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Keynote

Teaching thinking on a national scale: Israel's pedagogical horizons

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ABSTRACT

Like other countries, Israel had its share of projects that see the implementation of inquiry and higher order thinking in schools as their main goal. However, although many of these projects were quite successful, they did not succeed in changing the bulk of teaching and learning in Israeli schools. This article describes a new national educational policy called "Pedagogical Horizons for Learning". The goal of this policy is to move the whole educational system towards a focus on higher order thinking and deep understanding. Such a move must consider the knowledge gained from previous projects but it must also lean on strategies for implementing systemic educational change. Implementing the goals of the "Pedagogical Horizons for Learning" on a national scale requires simultaneous work on three-dimensions: (a) curriculum, learning materials and standards; (b) professional development; and (c) assessment. The article outlines the plan for each of these three-dimensions and provides some accounts of the first stages of the implementation process.

1. Introduction

The call for teaching in a way that would invoke thinking as a daily routine in schools is by now several decades old (e.g., Bruer, 1993; Pauls, 1992; Perkins, 1992; Resnick, 1987; Resnick & Klopfer, 1989). Like other countries, Israel had had its share of projects that see the implementation of inquiry and higher order thinking in schools as their main goal (e.g., Schwarz, Neuman, Gil, & Ilya, 2003; Zohar, 2004). However, although many of these projects were quite successful, they did not succeed in changing the bulk of teaching and learning in Israeli schools. Rather, such projects still exist as isolated pockets or "islands" of exemplary teaching within a "sea" of much more traditional schooling that emphasizes rote learning of facts and algorithmic problem solving.

With an eye to changing this state of affairs, the Israeli Ministry of Education has adopted a new national educational policy. A document explaining this policy (called "Pedagogical Horizons for Learning") was first published in January 2007. The rationale to the new policy is explained by making reference to the desired characteristics of future school graduates, formulated in the following way:

> "We live in an era characterized by short-lived generations of knowledge that succeed each other at a dizzying pace. In order to ensure that graduates of Israel's education system are able to successfully meet the cultural, economic, scientific and technological challenges of the 21st century, we must change our conception of what such graduates should know. One of the main goals of the education system has been, and still is, for graduates to have extensive knowledge in a variety of academic disciplines. However, our future graduates will not be able to rely on a set, pre-

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defined body of knowledge that they have acquired at school; rather they will need, higher-order thinking abilities, the ability to make judgments, and the skills for creative and critical thinking, all of which will enable them to attain new knowledge throughout their lives. The material taught must be meaningful, understandable and relevant to life outside the school walls. The skills imparted should help our future graduates function more effectively in tomorrow's world. Citizens of a democratic state need the ability to make sound, moral judgments, to think critically, and to defend one's position rationally—all of which reinforce the importance of the scholastic and ethical aspects of teaching thinking within the education system. The effort to teach thinking is thus the foundation for all learning activities that take place in school: knowledge acquisition, in-depth familiarity with cultural issues, and the formulation of intelligent moral positions".

2. From policy statement to practice

Numerous leading educators world-wide have developed means to teach for thinking and understanding in well designed and often well supported educational projects. Moving a whole educational system from a focus on rote learning towards a focus on higher order thinking and deep understanding must lean on the knowledge gained from such projects but must also lean on strategies for implementing systemic educational change. The practical question raised by the Ministry's statements about teaching thinking is how this goal can be implemented on a national scale. The model that was adopted for this purpose is a model developed by Tamir (2006) who had implemented teaching and learning by inquiry in biology education in all Israeli high-schools in the early 70's of the previous century. Tamir figured out that translating the inquiry-oriented American BSCS curriculum and learning materials into Hebrew was only one of the necessary steps for a sustainable reform. Two additional indispensable steps were extensive professional development courses and the development of appropriate assessment tools. Indeed, the development of a "hands on", inquiry-oriented laboratory exam as a unique component of the Israeli biology matriculation exam that has been developed in this context, was one of the first examples world-wide of a performance assessment test given on a national scale. Other components of the biology matriculation exam that assessed inquiry thinking abilities were students' individual research projects and open-ended questions about a previously unseen scientific research article. A recent study shows that considerable traces of the unique pedagogy that had been implemented in biology as part of Tamir's endeavor remained in the system even 30 years later (Zohar & Schwartzer, 2005).

Following Tamir's model, the policy stated in the "Pedagogical Horizon" document is implemented by working on three-dimensions: (a) curriculum, learning materials and standards; (b) professional development; and (c) assessment. Progress in these three-dimensions needs to take place simultaneously. If we would change the tests without providing adequate learning materials and without helping teachers to develop appropriate ways of teaching, there will be protests from the field because students will not have the necessary skills for succeeding in the tests that would require higher order thinking. On the other hand, it is clear that an investment in professional development and in curriculum and learning materials will not be efficient without a parallel change in assessment because teachers conceive the preparation of students for high-stake testing as an important part of their job. As long as such tests will continue to require mainly recall of facts and algorithmic solutions to routine problems, teachers will not teach for thinking even if they would participate in professional development programs that will advocate a thinking curriculum. It therefore seems likely that only simultaneous progress in the three-dimensions mentioned earlier will indeed enable a systemic change in the desired direction.

In order to be able to consider the feasibility of the planned change, it is important to know that the Israeli educational system is centralized. With approximately 1.8 million students (k-12th grade) there is basically one mandatory curriculum prescribed by the Ministry of Education that covers a large percentage of what is taught in schools (although the schools that belong to the ultra-orthodox stream are exempt from most of this curriculum). At the end of 12th grade students take the matriculation exams that consist of 7 exams in mandatory core subjects: Language (Hebrew/Arabic), English (as 2nd language), Mathematics, History, Bible, Literature and Civics. Additional subjects are mandatory in elementary and junior high schools (Science, Geography, 2nd foreign language, etc.). In addition, many additional subjects are electives in high school (e.g., Biology, physics, chemistry, communication, arts, computers, etc.). For each subject there is a subject's chief supervisor [S.C.P.] who is responsible for policy making, curriculum, teachers' professional development and assessment in that particular subject.

In what follows, I outline the plan for each of the three-dimensions mentioned earlier as well as provide some accounts of the first stages of the implementation process that took place during 2007.

3. Curriculum, learning materials and standards

Each subject has a detailed curriculum that prescribes the goals of instruction. Around the year 2000 the Ministry of Education had also adopted a decision to write detailed standards that have been completed in some subjects, but are still in progress in other subjects. An inspection of curricular documents in many subjects (e.g., science, civics, mathematic) shows that higher order thinking goals are already there. The problem is that while these goals exist on the declarative level, they are not implemented. Thus, in most classrooms these goals are not expressed in the mainstream teaching and learning activities, nor are they apparent in textbooks and in tests. This indicates that although it is important to incorporate explicit thinking goals in curriculum documents, they can be insignificant if not accompanied by appropriate support-

ing means. Since textbooks and learning materials (e.g., educational software) need to get approved by the Ministry of Education, one such mean can be a requirement to adhere to the pedagogical approach delineated in the pedagogical horizon.

Standards prove to be a complicated issue. Work on the science standards for instance has been in progress for several years and preliminary standards documents have been published for elementary and junior high schools (1st–9th grade). The science standards consist of very detailed lists delineating what students need to know and to be able to do on two operational levels (low and high) in the context of each part of the curriculum. Although the preliminary science standards do have references to thinking goals a thorough examination show that they are problematic in several ways.

First, the content standards and the thinking standards are written in two distinct parts of the document with an apparent innate tension between them. The content standards are very detailed, cutting the science curriculum into numerous tiny little bits of information, consisting of isolated concepts that are disconnected to each other. This approach is contradictory to the spirit of "teaching for thinking and understanding" which highlights (a) meaningful learning that needs to take place in context and (b) learning that entails students' active knowledge construction as they search for answers to questions (rather than learning a closed list of static concepts). Second, there is the question of the amounts of material to be "covered". When thinking standards are introduced, the amount of content must be reduced because teachers cannot be expected to teach in more depth and devote time to thinking and problem solving while covering the same amount of material as before. Third, the content standards consist of "operational levels", that dictate exactly what do high and low performance levels require students to do in each topic. This means that for instance in topic A, a low level of performance requires students to "know" some concepts, while a high level of performance requires students to "compare" these concepts. However, a high level of performance in another topic, for instance topic B, requires students to provide an explanation, or to be able to formulate an argument concerning the pertinent concepts. This means that the standards were written in a way that creates a tight connection between a specific thinking operation and specific bits of information. This approach is problematic because the gist of teaching higher order thinking is flexibility and its ultimate goal is transfer, implying that students should be able to apply a thinking skill taught in one context to different, new contexts rather than to link a thinking skill to a specific bit of information.

The problems that were identified with the existing science standards with respect to the goal of teaching higher order thinking made it necessary for the team who is writing the science standards to re-think them. Currently, the team is working to develop a new model combining content and thinking standards in a way that will provide solutions to the problems described earlier, will be clear enough to teachers and will provide an accurate template for the writing of the national assessment tests. The plan is that standards in other subjects will then follow the model that will be developed for the science standards.

4. Professional development

The main difficulty in incorporating higher order thinking into professional development programs is the lack of a large enough number of adequate experts that would be able to lead this theme, i.e., to teach in in-service and pre-service courses and to provide guidance in the field. Therefore, a necessary first step is to provide professional development for experts that would then be able to disseminate the "thinking curriculum" to other educators.

The first course that took place in that venue was a thinking workshop for subject's chief supervisors (S.C.P.). It should be noted that these people are usually exemplary teachers, who were at some point in their career appointed as teachers' instructors, and then were chosen from all instructors to serve as S.C.P. They are therefore a unique group who has strong capabilities in both pedagogy and administration. During the past decades however, this group was given primarily administrative responsibilities and was not seen as the target of a professional development program.

Approximately 25 S.C.P. joined a voluntary workshop that was offered to them by the Director of Pedagogical Affairs. The workshop indicated a clear educational goal: moving towards learning for understanding and higher order thinking. However, rather than focusing on fixed routines and ways of implementation for achieving this goal, the rationale of the workshop was to empower the participants to become critical consumers and independent initiators of educational programs in this field. The primary part of the workshop was 56 academic hours spread over a whole school year. It consisted of several topics: theoretical issues and important concepts concerning instruction of higher order thinking, rationale and educational means for developing appropriate learning materials, pedagogical approaches and tools for teaching thinking, appropriate ways of assessment, and strategies for implementing a change to incorporate the thinking curriculum on a national level. Following the participants' request the course is continuing for another year. The meetings of the second year are used mainly to present and discuss various issues that come up as part of the implementation processes.

The workshop is already bearing fruit in the sense that approximately half of the participants became enthusiastic about the "thinking curriculum", and committed to its implementation. Since many of them are educational leaders in their respective fields, they are capable of implementing the ideas they had studied in the workshop in their respective subjects and of adapting them to the unique challenges and problems of each subject. An interesting element in the implementation process is the extent to which it is non-uniform. First, each subject faces unique issues and challenges according to the

unique circumstances in which it is taught. For instance, the student population of a mandatory subject taken by all school students (such as history or civic education) is fundamentally different from the student population of an elective subject (such as accelerated biology or social sciences). In order to be successful, the implementation must grow out of these unique issues and accommodate them. Second, as a "thinking curriculum" begins to unfold in various subjects, the extent to which thinking skills are content-bound rather than only general (Perkins & Salomon, 1989) is striking. Authentic problems in various school subject call for different thinking strategies, or sometimes, for very different meaning of the same thinking strategy (e.g., the meaning of analysis in mathematics, science or literature is quite different). It is interesting to note that following the participants' requirement the workshop is continuing during the school year 2007–2008. The goal of the workshop has changed and is now taking the form of a support group that provides a forum for the participants to share the successes and concerns they encounter during the implementation processes they experience in the field.

In terms of professional development the implementation in each school subject consists of courses for teachers' instructors and workshops for teachers. Part of the curriculum for these PD courses, namely, the part consisting of general theoretical ideas and concepts about education for thinking is common for all subjects. However, most of the curriculum for these PD courses must be developed separately for each subject because it must consist of specific authentic examples for lessons, learning materials and pedagogies that are deeply embedded in the content and in the pedagogical content knowledge of each subject. This process emphasizes that in order to further develop the implementation of thinking according to the infusion approach (Ennis, 1989) in various school subjects, it is imperative to integrate two groups of educators: a group who has an expertise in the subject-matter, and a group who has a sound background in the pedagogies of teaching thinking.

Another venue for professional development involves pre-service education. Following the Ministry of Education's initiative and funding, a total of approximately 30 new courses about teaching thinking in a variety of school subjects is offered in several pre-service education programs during the school year 2007–2008.

5. Assessment

The Israeli matriculation exams have not been updated in several decades. The exams consist of predominately written tests with a large proportion of items that require recall of information and a small proportion of items that require thinking and understanding. Since the educational system is oriented towards "teaching for the test", the matriculation exams indicate to teachers what type of learning is required and valued. The matriculation exams are therefore a conservative factor that leads the system to superficial learning, putting off any chance of innovation and refreshment. Adapting the tests to the requirements of the 21st century is therefore a necessary condition for any change we would like to implement.

The Ministry of Education has currently began a process of introducing gradual changes in the matriculation exams by using the following means: increasing the proportion of written items that require higher order thinking and of open-ended written items, by increasing the number of subjects in which the products of inquiry learning or individual projects are considered a component of the final scores, and by combining elements of on-going school-based assessment with the scores of external exams. A systematic effort to induce such changes will indicate to the system that in the future a focus on rote learning will not be sufficient to support success in the matriculation exams. In addition, increasing the level of thinking in national tests designed for elementary school will indicate that thinking is a desired goal throughout the school system.

The changes in assessment must be gradual and slow, but consistent and noticeable. They must be gradual and slow because it is not fair to introduce considerable changes to the exams before the preparation of adequate learning materials and adequate teachers' professional development had taken place. On the other hand, they must be noticeable because their visibility is an important lever, signaling to the whole system that the requirement to incorporate more thinking in teaching and learning is a serious one that cannot be overlooked. An important key to the success of the whole enterprise therefore lies in the ability to balance these two opposite requirements. The plan is thus to start by increasing the frequency of higher order thinking skills by just a few percentages per year. Such a small increase is unlikely to have a dramatic effect on students' achievements. However, if the process would be consistent over several years and if it would accompanied by making the new models of questions, answers and rubrics publicly known (and by the simultaneous development of new learning materials and professional development), a noticeable change will take place in a few years. During these same years, pilot projects of school-based assessment referring to chunks of the curriculum (substituting sections of the current written exams) will take place. The same will be true for pilot projects concerning inquiry. Taken together, these changes will eventually transform the matriculation exam to be aligned with the general goals of the "Pedagogical Horizon for learning".

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