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John Dewey & psychologizing the subject-matter: big ideas, ambitious teaching, and teacher education

John P. Smith III^{a,*}, Mark Girod^b

^a College of Education, Michigan State University, 513H Erickson, East Lansing, MI 48824, USA

^b Western Oregon University, USA

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Abstract

John Dewey's (*The Essential Dewey*, Vol. I, University of Chicago Press, Chicago, IL, 1902) proposal that rich and engaged learning requires teachers to “psychologize” their subject-matter is now 100 years old. Yet his message remains insightful, challenging, and timely in the United States—especially given recent curricular reforms in mathematics and science. We represent his proposal, contrast it with more subject-centered reforms, and emphasize the task of teachers' understanding of students' subject-relevant experience. Since published examples of teachers' “psychologizing” remain relatively scarce, we sketch two—one each from secondary science and mathematics. They show how teachers can combine promising “big ideas” with sensitive analyses of students' experience to transform subject-matters, especially for academically less successful students. In closing, we argue that support for and focus on this work must begin in teacher preparation programs.

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A century ago in *The Child and the Curriculum* Dewey (1902), John Dewey placed teachers—not content experts—at the center of the process of designing powerful classroom learning experiences for their students. Only teachers, he argued, could “psychologize” the subject-matters they teach, that is, reinterpret the fundamental concepts and methods of the respective disciplines in accessible, engaging, and powerful ways for students. We find this proposal equally compelling and provocative today, especially in light of the implementation of new standards-based reform curricula (e.g., in mathematics and science) in the United States.

But for a host of reasons, Dewey's task of psychologizing the school subjects has proven too challenging for teachers to undertake seriously and widely—at least in our country. Other demands on their time leave little room for this work, temporally or intellectually, and the structures and resources that might support it are scarce.

In this article we explore both horns of this dilemma. Bold and ambitious teaching demands that teachers bring the powerful methods and ideas of their subjects into contact with the lives of their students, yet teachers typically lack the resources to support a serious re-examination of either their discipline or their students' varied experiences. First, we consider two detailed

*Corresponding author. Tel.: +1-517-353-9272.

E-mail address: jsmith@msu.edu (J.P. Smith III).

examples of secondary teachers undertaking and succeeding at Dewey's task. Both teachers made profound changes in their curricula that, in turn, had deep effects on their students' and their own understandings of their disciplines. These examples represent contemporary existence proofs of the feasibility of Dewey's enterprise. Second, we review the challenges and obstacles to serious psychologizing in order to argue that the proper place to begin this ongoing pedagogical work is pre-service teacher education. Our central claim is that Dewey correctly emphasized teachers' special expertise in understanding the experiences of their students and that current standards-based curricula have given insufficient attention to this dimension.

Serious explorations of Dewey's proposal from the perspective of classroom teaching are not new (Cuffaro, 1995; Fishman & McCarthy, 1998; Tanner, 1991, 1997). But very little attention has been given to students' particular experiences in psychologizing subject-matter and virtually none at the secondary level where subject-matter becomes more technical and apparently divergent from everyday experience. In the current era of standards-based reform, the content and implementation of bold and innovative curricula have drawn a great deal of attention (e.g., Reys, 2001; Trafton, Reys, & Wasman, 2001 in mathematics). One main goal of these curricula has been to connect disciplinary concepts to students' everyday experience. While care has been taken to make these materials relevant and engaging to students, curriculum developers, not teachers, have carried out the bulk of this work. Also, in targeting all students, these authors (like all curriculum developers) have had to make assumptions about the sorts of experiences that are common and ubiquitous—typically the kinds of quantitative situations that students confront in their everyday experience. So in the current period of implementation and discussion of these materials, the time is especially ripe for re-addressing a central educational question, "How does the experience of students orient the development and teaching of school subject-matter?" Can we depend on thoughtfully designed curricula to engage all students, or must teachers be

centrally involved in connecting students to subject-matter.

Before we begin, we address three concerns that could limit the impact of our argument. First, our initial assumption that teachers do *not* psychologize their subjects could surprise some readers. While other educational cultures may expect more and support more of this work, US teachers have typically "received" their curricula as given; they have done little restructuring beyond surface additions and deletions. As Paris (1993) noted,

...teachers have been considered to be consumers of curriculum knowledge, but are not assumed to have the requisite skills to create or critique that knowledge. (p. 149)

The dominant source of curricular content has been the textbook (Porter, Floden, Freeman, Schmidt, & Schwille, 1986; Schmidt et al., 1996), and as the Third International Mathematics and Science Study has shown, US textbooks contain many diverse topics but develop them only superficially (Schmidt, McKnight, & Raizen, 1997). Hence our problem has been two-fold: (1) teachers generally do not extensively rework the content of their textbooks which (2) do not present subject-matter in rich, coherent, and compelling ways.

Second, because our examples of successful teacher psychologizing are drawn from secondary mathematics and science, our argument could be seen as relevant mostly (or singularly) to those subjects. This concern cannot be dismissed but it can be turned on its head: It is precisely in mathematics and science where the secondary content begs for psychologizing—to decrease the felt distance between students and the subject-matter. Third, our evidence for the linkage between teacher psychologizing and richer, more robust student learning is primarily given in terms of those teachers' own assessments—though additional documentation is given elsewhere for the second example. This is also a sensible concern, though assessments—even careful ones—are only approximate measures of learning. Most often, teachers must judge the impact of any curricular

change on their students' learning with their own imprecise measures.¹

1. Dewey: the logical and the psychological aspects of subject-matter

In the opening years of the 20th century, John Dewey rejected E. L. Thorndike's program of decomposing the content of school subjects into their elementary atoms and slowly building up more complex knowledge from those small bits. Dewey argued instead for bringing the full structure and practice of "scientific" disciplines into contact with students' experiences. He rejected the priority of the subject-matter over the child *and* the child's existing interests and activities over the subject-matter. Indeed he argued for abolition of this dualistic opposition. The task of schooling generally and curricula more specifically was to bring the child's current experiences into contact with the ideas and tools of the discipline without damage or sacrifice to either. Every school subject involved thinking on two intellectual planes—the logical and the psychological. The logical aspect embodied what we typically think of as the subject-matter itself. It represented the understanding of disciplinary experts who developed and used what Jerome Bruner later termed "structure"—the conceptual frameworks, central questions, and processes of inquiry of that subject. It was the human experience of the subject but distilled, codified, and abstracted into forms quite distant from that experience. The psychological aspect represented the elements of the child's interests and experiences that concerned the fundamental phenomena of that subject. It was the growing bud of the logical—what would become the logical given sufficient interest, study, and focus. As his previous essay, "The Psychological Aspect of the School Curriculum" Dewey (1897), made clear, one of Dewey's most

provocative claims—now and at the beginning of the century—was that the two aspects were inextricably linked.

From the psychological standpoint, we are concerned with the study [a subject-matter] as a mode or form of living individual experience. Geography is not only a set of facts and principles, which may be classified and discussed by themselves; it is also a way in which some actual individual feels and thinks the world. It must be the latter before it can be the former. It becomes the former only as the culmination or completed outgrowth of the latter. Only when the individual has passed through a certain amount of experience, which he vitally realizes on his own account, is he prepared to take the objective and logical point of view, capable of standing off and analyzing the facts and principles involved. (pp. 168–169)

Attempts to move directly to the logical—the most common pedagogical approach of his time as well as ours—fail because the curiosity and interest of the child is not engaged.

In *The Child and the Curriculum*, Dewey argued explicitly that the analysis of the psychological aspect, that is, "psychologizing," could only be successfully accomplished by classroom teachers. Only teachers were in the position to study and come to understand what elements of their subjects were already present and active in their children's experience and could be engaged in the development of the logical.

Hence what concerns him as teacher, is the ways in which that subject may become part of experience; what there is in the child's present that is useable with reference to it; how such elements are to be used; how his own knowledge of the subject-matter may assist in interpreting the child's needs and doings, and determine the medium in which the child should be placed in order that his growth may be properly directed. (pp. 242–243)

Teachers—much more than subject-matter "experts"—could foresee points of contact with the ideas and tools of the subject and arrange their classrooms (the physical space, instructional

¹For example, if a teacher fundamentally changes her curriculum and her students' standardized test scores decline, pressure to give up on the new approach will likely emerge. However, it remains an open question whether her students are better or worse off, based on test scores alone—if the curriculum and the test emphasize different learning goals.

materials, and tasks and activities) to foster students' development toward the logical. This work called for teachers to turn over repeatedly and re-examine the subjects from both standpoints: To see the elements of the subject in the child's present experience and activity and the child's interests and explorations in the historical evolution of the subject. Only then could the opposition between the child and the curriculum—and the resulting pendulum swings between them—be overcome.

In the 100 years that followed, many educational scholars addressed the central challenge of rethinking subject-matter and how students might learn their ways into them in terms related to, but not identical to his. Before we pass over to examine our examples of psychologizing, we identify some of these scholars and their approaches. Part (but only part) of Dewey's notion of psychologizing was captured and expressed 60 years later in Bruner's (1960) view of disciplinary structure. Bruner argued that curricula that highlighted the fundamental disciplinary principles would help students acquire deep understandings of subject-matter. Those principles embraced both the content (basic concepts) and methods of inquiry. Together they formed a discipline's "structure", the conceptual framework that shaped a field's objectives, connected its results, and defined its central questions. Designing curricula around the structure of disciplines made learning, remembering, and applying knowledge easier. Students, as sense-makers, were more likely to learn particular facts when they were connected to the central organizing principles of the discipline.

Despite the striking parallel between Dewey's logical aspect and Bruner's notion of structure, two fundamental differences separated them. Bruner argued that disciplinary experts should devise school curricula because they were the masters of their disciplines' structures. Teachers were either peripheral partners in this work or consumers of its eventual products. Bruner also attended less to the nature of students' experience. He acknowledged children's intrinsic interest and motivation in subjects, but did not see the roots of the logical in students' experience as strongly as Dewey. So it was no accident that the US

curriculum development he inspired and was inspired by (the "new math and science" curricula of the 1960s and 70s) strongly emphasized the logical over the psychological.

Joseph Schwab (1964) further refined Bruner's notion of structure into its "substantive" and "syntactic" components, arguing that each discipline was characterized by its own conceptual and methodological content (respectively). This work was clearly limited to the logical. Lee Shulman (1986) shifted attention back to the psychological and re-emphasized the central role of teachers when he argued that pedagogical content knowledge (PCK) was an essential complement to subject-matter knowledge for effective teaching. Teachers who possess it know the best ways of representing and formulating the subject and the most common preconceptions that their students bring into the classroom. While PCK targets teachers' knowledge of students in relation to subjects, it still emphasizes the demands of the logical rather than the promise of the psychological. Robbie Case and colleagues (e.g., Case, 1992) identified "central conceptual structures" as another bridge between the logical and psychological. These cognitive psychological structures appear to underlie basic concepts in different subjects, but their abstract character separates them from the content of students' experiences.

Action research carried out by teachers to explore practical, classroom-specific issues of curriculum and/or pedagogy is another related, but distinct research tradition (Freeman, 1998). Central features of this research tradition—teachers designing and carrying out inquiry, using their classrooms and students as sites and participants, and grounding research questions in specific curricular and/or pedagogical issues, closely parallel Dewey's proposal. But there are also important differences. Action research typically is locally focused on specific curricular units or learning activities, rather than more aggressively targeting entire curricula. Thus, the results of action research do not typically lead to the fundamental curriculum-wide rethinking that Dewey envisioned.

Despite these conceptual advances and programs of research, Dewey's proposal to psychologize the

subjects leaves many questions unanswered, for teachers if not for all analysts. Are the structures of subjects (their logical aspects) available for inspection? If not, why not? What would it mean to “psychologize a subject” for a semester—or a year-long course? How does one select from the myriad aspects of their students’ experience the most promising “growing bud” of the subject? These are serious and difficult questions that defy simple answers. General observations that (1) all disciplines have multiple competing structures (Schwab, 1978) and (2) it is an intuitive art to select “the right” aspects of students’ experience are not particularly helpful. We are, like others, at a loss to address these questions in general terms. Instead, we attempt to illustrate the character of psychologizing the subject via specific classroom examples.² In the first, Mark, a second year teacher and the second author here, fundamentally reorganized his geology curriculum to move his non-college bound students away from the obscure details and into the heart of his subject. In the second case, Daniel Chazan, a university-based mathematics teacher–researcher, undertook an even bolder program of rethinking the relationship between his lower-track students and the nature and uses of school algebra. While Chazan (2000) has documented his psychologizing work carefully and cogently, the first case has not been reported elsewhere.

2. Case I: rethinking high school geology for the non-college bound

Though he majored in geology in college, Mark never imagined teaching the subject to “second tier” students, most of whom awaited their high school graduation in order to work in the local food processing plant. Few were interested in college; fewer still cared about geology—or more generally about science. They saw his class as an easy way out of the more difficult options of chemistry and physics. Worse yet, the assigned

²In addition to our examples, we acknowledge other rich and compelling examples of psychologizing the curriculum offered by university-based researchers. These include Ball (1993), Barton (1998), Gallas (1994), and Lensmire (1994).

school text was an ancient, poorly written, college-level book that was inappropriate for his students. Rather than bringing important geological ideas within their reach, its abstract, overly technical presentation seemed likely to push the subject farther from their experience. Concepts and terminology from volcanology, hydrology, stratigraphy, petrography, and many other classifications flowed and changed throughout, obscuring any sense of fundamental structure.³ No unifying ideas linked one topic and chapter to the next. Mark needed a teachable and learnable curriculum—one that would engage his students on their terms. Unlike their college-bound peers, these students’ negative school experiences shaped their demand that subjects and topics be clearly and immediately applicable to their lives before they merited any serious attention. Fortunately, in pondering this dilemma, he had an experience that suggested an alternative approach.

Walking along the nearby Columbia River one day, Mark watched as a large slab of sandy soil slumped off into the swiftly flowing river. The murky water swirled and spun as the current carried the sediments away. A 100 feet or so downstream a large sand and gravel bar jutted out into the water. Never before in his experience had a geologic principle presented itself so clearly and vividly! Just as rivers destroy the earth’s surface features as they meander and erode the shoreline, they also create new features with the same sediments. Immediately appreciating the potential generality of that idea, Mark quickly began to

³The problem here was not simply a matter of a single, poor-written text. Geology textbooks are often structured in ways that make only partial sense. Topics move from the largest to the smallest unit of analysis beginning with the structure of the earth, tectonic activity within that structure and its results and products in the form of volcanism and deformation. Better texts highlight higher level organizing ideas like “internal processes” (e.g., tectonic motion) vs. “external processes” (e.g., erosion) that come closer to structuring the subject. Poorer ones offer many different typologies whose interrelations are very obscure. Either way, the conceptual landscape is complex and cluttered, making it difficult to find (and teach) connections between topics.

think about geology in terms of the interplay of forces that destroy and forces that create. He worked his way through some of the major units in his assigned text to test his “big idea”. In some phenomena the struggle was played out in single events like volcanic eruptions that destroyed mountaintops and reshaped the landscape below. In others the processes were less proximate in space and time (e.g., the general erosion of the landscape and the gentle evolution of a river delta). But because these processes were so basic in human experience *and* could be related to fundamental, if more technical geological processes, Mark decided to try out his idea in the classroom.

Since he was stuck with his poor assigned text, he followed its general sequence but, rather than presenting each topic in its own terms and hoping that students would make connections between them, Mark highlighted creation and destruction at every turn. Volcanoes vividly showed their destructive power but also helped students understand the growth of the Hawaiian Islands and their amazing fertility. The erosive power of glaciation was illustrated very clearly in the intense “carving” and “gouging” in the local area but also in the many small hills of gravel deposited by the retreating ice. Tectonic stresses explained horribly destructive earthquakes but also the continuously rising Himalayan Mountains. But like any “big idea”, the complementarity of creation and destruction did not work equally well everywhere. It was applicable to the study of minerals but would have required sophisticated chemical knowledge and the use of temperature and pressure gradients in phase diagrams. The process of crystallization—the formation of particular minerals in particular environments—could have become the give and take of creation and destruction, but by substantially obscuring the phenomenon rather than making it more accessible. With these topics and others, he set creation/destruction aside.

As Dewey might have suggested, Mark motivated his general approach by first examining creation and destruction in ordinary experience. On the first day of class, he discussed how to make a cake. The class agreed that the process required using (destroying) eggs, milk, flour, energy and other resources to produce (create) a different sort

of final product. From there the role of creation and destruction in war, farming, relationships, and even sporting events was considered. Then, beginning gently with geologic processes that were readily apparent (like the river erosion example), Mark helped his students grow accustomed to looking for the Yin and Yang of geology in the world around them. Building slowly from students’ present experiences toward more distant and less visible phenomena, most students joined him in the work, willing and sometimes eager to look for examples of the interplay of creation and destruction in the physical world. His relatively simple refocusing of the curriculum empowered them. Not only did they see the world differently through the lens of creation and destruction, they also saw themselves differently, as purveyors of scientific ideas, habits, and perception. The twin processes were readily accessible; they “owned” and used them. As scientific principles they were less “external”, less the property of someone else’s activity and interest. They opened the door to “doing” some science and building much richer understandings than their previous science classes had permitted.

Several students enrolled in more advanced earth science classes as a direct result of their experience in geology. John, who was prepared to quit high school before graduation, went on to study geology at the local community college. He reported back that he would have tried harder in his other high school science classes if they were more about “seeing things differently”. John’s experience provides support for Dewey’s claim that successful psychologizing increases students’ curiosity, interest, and engagement with the subject, revealing some of the potential that has lain latent. Not all the students were affected as strongly as John, but his case illustrates the nature of the impact on the class: Engagement in and empowerment through an intuitive, though serious intellectual task.

Mark’s psychologizing engaged both the logical and the psychological aspects of geology. His disciplinary understanding provided the concepts of creation and destruction when his riverside experience and the challenge of teaching less-engaged students called them forth. His

understanding of his students' interests and life directions led to the quick choice of creation/destruction as a promising point of contact with the subject-matter.⁴ These processes connected both with his students' pragmatic orientations toward life and work (work meant physically making something) and their preoccupation—like all adolescents—with “making” an identity. Schooling is an on-going interaction between a social institution (represented by teachers, subjects, and norms and values) and its adolescent clients. Schools try to mold adolescents into particular ways of being, and these future adults often energetically resist that shaping. Creation and destruction in geology mirrored these dynamics: Creation in the “trying on” of new behavior patterns and destruction in the setting aside of younger, often more pliant patterns. Recent conceptions of identity development (e.g., imagining possible “future selves” (Markus & Nurius, 1986) and appropriating specific ways of being into an “identity kit” (Gee, 1991) at the expense of other versions of the self) resonate strongly with this framework. Making or choosing an element of one's emerging identity (a creation) necessarily involves setting aside or actively rejecting other choices (destruction)—especially choices have been advanced as “good” by others.

3. Case II: psychologizing introductory algebra for lower-track students

Daniel Chazan's (2000) recent portrayal of his reconstruction of both the content of Algebra I and the life trajectories of his “lower-track” students is strikingly parallel. Unlike Mark, Chazan came to the task of psychologizing his subject after a period of success in teaching Algebra I—but with quite different students. His motivated, college-bound students learned the procedures for solving equations and

⁴Mark did not explicitly consider other competing approaches at the time, in part because there was little time. But upon reflection, alternative “big ideas,” like the temporal structure of geologic time, were available but did not seem compelling on psychological grounds. They were not strongly rooted in students' experience.

manipulating expressions and moved on to more advanced courses, but he began to question the content and purpose of his course. Why, in response to students' questions, did he feel he could justify the study of algebra only by reference to future mathematics courses? Why were the textbook's application problems (word problems) so arcane and unrealistic? Were they the only linkage between algebra and the everyday world? What was the main purpose of learning to manipulate algebraic symbols? Were there “big ideas” that could organize and made sense of the diverse topics in his Algebra I textbook?

After completing his doctoral studies, Chazan positioned himself to address these questions in a quite different school context. In addition to his university duties, he taught Algebra I at a nearby high school to students who were already “behind” in mathematics. In contrast to his previous algebra teaching, these “lower track” students came to his classroom with very different expectations of school, different visions of their future after graduation, and a volatile mixture of pain and suspicion about school mathematics. They knew they had been labeled “slow” (or worse) in mathematics, and the tag was painful. College was not their next destination; their engagement with mathematics was defined by the requirements of a high school diploma, which had real consequences for their potential employment. Beyond the instrumental goal of simply passing the class, algebra was only worth learning if they could see it as relevant to their world.

Where Mark was struck with a “big idea” that quickly proved effective, Chazan's project of psychologizing of introductory algebra extended over multiple years. He did not quickly “solve” the problem of reinterpreting the content for his difficult and skeptical students; his efforts were step-wise and recursive. Indeed, after years of intensive work, he was not completely satisfied with his “solution”. Here we recount the major aspects of his work.

Realizing quite early that they did not understand how their students experienced school, each other, and their lives away from school, Chazan and his co-teacher, Sandy Bethell, undertook a series of efforts to study them more seriously. Over

time, they came to understand how strongly students' behavior, judgments, and outlooks were oriented by their membership in different peer-groups. Most were "smokers"—so labeled for the time they spent in the school's legal smoking area. They actively rejected academic work away from class, were not college-bound, and wished for but were uncertain about "good" jobs after graduation. There were also some "preppies", oriented by traditional forms of achievement in school and careers (and irritated by others who were not). A few were "nerds", isolated, uncommunicative, and socially inept. One was a "stoner", who sought and maintained a "hard" persona. He came to school from jail.

These insights helped to explain why students generally could not or would not work collaboratively in the classroom: Often they were asked to work with their "enemies". It also helped to explain why some, e.g., "smokers", saw homework as an optional task. Because they anticipated neither college nor "good" jobs, they saw being present at school as their main responsibility as students. Work at home was an infringement on their lives—one that was not part of the contract they implicitly made with their teachers. But Chazan also learned where they saw their lives headed and specifically, what sort of work they anticipated and valued. This exploration of possible work settings eventually provided meaningful access to algebra, but an approach to algebra quite unlike traditional Algebra I.

More or less simultaneously, Chazan worked on the logical plane to understand the historical roots of algebra, its varied meanings in professional mathematics, and whether conceptual integrity was possible in Algebra I. Significantly, he did not find a simple, unitary answer. There were (are) many algebras and therefore many intellectually honest approaches to psychologizing the subject. More specifically, there were many different practices on different sorts of mathematical objects that had counted as algebra. He was forced to choose. His choice—algebra as the study of functional relationships between quantities and their representation in algebraic symbols, tables of values, and graphs—was oriented both by his emerging understandings of his students and his

study of algebra(s). He designed problem situations where one quantity varied in relation to another that were meaningful and plausible to his students. Quantities whose values changed were an experientially real form of "true" variables,⁵ and relationships between them were the cognitive precursors of functions, one of the most central ideas in all of mathematics. These choices provided the skeletal structure for a different introductory algebra: First examine quantities in the everyday world, then dependency in various situations, then families of dependencies of similar kind, and finally focus on linear dependency and the algebra of linear relationships (e.g., equation solving and equivalent expressions). This approach retained most topics from the traditional Algebra I course but cast them in new conceptual light. For example, equations of the form, " $2x - 3 + 5x = -x + 11$ ", were understood as a search for a value where two functions, $F(x) = 2x - 3 + 5x$ and $G(x) = -x + 11$, take on the same value of the variable x (Chazan, 1993).⁶

Though his success felt partial and halting, some achievements were apparent. Students' outlook and behavior continued to present challenges, but he and Bethell did manage to link their students' experiences and life trajectories to the mathematics. When students investigated work contexts in their local community for mathematical activities, they found quantities (counts and measures) and relationships between them that shaped how work was being completed. These discoveries constituted the kernel of an honest answer to his students' central question, "Why learn algebra?" that did not turn on the requirements of compulsory schooling. Moreover, the central organizing ideas of quantity, change, and types of functions allowed Chazan to relate specific topics in the

⁵More precisely, a variable "varies" in the sense that it can take any particular value in its domain.

⁶This shift in interpretation, though subtle, is not trivial. In the traditional Algebra I curriculum, the letter " x " in equations stands for an unknown number, where in Chazan's approach, " x " varies over the domain of both functions, F and G . More generally, the meaning of variable terms shifts frequently and without mention in the traditional curriculum, where in Chazan's approach variable terms almost always stand for true variables (that is, for quantities whose values change).

curriculum to the larger nature and purpose of his course—an important achievement for both teacher and students. His new Algebra I had an intellectual integrity that it lacked before. This conceptual coherence, once in place, shaped revisions to the course that were not ad hoc and, even more important, supported his colleagues' rethinking of more advanced courses like Algebra II and pre-calculus.

Like Mark's, Chazan's psychologizing worked the logical and psychological aspects of the subject simultaneously and in close connection. His logical analysis of algebra in terms of variable quantities and functions was driven jointly by considerations of mathematical coherence and the need to motivate the subject for skeptical "lower-track" students. His psychological analysis of students' outlooks and expected life trajectories shaped specific course components, e.g., students' investigation and reporting of "algebraic" activities in local workplaces. Like Mark's, his course embodied Dewey's proposal of finding the subject in the lived experience of students, rather in its codified disciplinary form.

Even in their brevity, these examples show that Dewey's vision of *teachers* psychologizing their subjects is achievable in some contexts and, when executed thoughtfully, can lead to powerful results. In both cases, teachers came to richer appreciations of the learnable structure of their subjects for students who had not been able to deeply engage or profit from schooling. Their analyses of the logical aspect of their subjects generated key ideas that transformed the "traditional" content into fresh and more meaningful objects of study. Topics and units became parts of engaging intellectual stories; their curricula were no longer simply lists of weakly related topics. And most significantly, the choice of these "big ideas" was grounded in deeper understandings of who their students were, how they looked at their post-school futures, and how their life trajectories created entry points for serious work in mathematics and science.

Yet the path of teacher inquiry and intellectual development illustrated by these examples is far from easy—a fact illustrated by the dearth of reported examples. Why is serious psychologizing

by teachers so difficult and uncommon? In order to support teachers' work to psychologize their subjects, we next consider the serious obstacles that stand in the way.

4. Challenges for teachers

Obstacles to undertaking Dewey's program are of two broad types: Those that generally impede all forms of thoughtful intellectual work by teachers and those that specifically relate to the logical and psychological analysis of subject-matter. We consider the latter more challenging to address, but the former are more ubiquitous, so we begin there. Initially, of course, teachers must feel some strong need to engage in this difficult work, in the face of competing tasks. If they do not see their existing curricula as failing their students, they have no motivation to engage in this demanding process.

As serious intellectual work, psychologizing the subject requires substantial time and mental space left unclaimed by other teaching tasks and duties. Even if teachers see their current curriculum as deeply problematic for their students, most will not take on the task if other competing work and responsibilities cannot be contained so that "free" resources of time and mental space become available. A felt pedagogical need must be coupled with personal resources for addressing that need.

Time and mental space must be coupled with support from an intellectual community of teachers and others who understand the pedagogical challenges. The generally isolated nature of teaching is well-known and documented (e.g., Lortie, 1975). To undertake this work, teachers need professional contexts where they can try out candidate big ideas, explore their consequences for curricula, and receive wise and critical feedback. The power of such teacher communities of inquiry has now been widely reported (Chazan, 2000; Featherstone, 1998; Stigler & Hiebert, 1999; Wilcox, Schram, Lappan, & Lanier, 1990). But obstacles to psychologizing subject-matter also lie on both Dewey's logical and psychological planes. Since the power of prior learning experiences orients most teachers' teaching, how would they

come to question and eventually set aside the assumption that their students will learn just as they did? How might they problematize and explore their students' experience, especially when that experience is markedly different from their own? Where do candidate "big ideas" come from?

The work on the logical plane centers on seeing the subject in a new light, breaking the grip of past learning and teaching to identify new ways to organize the subject in intellectually rigorous yet intuitive ways. Because past patterns of thinking and action are strong, it is difficult to "make the familiar [content] strange"—even when there is a felt need. As both examples have shown, candidate "big ideas" must arise from teachers' understandings of their subjects, even if supplemented by other forms of inquiry. As Dewey reminded readers at the close of his essay,

But save as the teacher knows, knows wisely and thoroughly, the race-experience which is embodied in the thing we call the Curriculum, the teacher knows neither what the [student's] present power, capacity, or attitude is, nor yet how it is to be asserted, exercised, and realized. (p. 245)

Whatever their source, candidate "big ideas" must be serious and honest representations of the discipline's content and methods. Otherwise, teachers become vulnerable to charges of not knowing or "watering down" their subject-matter. They must be bold and extensive in scope—this, after all, is the meaning of "big". They cannot simply explain a small part of the subject; they must make connections to and integrate a large proportion of, if not the entire subject. They must be generative and powerful, pointing students in new directions, helping them to see new phenomena and new connections (see, for another classroom example, Girod, Rau, & Schepige, 2002). They must be simple, intuitive, and accessible. A promising big idea makes the subject easier to grasp, more evidently real, and more sensible. Potent "big ideas" also point the way to further psychologizing, both in school (e.g., the more advanced mathematics courses in Chazan's work) and outside (seeing the world of adolescents anew through the lens of creation and destruction).

As both examples illustrated, teachers' work on the logical plane must be inextricably tied to parallel explorations on the psychological plane. This may be the most challenging task of all: Seeing students and their experience in a new light. Efforts to psychologize the subject cannot be successful if the evaluation of past curricula does not centrally include some understanding of their limitations, for the students who worked with them. All students are curious about some phenomena and projects of inquiry. The challenge is to see the world that they look out on—especially when it differs from other students, e.g., the college-bound, and our own experiences as teachers. Resistance to this dimension of the work can be strong. Psychologizing the subject entails setting aside existing "pat" explanations of why students have not and will not engage. If teachers can do this, they may come to see their students in a new light. As Chazan's work illustrates, this re-seeing may well involve explicit efforts to understand students' views and behavior that are quite strange and off-putting. Clearly, that is a tall order for most all of us.

5. Where can these challenges be met?

From one perspective, these challenges paint a bleak picture. If Dewey's project holds powerful potential but for many reasons is too challenging to undertake (much less successfully complete), psychologizing will never become common-place work for teachers. Isolated examples will continue to represent a lofty but unreachable ideal. Or, worse yet, psychologizing will be carried out widely and poorly. Dewey (1938) foresaw this pitfall in the "child-centered" schools that lacked rich connections to the accumulated wisdom of the species. Reorganizing curricula around *any* experience or idea that is personally meaningful generally leads to poor education—often, to "activities" without content, "doing" without direction or depth (Prawat, 1995).

While recognizing the inherent difficulties in a broad and extensive practice of teachers' psychologizing their subjects, we argue that programs of

teacher education are the appropriate place to *initiate* this work. For one important reason, teacher education students are still engaged in learning their subjects in their university-based courses. This is not to say that these courses optimally support the acquisition of deep and robust understandings; indeed the literature more often suggests the opposite (e.g., Borko et al., 1992). But prospective teachers understand that they are still mastering their subject. Their uncertainties about their competence mean they need less convincing to “go back” and return to that task than do practicing teachers. Moreover, their education courses, e.g., “methods” classes, can become contexts where they examine, evaluate, and reconstruct their often disconnected and incoherent subject-matter knowledge.

Education courses are also sensible contexts for raising the thorny issue of how to teach students whose experiences are often quite different from one’s own. This problem becomes real and accessible when prospective students take on authentic roles in K–12 classrooms, typically in their last year (or two) of their programs. The differences between their identities as “good students” and the orientations of those who sit in their classrooms become clearly, and often painfully apparent. This is arguably the most compelling time to begin the process of considering and exploring their students’ experience, rather than focusing on “motivating” the “unmotivated”. Here, amid the skeptical students questions of “why do I need to learn this?”, student-teachers can begin to bring the logical and the psychological together.

Clearly, programs of teacher education, as currently configured, are hard pressed to carry out this work. There are competing tasks; credit hours are short; and the task is daunting. Our response is two-fold. First, the conceptual point: Psychologizing the subject is the right and proper work of secondary teacher education. If the process does not begin in teacher education programs, it is unlikely that it will continue in schools. Second, our claim is only that the initiation of the process is possible. The development of a much more extensive network of teacher professional development communities, where

teachers raise and explore problems of practice, will be necessary to continue it.

6. What about new standards-based curricula?

Our argument has suggested that even excellent curricula, developed by subject-matter and curriculum experts for “all students”, may under-serve some students (and the teachers who want to engage them). Yet, the 1990s has produced both bold standards for content, teaching, and learning in the major subject-matters areas (e.g., American Association for the Advancement of Science, 1993; National Council of Teachers of Mathematics, 1989, 1991, 2000), and, in mathematics at least, K–12 curricula that embody that vision. These standards and curricula represent a serious break with the past: They embrace new and reconfigured content, target all students, set high intellectual expectations, and engage students and teachers in new roles and practices of teaching and learning. How then does the call to psychologize the subjects square with the existence of excellent, “teach as written” curricula?

We both have followed closely the development of these standards and curricula and have been deeply influenced by them. Their bold vision will represent a standard of progress in teaching and learning in the US for some time. Yet we see two limitations in their potential. First, teachers can pick up and “implement” these curricula without working through the logic that suggested them in the first place (Hill, 2001). In these cases, much of the potential power of rich curricula remains latent. More generally, new and innovative curricula are usually chosen by others—lead teachers, curriculum coordinators, and district selection teams. Consideration and adoption by others curtails the process that is essential to their powerful use; teachers typically do not psychologize their subject on their way to any particular curriculum. If they do not first problematize their existing curriculum and teaching, the new alternative will be a weaker “solution.” Second, “stand alone” curricula cannot, by definition, be tailored to the experiences of all students who differ by class, ethnicity, and culture. In the end, developers

of such curricula must make assumptions about the common and shared experiences of students. Even with “excellent” curricula, there remains a role for teachers’ analysis of the psychological plane of their subjects.

7. Conclusion

The vision of education represented in Dewey’s *The Child and the Curriculum* is remarkable both in its depth, insight, and enduring relevance and for the challenges it presents to teachers. Our intent has been to illustrate it vividly and clearly (because we cannot do more) and argue for its role in orienting programs of teacher education. Ironically, the current period of curriculum development and implementation in the United States helps to highlight the importance of Dewey’s vision. Teachers are much less likely to harness the full power of curricula, including new, Standards-based curricula if they do not first psychologize their subjects. In particular, the careful study of students’ experience, especially those on the margins of achievement, remains a central element in powerful teaching.

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