The “New” Academic Rigor
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Harvard professor Tony Wagner (2008a, 2008b) recently conducted hundreds of interviews with business leaders in which he inquired about the skills students need to learn in school to ensure their future success and productivity in the work force. He reports that they identified seven key survival skills:

1. critical thinking and problem solving
2. collaboration and leadership
3. agility and adaptability
4. initiative and entrepreneurialism
5. effective oral and written communication
6. accessing and analyzing information
7. curiosity and imagination

Somewhat surprisingly, nowhere in this list are basic skills, content knowledge, or test-taking proficiency mentioned. In the 21st-century workplace, good questions take precedence over good answers, and it’s easier to learn technical information than it is to learn how to engage and influence others

Of course, even in this new conception of academic rigor, the three R’s remain fundamental. No amount of flexibility, intuition, or innovativeness can make up for an inability to read perceptively and analytically, write and speak articulately and persuasively, and build, understand, and apply mathematical models. But even within these skill sets, what used to qualify as mastery is no longer enough: reading fluently is not the same as reading with insight, writing correctly is not the same as writing with clarity and voice, and computing accurately is not the same as reasoning mathematically.

In other words, the mainstream direction of American schooling, reflected in the policies, priorities, and programs of the U.S. Department of Education – No Child Left Behind, Reading First, Math Now – is misaligned with the emerging keys to success in the global economy. When the aims of education were more modest, traditional methods such as direct instruction, lecture, and reading textbooks may have been plausible teaching strategies. However, the new academic rigor is unattainable without a more powerful, dynamic model of teaching and learning.

A Learning Design for Academic Rigor

The constructivist classroom is one such model. At the Solomon Schechter School of Manhattan, we have adopted the constructivist learning design described by Gagnon and Collay (2001, 2006), which posits six elements, as follows:

1. designing situations
2. organizing groupings
3. making connections (which they refer to as building bridges)
4. asking questions
5. arranging exhibits
6. inviting reflections

Of course, constructivist learning is not all we do. Clearly, there are some parts of learning basic skills that are less about thinking and understanding, and more about doing quickly and accurately: times tables, for example, or conjugating Hebrew verbs, or spelling and punctuation in English language arts. It would be inefficient to try to teach these topics in a constructivist way. However, Schechter Manhattan devotes most of its time and energies to promoting the seven survival skills of the new academic rigor, aims that are well served by the constructivist approach described below:

Designing Situations – Situations are learning tasks that fulfill an educational purpose of the teacher's choosing. They are designed to be open-ended and challenging in order to promote students' interest and engagement. In other words, they have many right answers rather than only one. When students explain their answers, others benefit from their thought process and insights.

For example, first graders are asked how many combinations of numbers they can list that total 8. Some children list simple answers, such as 5 + 3 and 1 + 7. Others find all the combinations of two numbers that add up to 8. Yet others find answers using three numbers, such as 4 + 2 + 2. Some may decide to use subtraction or even multiplication, identifying answers such as 11 – 3 or two 4's.

Because this learning task opens up a wide variety of possibilities for students, it is both more challenging and more engaging than asking them to perform a long list of simple computations, such as 5 + 3 and 11 – 3. The learners' interest is likely to be sustained not only for as long as they are working on the task, but also when they are reporting their solution strategies to each other.

Organizing Groupings – Teachers ask students to work in groups in order to accomplish the task defined in the situation. The benefit of working on tasks in groups, rather than individually, is that group members approach the same task with differing perceptions, associations, insights, and intuitions, and by talking together, they pool their resources, share in constructing meaning, and collaborate on completing the task.

For example, middle school students trace the development of Israel's Law of Return, examining the law and its amendments in order to identify challenges that needed to be addressed in its implementation. They then work in groups to draw up an immigration policy for an imaginary country, attempting to balance the various considerations that arose for Israel. Though creating a policy that might work for Israel is not an explicit specification, in practice student groups often incorporate many of Israel's realities in their imaginary country – a religious majority and minorities, multiple interpretations of the majority religious tradition, etc.

The advantage of the group in this case is that, collectively, the students are better able to incorporate a variety of perspectives and identify competing interests that need to be balanced in an ideal immigration policy. The inquiry process is richer, and the product more comprehensive, than individual students, left to their own devices, could possibly have come up with.

Making Connections – Students come to new situations not as blank slates, but with substantial prior knowledge and experience that can enhance their learning. By eliciting students' prior knowledge, teachers signal to them that their own experience is valuable not only in its own right, but also as a resource to themselves and their classmates. Furthermore, since students bring different backgrounds to each learning episode, making prior learning explicit helps guide their learning paths in uniquely productive ways.

For example, when children at Schechter Manhattan learn a brief excerpt of a *t'filah* (such as the *chatimah* of a *b'rachah* of the *Amidah*) in kindergarten or first grade and then, a year or more later, fill in the rest of the text, the *iyun t'filah* (inquiry) into the expanded version begins from the students' previous understanding of the abbreviated version. By surfacing students' understanding, teachers offer them a foothold from which to begin to construct a more complex understanding of the *t'filah* as a whole.

Since each new passage raises questions about students' earlier understanding and needs to be reconciled with it, a creative tension develops between old and new, and interest in the task is piqued. Furthermore, by reminding students that they already have some insight into the meaning of the expanded text, making connections increases their confidence to take risks in achieving new understanding.

Asking Questions – Questions are central to every type of teaching, but in a constructivist learning design, they tend to have two distinctive characteristics: first, they are broad enough to have more than one defensible answer, and second, their purpose is to propel students' thinking and learning forward. Unlike traditional classrooms, in which questions tend to have one specific answer and to point backwards – teachers checking students' understanding of what they read or the teacher taught, students clarifying what the teacher said – constructivist questions create opportunities for students to sustain and extend their thinking by probing and redirecting it.

For example, near the end of each unit in *Tanach*, when students have responded to all of their teacher's questions about the *p'shat* (literal meaning), *d'rash* (interpretive meaning), and personal meaning of a chapter, students formulate *hakushyot sheli*, their own probing questions, about unresolved difficulties or anomalies in the text. After groups of students try their hand at proposing answers to their own and their classmates' questions, they are given a selection of *parshanut* (classical and modern commentaries) with a range of answers to some of the same questions. Usually the unit ends when the students compare and contrast their answers to those of the commentators, but occasionally, if they wish, they may explore their questions further, either by searching for additional commentaries or by interviewing teachers, parents, and students in other classes.

In a *Tanach* learning episode of this kind, questions promote learning in a number of different ways: guiding students' thinking as they get started, pointing out problems or textual issues that they might not otherwise have noticed, probing to extend their thinking, and encouraging them to integrate their thinking. At every step, questions provide the impetus for student to think deeper and deeper and learn more and more powerfully.

Arranging Exhibits – Exhibits are public demonstrations by students that document their successful completion of a task. In these presentations, students share artifacts they have produced in the course of learning, explain their thinking, and support their point of view in response to questions from their audience. Unlike traditional tests, exhibits rely on social interaction to help shape learning, both for the presenter and for the audience: presenters learn to help others make sense of their thinking, relate to the ideas and questions of their audience, and think clearly and critically on their feet; audience members learn to listen attentively and supportively, make meaning of the work and thinking of a peer, and engage in collegial, but critical academic discourse.

At Schechter Manhattan, training for exhibitions begins in kindergarten when students sit in the author's chair, read their finished writing to their classmates, and respond to their questions. By middle school, they are ready to present an exhibition each semester to their teachers, classmates, parents, and other community members. For instance, seventh graders mark the culmination of their study of the Constitution in an exhibition on the Federalist and Anti-Federalist Papers. In pairs, students read a

Federalist paper and the corresponding anti-Federalist paper and analyze the arguments presented. In some years, the exhibition is structured as a debate in which the two students adopt opposing positions and defend them; other times, they share the task of presenting and critiquing both points of view. Questions challenge them to re-examine and evaluate the thinking they have already accomplished, sometimes in the light of new and unfamiliar information presented by the questioner.

Students who stand before a supportive but skeptical audience and present convincing evidence that they have accomplished a significant learning task and have thought carefully about it are developing skill and self-confidence in public presentation. Articulate and self-assured, they are poised to succeed in the real world.

Inviting Reflections – Reflection is a metacognitive strategy, a process of thinking about thinking, in which students revisit the learning episode they are working on or have recently completed in order to become more conscious of how they learn. It may involve students recalling what they thought or felt at various points, self-questioning to check for understanding and identify misconceptions, inquiring what meaning they draw from what they learned, or relating the situation to larger themes or essential questions. Both the student and the teacher benefit from reflection: the student, by becoming progressively more self-aware and therefore more confident and independent as a learner; the teacher, by gaining feedback on and insight into the learning design.

For example, the K-W-L (Know-Want to know-Learned) routine promotes reflection at the beginning and end of a learning episode. At the outset, teachers ask students to identify what they know about the topic that will be studied and what they want to know about it, recording their answers on the first two columns of a chart. Students return to the K-W-L chart near the end of the unit of study and restate in a third column what they've learned that has shed further light on what they initially thought they knew and what they wanted to learn.

Reflections enable teachers and learners to take stock of their learning at different points of the learning episode. In addition, they show respect for the learner as a co-creator of meaning, together with the teacher, by acknowledging the value of the learner's perceptions and reflections. Finally, they bring closure to the learning episode and, in many cases, provide a bridge to the next situation. Ultimately, the hope is that, with practice, students will gain successively better insight into themselves and, as a result, become more thoughtful and resourceful learners.

Returning now to the seven survival skills associated with the new academic rigor, we can trace how the elements of constructivist learning design contribute toward their attainment:

1. critical thinking and problem solving – central to designing situations and asking questions
2. collaboration and leadership – inherent in organizing groups and arranging exhibits
3. agility and adaptability – promoted by making connections and inviting reflections
4. initiative and entrepreneurialism – an outgrowth of making connections and designing situations
5. effective oral and written communication – part and parcel of arranging exhibits and organizing groups
6. accessing and analyzing information – encouraged by designing situations and asking questions
7. curiosity and imagination – fundamental to asking questions and inviting reflections

Theoretical Underpinnings of Constructivism

Constructivism is a powerful approach to teaching and learning, but it is also a theory of knowledge, that is, a set of philosophical assumptions about how we come to know the world. To gain a fuller understanding of the educational practices of constructivism, namely the elements of the constructivist learning design described above, it is helpful to appreciate the ways in which constructivist theory differs from other educational theories.

According to Elkind (2003), constructivism occupies the middle ground between two other theories of knowledge, empiricism and nativism. Empiricism holds that reality exists independent of our minds, and coming to know the world is a process of taking it in with our senses. The world, according to empiricism, is an independent entity, and the mind is a blank slate that derives its knowledge directly from it. The classical educational approach that is grounded in the theory of empiricism is behaviorism, the basis of teacher-directed and rote learning.

The nativist view is virtually the opposite: the mind is primary, and the world is derivative. We are born knowing everything we will even learn about the world, but the knowledge we already possess needs to be drawn out through a process of reasoning; the world is a blank canvas onto which we project our mind's understanding. The educational method which best exemplifies this theoretical position is Socratic inquiry, in which the teacher tries to elicit, through questioning and discussion, the latent knowledge that the learner already possesses.

The theory of constructivism maintains that knowledge and reality exist independently of each other, and coming to know the world is a process of successive approximation between the two. In other words, our mind has inborn structures, such as number, space, and time, which are not part of the real world but with which we organize the sensory data we take in from it; similarly, the environment has physical characteristics that don't depend on our mind for their existence. The more we interact with our environment, the more our mind comes to reflect external reality, and the more the world takes on the character of our internal mental constructs. As we adjust our understanding based on the interaction of our mental categories and external environmental stimuli, we also modify reality through our perception of new possibilities of action.

There are two distinct, but related, traditions of constructivism: cognitive constructivism, which derives from the work of Piaget and maintains that knowledge must be discovered individually, from each person's interaction with the environment; and social constructivism, propounded by Vygotsky (among others), who held that knowledge is the product of enculturation into a learning community which helps its individual members make sense of their interactions with the environment (Phillips, 2000; Richardson, 2003; Liu and Matthews, 2005).

Another central tenet of constructivism is the existence of two complementary processes: first, mental constructs are reinforced, extended, and refined when newly discovered data about the environment confirm them; and second, the existing mental structures are called into question, undermined, and ultimately replaced when reality disconfirms them. Cognitive constructivists describe this process as assimilation and accommodation, in which the former describes what happens when data from the outside world fit comfortably into existing mental categories (although, at times, this may involve subconsciously "misreading" the external stimuli to fit the internal constructs), while the latter describes the changes that occur when the real-world evidence is at odds with the former structures (Piaget, 1967). Social constructivists make a similar distinction. For example, Kuhn (1970), a historian of science, differentiates between normal science and revolutionary science (also know as paradigm shifts), in which the former reflects the gradual accumulation of detail that supports an existing scientific theory, while the latter refers to a change in the worldview of the scientific community when experimental data challenge an existing theory in a way that can't be explained away as a tolerable level of measurement error, and the theory needs to be adjusted to fit the reality.

We can now trace the threads of these theoretical foundations in the constructivist learning design elaborated above. **Situations** are open-ended precisely because of the complexity of the relationship between mind and external reality. The important role that **questions** play in promoting deeper and more complex thinking is also explained, in part, by this complexity; in addition, questions are a key method of testing the fit between new knowledge and the learner's understanding, resulting either in integration of the new learning into pre-existing categories or a challenging and, eventually, a rethinking of assumptions. The social nature of knowledge construction is behind the use of **groups** and the public nature of **exhibitions** of task completion. On the other hand, making **connections** and engaging in personal **reflection** facilitate the individual cognitive processing that is central to constructivist theory.

Critiques of Constructivism

Constructivism has proven to be a controversial approach, both educationally and philosophically. This section sets out, and attempts to refute, three of the strongest and most persistent critiques that have been leveled against constructivist theory and practice.

Critique: Constructivism is relativistic; there are no right or wrong answers. – The first objection to constructivism operates on two levels, both the theoretical and the practical. Philosophical constructivism, it is argued, claims that the subjective understanding of the individual or the group is more important than any objective reality, and therefore undermines any idea of an absolute truth, leading to the dangerous notion that one truth is as good as any other (Hirsch, 1996; Phillips, 2000; McCarty and Schwandt, 2000; Loveless, 2001). In addition, constructivist practice is said to privilege children's innate capacities, free expression, and constructed understanding over teachers' abilities to organize and guide instruction, resulting in an unwillingness or inability to correct student errors (Hirsch, 1996; Geary, 2001).

Response: The theoretical critique is based on a fundamental misunderstanding of the dynamics of Piaget's assimilation and accommodation, of the complex interplay between the continuities of normal science and the evolution of paradigms in revolutionary science in Kuhn, and of Vygotsky's dialectical pathway toward the pursuit of truth across human history (Liu and Matthews, 2005). Rather than pointing toward an underlying relativism, constructivism posits that there is, in fact, an objective truth which is the ultimate aim of the pursuit of knowledge. Understanding, on both an individual and a collective level, evolves in such a way that we are always in the process of coming closer to the absolute truth, even though the mind's representation of the truth may never fully coincide with the absolute truth of the real world.

In practical terms, the educational critique of constructivism as a method that accepts student errors might have a kernel of truth in a school or a classroom which practices constructivist teaching exclusively. Fortunately, I have never seen or heard of such a pure case. Schools in the real world are hybrids which emphasize one educational model but incorporate other approaches, as well, at least some of the time (Elkind, 2003).

For example, when kindergarten children at Schechter Manhattan write a story, or speak Hebrew, or solve a math problem, teachers do in fact affirm their efforts without overtly correcting them. At this stage, imprecision is accepted as a necessary byproduct of learning to take risks and engage fearlessly in academic pursuits, although implicit corrections, such as sounding out a word slowly so that a child can hear a final sound, or repeating a child's Hebrew sentence with an error corrected, are part of the classroom experience from the very beginning. However, by first grade, children are already expected to recognize and correct some errors, and by the end of the elementary years, their basic skills are at least on a par with those of children of comparable ability in more traditional schools.

Critique: Students constructing knowledge take too long to figure it out and lose valuable learning time, leading to lower motivation. – According to this objection, constructivist learning is inefficient because students sometimes get bogged down along the way to discovering new knowledge or formulating a new concept. Because most of their time is spent finding their way to the new construct, and because little effective learning can take place until the construct has been found, much valuable time is wasted even when the search is eventually successful. Learning time can be used more efficiently through direct instruction and guided practice (Anderson et al., 2000).

Response: This critique overlooks three key aspects of constructivist teaching and learning: first, the teacher is not absent or passive while students are engaged in a learning task. When teachers design situations with appropriate resources and support built in, arrange groups so that students can use each other as resources, anticipate obstacles and misunderstandings, and respond to questions with appropriate clarifying questions and guidance, they can significantly streamline students' discovery process.

Second, the moment of discovery is often accompanied by a flash of realization, an "aha!" experience, that makes the culmination of the discovery process far more consequential than its duration might suggest. Conversely, the mindlessness and partial inattentiveness with which students sometimes approach rote learning and repetitive practice – even when they are technically on task – can diminish the efficiency of direct instruction.

Finally, the view that time spent searching for a new construct is time lost to learning undervalues the considerable ancillary learning that takes place while students are working on a task but before they have figured it out. The learning includes subject-matter related outcomes (for example, discovering that several solutions don't work) as well as insights into social (e.g., I learned something about how a classmate and I interact) and metacognitive (e.g., I learned something about what gets in the way of my learning) processes.

Critique: When schools fail to teach for breadth as well as depth, they produce cultural illiterates. – According to the third and final objection, because each constructivist learning episode takes longer than it would if the teacher had taught it directly, the graduates of a constructivist education know a great deal about very little. But because future learning also hinges to a large extent on students' having extensive stores of shared knowledge, the victims of constructivist learning, deprived of much of this shared heritage, are forever handicapped in their ability to acquire new learning by association (Hirsch, 1996).

Response: Much rich content learning takes place in the constructivist classroom, though the shared knowledge tends to cluster around fewer topics studied in greater depth than in traditional classrooms. For example, first graders who explore a theme such as the human body tend to take away extremely detailed knowledge about their organs, senses, and body systems, though they may have less information about animal or plant life than do children in a traditional classroom.

Moreover, the objection that the products of constructivist education are not well informed or well rounded is based on a fallacy. In reality, students in constructivist schools, including Schechter Manhattan. learn both *b'iyun* (in depth) and for *b'kiut* (extensively). Not only do they read literature and analyze it at length; they also read widely for pleasure. They not only study selected *p'rakim* of *Chumash* intensively; they also regularly study *parashat hashavua*. The alternation between studying in depth and studying for breadth produces students who have been steeped in the best of both educational traditions.

In addition, we should not accept uncritically the claim that direct instruction invariably produces shared knowledge that is available for future learning. In the first place, what schools prescribe that teachers should teach (the intended curriculum) is not identical with what the teacher actually teaches (the taught curriculum), which in turn is not the same as the information students actually learn (the learned curriculum), which differs from how they make sense of what they learn (the internal curriculum) (Cuban, 1992). As knowledge passes from curriculum guide to teacher to student, the quality of the shared knowledge becomes degraded, often severely so. Furthermore, studies have repeatedly shown that teaching methods that emphasize rapid learning of large quantities of information result in poor retention of knowledge (Bahrick, 2000). Therefore, students exposed to direct instruction, in which the information taught tends to be discrete and the pace rapid, are less likely to remember what they learned than are the products of constructivist learning.

Fundamentally, however, this critique misses the crucial point implicit in the enumeration of survival skills associated with the new academic rigor (see pg. 2 above) that a large store of factual information isn't nearly as important as it used to be, nor is it as necessary now and in the future as knowing how to access, acquire, and analyze information. Wagner (2008b, p. 22) writes that about 15 years ago, he "heard then-Harvard University president Neil Rudenstine say in a speech that the half-life of knowledge in the humanities is 10 years, and in math and science, it's only two or three years," a rate of obsolescence that is not likely to have decreased in the interim, and may very well have accelerated.

Conclusion

When one spends a few minutes walking through a constructivist school such as Schechter Manhattan, serious engagement is everywhere in evidence. Sounds of expectant inquiry and excited discovery waft through the hallways, muffled conversations punctuated by a passionately raised voice here, a moment of shared humor there; classfuls of students pore over a complex math problem or an enigmatic *sugya*; a cluster of young children are absorbed in collaborative block construction, animated in their attempts to achieve an architectural breakthrough; groups of three and four students huddle together in sober and occasionally vocal debate; a teacher and a student lean in towards each other in spontaneous consultation over a halting first attempt to expand a writing seed. Every interaction, seemingly every movement, is purposeful, thoughtful, yet imbued with a reassuring calm.

The face of academic rigor has indeed changed – for the better.

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