consent of the citizens. The following forms of government are authoritarian:

- **Monarchy:** The country is officially ruled by a single person whose right to rule is passed along through the family. The monarch (usually called the king or queen) is empowered to rule for life.

  - **Absolute Monarchy:** The monarch holds all power and rules his or her country and its citizens with no legally-organized direct opposition in force.

  - **Constitutional Monarchy:** The power of the monarch is restrained to a certain extent by a constitutionally organized government. (PLEASE NOTE: If the monarch retains only minor power or even no power at all and his or her role is mostly ceremonial, this constitutional monarchy is a form of Democracy.)

- **Theocracy:** Means literally “the rule of God.” A God or a deity is recognized as the supreme civil ruler. The leaders claim to be ruling as direct agents of a deity or a God, or on behalf of a set of religious ideas.

- **Totalitarianism:** The power in the state is taken over and held by a single political party. The party has a monopoly over the police, military, economic, and education systems and uses an official all-embracing ideology and propaganda disseminated through the state-controlled mass media to maintain itself in power. Dissent is suppressed.

- **Dictatorship:** Absolute rule by a self-appointed leader or group of leaders who may use force to maintain control. In a military dictatorship, the army is in control.

Figure 6. Concepts for the lesson on “How to identify what form of government this is.”
Figure 7. Procedure for the lesson on “How to identify what form of government this is.”