DOWNLOAD PDF ACHIEVING THE GOALS: FIRST IN THE WORLD IN MATH AND SCIENCE

Chapter 1 : Connecting to Math in Real Life | Education World

The goal of this book is to provide important information about technological resources that will assist teachers, administrators, students, parents and others in achieving the goal of the United States being first in the world in math and science.

Actionable customer service tips and ideas, delivered weekly. No sales pitches, no games, and one-click unsubscribe. Grit is sticking with your future day in and day out â€” not just for the week, not just for the month, but for years. But how does that marathon-mentality resonate in regard to setting and achieving goals in our work lives and careers? In a study of Chicago public high school students, she found that kids with more grit were far more likely to graduate high school than others. In other words, those students with the stamina to be in it for the long haul were the ones who fared best overall. One fundamental way to develop this is to have what Carol Dweck, Stanford psychologist and author of Mindset: According to John Norcross , psychologist and author of the book Changeology , specificity is critical when it comes to setting goals you actually achieve. He encourages people to think of goals in terms of how defined, measurable, attainable, relevant, and time-specific they are. Those kinds of tasks have clear accountability measures, but once you get into more creative, big-picture territory, holding yourself accountable can become more elusive. Research economists at the University of California, Santa Barbara looked at the difference between reward and penalties when it comes to achieving and sticking with goals for the long-term. They looked at gym attendance and found that while visits increased when people were given financial incentives for working out, once the rewards stopped, so did their attendance. Ambition is important, of course, but the danger comes in setting unrealistic expectations for what you can get done, which can set you up for feeling like a failure. Janet Polivy, psychologist at the University of Toronto, has a name for this type of unrealistic goal setting: Never Underestimate the Power of Positivity Reframing goals so that they are positive, rather than triggering you to feel intimidated or afraid, is also important to making progress. One way to do this, according to leadership coach Peter Bregman, is to think in terms of focus areas rather than hard and fast goals. For example, a sales person who maintains a goal mindset might focus on winning a specific number of clientsâ€”a task that some might find daunting. Translating that goal into a focus area, on the other hand, would mean concentrating on reaching out to lots of potential clients, rather than over-focusing on a number. Join , customer-obsessed readers on our mailing list. Jane Porter Jane is a freelance writer and editor based in New York. She writes about business, technology, psychology, creativity, and more. Connect with her on Twitter.

Chapter 2 : The Science of Setting and Achieving Goals

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But few who debate the details of implementation have considered how this accountability system has begun to shift how we think about what schools should do. By basing sanctions solely on math and reading scores, the law creates incentives to limit â€" or in some cases to eliminate entirely â€" time spent on other important curricular objectives. This reorientation of instruction disproportionately affects low-income and minority children, so achievement gaps may actually widen in areas for which schools are not now being held accountable. The shift in curricular coverage is also at odds with the consensus about the goals of public education to which Americans historically have subscribed. More surprisingly, it is also starkly at odds with the apparent intentions of school board members and state legislators, who are responsible for implementing the policy, and with the intentions of the public whom these leaders represent. We will discuss the evidence with regard to these intentions later in this article. For now, let us begin by documenting the goal displacement stimulated by NCLB. Meanwhile, time for social studies and science decreased. The Council for Basic Education surveyed school principals in several states in the fall of and found that principals in schools with high proportions of minorities were more likely to have reduced time for history, civics, geography, the arts, and foreign languages so that they could devote more time to math and reading. In New York, for example, twice as many principals in high-minority schools reported such curricular shifts as did principals in mostly white schools. This is how one former teacher describes her changed classroom activities: From my experience of being an elementary school teacher at a low-performing urban school in Los Angeles, I can say that the pressure became so intense that we had to show how every single lesson we taught connected to a standard that was going to be tested. This meant that art, music, and even science and social studies were not a priority and were hardly ever taught. We were forced to spend ninety percent of the instructional time on reading and math. This made teaching boring for me and was a huge part of why I decided to leave the profession. They developed gradually in the s as states implemented similar accountability policies. A analysis by researchers at the University of Colorado found positive effects of higher math and reading standards, but these gains were offset by losses in other areas, especially in activities that developed citizenship, social responsibility, and cooperative behavior. One Colorado teacher reported: Our district has told us to focus on reading, writing, and mathematics. In the past I had hatched out baby chicks in the classroom as part of a science unit. In testimony before a U. Senator Robert Byrd D-W. It can hardly be considered a reasonable solution to have Congress mandate specific days of instruction for each of the many education goals now being deemphasized under the testing pressure of NCLB. The growing national diabetes epidemic also shows how accountability for math and reading alone can exacerbate inequity in other important aspects of schooling. The incidence of the disease is even higher for Mexican Americans and Puerto Ricans. This, in turn, results partly from the substitution of greater test preparation in math and reading for gym classes. But because black students are less likely to have opportunities to participate in out-of-school sports, they also are more dependent on adequate physical education programs in school to protect their health. Consequently, some may be having second thoughts. Robert Schwartz, for example, was the founding president of Achieve, Inc. The goal of equipping all students with a solid foundation of academic knowledge and skills is leading to an undue narrowing of curricular choices and a reduction in the kinds of learning opportunities for academically at-risk students that are most likely to engage and motivate them to take school seriously. This is a painful acknowledgment from someone who considers himself a charter member of the standards movement. Responding to a report by the Thomas B. Even in the unlikely event that tests created for informational purposes only would serve as incentives to redirect teaching time back to science, the Spellings approach says nothing about the many other areas of knowledge and behavioral traits that are being dropped from curricula by schools held accountable only for math and reading. A Historical Perspective The current overemphasis on basic academic skills is a historical aberration. Throughout American history, we have held a more expansive set of goals for our public schools. When the Founders endorsed the need for public education, their motives were mostly political. Learning to read was less important than, and only a means toward, helping citizens make wise political decisions. The Founders had no doubt that schools could produce students who exhibited these traits, and it would never have occurred to them that instruction in reading and arithmetic alone would guarantee good citizenship. Rather, Jefferson thought schools could prepare voters to think critically about candidates and their positions and then choose wisely. Toward the end of his life, he proposed a public education system for the state of Virginia: To give to every citizen the information he needs for the transaction of his own business; to enable him to calculate for himself, and to express and preserve his ideas, his contracts and accounts in writing; to improve, by reading, his morals and faculties; to understand his duties to his neighbors and country, and to discharge with competence the functions confided to him by either; to know his rights; to exercise with order and justice those he retains, to choose with discretion the fiduciary of those he delegates; and to notice their conduct with diligence, with candor and judgment; and in general, to observe with intelligence and faithfulness all the social relations under which he shall be placed. Anticipating by nearly two centuries our contemporary accountability policies, union leaders of the time feared that public schools for the poor would include only basic reading and arithmetic and not the more important intellectual development that could empower the working class. Education, instead of being limited as in our public poor schools, to a simple acquaintance with words and cyphers, should tend, as far as possible, to the production of a just disposition, virtuous habits, and a rational self governing character. One report stressed the importance of teaching vocal music. Prussian students were literate, after all, but supported autocracy. Mann concluded that schools in a democracy could not be held accountable for academics alone but must inculcate democratic moral and political values so that literacy would not be misused. In his last report, Mann articulated a list of goals for education that included health and physical education, intellectual academic education, political education, moral education, and religious education by which he meant teaching the ethical principles on which all religions agreed. As schooling expanded in the early s, the federal Bureau of Education commissioned a report, the Cardinal Principles of Secondary Education. Although some contemporary academic historians have popularized the notion that the Cardinal Principles turned American education away from academic skills, this is an exaggeration. As its first goal, the commission listed physical activity for students, instruction in personal hygiene, and instruction in public health. Its second goal was academic skills. Third was preparation for the traditional household division of labor between men and women. Like the Founders, the commission emphasized in its fifth goal the need for civic education: And last, the seventh goal, ethical character, was described as paramount in a democratic society. The dictatorships [Germany, Italy, Japan, and the Soviet Union] have universal schooling and use this very means to prevent the spread of democratic doctrines and institutions. The report argued that school time for social studies should be increased and should include room for a broad background in social and economic history, as well as ongoing discussion of current affairs. Schools should also develop a commitment to promote social welfare and ideals of racial equality. School-sponsored extracurricular and community activities might be the most effective ways of reaching these goals, the report said. Prefiguring our contemporary dilemmas, the report went on to warn: Most of the standardized testing instruments [and written examinations] used in schools today deal largely with information. There should be a much greater concern with the development of attitudes, interests, ideals, and habits. To focus tests exclusively on the acquisition and retention of information may recognize objectives of education which are relatively unimportant. Measuring the results of education must be increasingly concerned with such questions as these: Are the children growing in their ability to work together for a common end? Do they show greater skill in collecting and weighing evidence? Are they learning to be fair and tolerant in situations where conflicts arise? Are they sympathetic in the presence of suffering and indignant in the presence of injustice? Do they show greater concern about questions of civic, social, and economic importance? Are they using their spending money wisely? Are they becoming more skillful in doing some useful type of work? Are they more honest, more reliable, more temperate, more humane? Are they finding happiness in their present family life? Are they living in accordance with the rules of health? Are they acquiring skills in using all of the fundamental tools of learning? Are they curious about the natural world around them? Do they appreciate, each to the fullest degree possible, their rich inheritance in art, literature, and music? Do they balk at being led around by their prejudices? He distinguished between outcomes that exclusively benefit students themselves in higher earnings and outcomes that benefit the community, for which all schools should be accountable. Our conception of excellence must embrace many kinds of achievement. There is excellence in abstract intellectual activity, in art, in music, in managerial activities, in craftsmanship, in human relations, in technical work. True to American traditions, the courts have proposed definitions that extend far beyond adequacy as measured by test scores alone. Thorough and efficient means more than teaching. Three years later, in , the West Virginia Supreme Court issued a decision that became a model for other states. Balanced Accountability We should not conclude from this review that the exclusive emphasis of NCLB on basic academic outcomes is entirely new. There have been previous efforts to assert the primacy of academic training. Yet most Americans have wanted both the academic focus and the social and political outcomes. Holding schools accountable only for math and reading is an extreme position, which rarely has enjoyed significant support. Last year, we attempted to synthesize these goals for public education that had been established over years of American history. We defined eight broad goal areas that seemed to be prominent in each era, although certainly emphases changed from generation to generation. We then presented these goals to representative samples of all American adults, of school board members, of state legislators, and of school superintendents, and we asked the respondents to assign a relative importance to each of the goal areas. Table 1 shows how the surveyed groups of Americans would structure an accountability system if its aim was to hold schools responsible for achieving a balanced set of outcomes. Development of a love of literature. The percentages shown are simple averages of the average responses for each of the four surveyed groups â€" U. What is most curious about these survey findings is that they take account of the goals of state representatives and school board members, two groups of public officials who have been aggressive in the past two decades about establishing school accountability systems that expect performance only in basic skills. This gap between the preferences that respondents expressed in our surveys and the educational standards established through political processes reflects a widespread policy incoherence. American schools should be held accountable for results. But an accountability system consisting almost exclusively of standardized tests is a travesty and a betrayal of our historic commitments. What would an accountability system look like if it created incentives for schools to pursue a balanced set of goals? Such a system would certainly include standardized tests of basic academic skills, but it would also include some standardized measures in other areas.

Chapter 3 : Why science education is key to development goals | World Economic Forum

Achieving the Goals: Goal 5, First in the World in Math and Science Technology Resources Achieving the Goals: Goal 5, First in the World in Math and Science.

A consensus answer to these fundamental questions is not easily attained, because science is characterized in different ways not only by different categories of people interested in itâ€"practitioners, philosophers, historians, educatorsâ€"but also by people within each of these broad categories. In this chapter, we describe some different characterizations of science and consider implications for what is taught in science classrooms. Although the characterizations share many common features, they vary in the emphasis and priority they place on different aspects of scientific activity, with potential consequences for what is emphasized in science classrooms. We then describe the goals of science education associated with each perspective. Science is both a body of knowledge that represents current understanding of natural systems and the process whereby that body of knowledge has been established and is being continually extended, refined, and revised. Both elements are essential: Likewise, in learning science one must come to understand both the body of knowledge and the process by which this knowledge is established, extended, refined, and revised. The various perspectives on scienceâ€"alluded to above and described belowâ€"differ mainly with respect to the process of science, rather than its product. The body of knowledge includes specific facts integrated and articulated into Page 27 Share Cite Suggested Citation: Taking Science to School: Learning and Teaching Science in Grades K The National Academies Press. These theories, in turn, can explain bodies of data and predict outcomes of experiments. They are also tools for further development of the subject. An important component of science is the knowledge of the limitations of current theories, that is, an understanding of those aspects of a theory that are well tested and hence are well established, and of those aspects that are not well tested and hence are provisional and likely to be modified as new empirical evidence is acquired. The process by which scientific theories are developed and the form that those theories take differ from one domain of science to another, but all sciences share certain common features at the core of their problem-solving and inquiry approaches. Chief among these is the attitude that data and evidence hold a primary position in deciding any issue. Thus, when well-established data, from experiment or observation, conflict with a theory or hypothesis, then that idea must be modified or abandoned and other explanations must be sought that can incorporate or take account of the new evidence. This also means that models, theories, and hypotheses are valued to the extent that they make testable or in principle testable precise predictions for as yet unmeasured or unobserved effects; provide a coherent conceptual framework that is consistent with a body of facts that are currently known; and offer suggestions of new paths for further study. A process of argumentation and analysis that relates data and theory is another essential feature of science. This includes evaluation of data quality, modeling, and development of new testable questions from the theory, as well as modifying theories as data dictates the need. Finally, scientists need to be able to examine, review, and evaluate their own knowledge. Holding some parts of a conceptual framework as more or less established and being aware of the ways in which that knowledge may be incomplete are critical scientific practices. The classic scientific method as taught for many years provides only a very general approximation of the actual working of scientists. The process of theory development and testing is iterative, uses both deductive and inductive logic, and incorporates many tools besides direct experiment. Modeling both mechanical models and computer simulations and scenario building including thought experiments play an important role in the development of scientific knowledge. Different Perspectives on the Process of Science Those who study the nature of science and the learning of science have a variety of perspectives not only on key elements of scientific practice and skills Stanovich, ; Grandy and Duschl, , but also on Page 28 Share Cite Suggested Citation: The committee recognizes that these different perspectives are not mutually exclusive and that, in considering how best to teach science, each can identify certain elements that need to be given their due attention. We summarize the key elements of a number of these viewpoints. Among psychologists, this view was pioneered by the work of Inhelder and Piaget on formal operations, by the studies of Bruner, Goodnow, and Austin on concept development, and by investigations by Wason , of the type of evidence that people seek when testing their hypotheses. The image of scientist-as-reasoner continues to be influential in contemporary research Case and Griffin, In this view, learning to think scientifically is a matter of acquiring problem-solving strategies for coordinating theory and evidence Klahr, ; Kuhn, , mastering counterfactual reasoning Leslie, , distinguishing patterns of evidence that do and do not support a definitive conclusion Amsel and Brock, ; Beck and Robinson, ; Fay and Klahr, ; Vellom and Anderson, , and understanding the logic of experimental design Tschirgi, ; Chen and Klahr, These heuristics and skills are considered important targets for research and for education because they are assumed to be widely applicable and to reflect at least some degree of domain generality and transferability Kuhn et al. Science as a Process of Theory Change This view places emphasis on the parallel between historical and philosophical aspects of science Kuhn, and the domains of cognitive development Carey, ; Koslowski, in which domain-specific knowledge evolves via the gradual elaboration of existing theories through the accretion of new facts and knowledge normal science, according to Kuhn , punctuated, occasionally, by the replacement of one theoretical framework by another. The science-as-theory perspective places its emphasis less on the mastery of domain-general logic, heuristics, or strategies and more on 1 Page 29 Share Cite Suggested Citation: In this view, at critical junctures, as evidence anomalies build up against the established theory, there can occur wholesale restructurings of the theoretical landscapeâ€”a paradigm shift, according to Kuhn Nersessian provides a good example of the semantic changes that occur when motion and force are examined across Aristotelian, Galilean, and Newtonian frameworks. This view focuses on the nature of scientific activity, both in the short term e. Science as practice suggests that theory development and reasoning are components of a larger ensemble of activity that includes networks of participants and institutions Latour, ; Longino, ; specialized ways of talking and writing Bazerman, ; modeling, using either mechanical and mathematical models or computer-based simulations Nersessian, ; and development of representations that render phenomena accessible, visualizable, and transportable Gooding, ; Latour, ; Lehrer and Schauble, They received the Nobel prize in medicine in for their discovery of the bacterial origins of stomach ulcers. Until , the prevailing view was that gastric ulcers were caused by lifestyle and stress. When Marshall and Warren suggested that ulcers were caused by the bacterium Helicobacter pylori, their claim was viewed as preposterous Page 30 Share Cite Suggested Citation: The reasons for both the initial and final positions in the field clearly involve important social mechanisms that go beyond simple evidence-based reasoning processes. However, to acknowledge the influence of situated, social, and noncognitive factors in the process of scientific discovery is not to deny the existence of an external physical reality that science attempts to discover and explain see, e. Language of Science In science, words often are given very specific meanings that are different from and often more restrictive than their everyday usage. A few such cases are important to discuss before we proceed further in this report. It is also important for teachers to be aware of the confusion that can arise from these multiple usages of familiar words, clarifying the specific scientific usage when needed. Through those tests and the resulting refinement, it takes a form that is a well-established description of, and predictor for, phenomena in a particular domain. A theory is so well established that it is unlikely that new data within that domain will totally discredit it; instead, the theory may be modified and revised to take into account new evidence. There may be domains in which the theory can be applied but has yet to be tested; in those domains the theory is called a working hypothesis. Scientists use and test hypotheses in the development and refinement of models and scenarios that collectively serve as tools in the development of a theory. One alternative use of the term comes from psychological research. Popular usage also confuses the ideas of scientific fact and a scientific theory, which we distinguish by example in the discussion below. Data and Evidence A datum is an observation or measurement recorded for subsequent analysis. The observation or measurement may be of a natural system or of a designed and constructed experimental situation. Observation here includes indirect observation, which uses inference from well-understood science, as well as direct sensory observations. Thus the assertion that a particular skeleton comes from an animal that lived during a particular geological period is based on acceptance of the body of knowledge that led to the widely accepted techniques used to date the bones, techniques that are themselves the products of prior scientific study. In the elementary and middle school classroom, observation usually involves fewer inferences. For example, students may begin by conducting unaided observations of natural phenomena and then progress to using simple measurement tools or instruments such as microscopes. When a scientific claim is demonstrated to occur forever and always in any context, scientists will refer to the claim as a fact e. Facts are best seen as evidence and claims of phenomena that come together to develop and refine or to challenge explanations. For example, the fact that earthquakes occur has been long known, but the explanation for the fact that earthquakes occur takes on a different meaning if one adopts plate tectonics as a theoretical framework. The fact that there are different types of earthquakes shallow and deep Page 32 Share Cite Suggested Citation: A century ago the atomic substructure of matter was a theory, which became better established as new evidence and inferences based on this evidence deepened the complexity and explanatory power of the theory. Today, atoms are an established component of matter due to the modern capability of imaging individual atoms in matter with such tools as scanning-tunneling microscopes. This kind of progression from theoretical construct to observed property leads to some confusion in the minds of many people about the nature of theory and the distinctions among theory, evidence, claims, and facts. The history of science further reveals that theories progress from hypotheses or tentative ideas to core explanations. Core explanatory theories are those that are firmly established through accumulation of a substantial body of supporting evidence and have no competitors e. For much of science, theories are broad conceptual frameworks that can be invalidated by contradictions with data but can never be wholly validated. To give a specific example: Repeated observations give the rate of acceleration in this event, both its global average and local variations from that average. These theories describe but do not actually explain gravitation in the conventional sense of that word; they invoke no underlying mechanism due to substructure and subsystems. In this example, drawn from physics, the theories are expressed in mathematical form and their predictions are thus both precise and specific. They lend themselves readily to computer modeling and simulation. In other areas of science, theories can take more linguistic forms and involve other types of models. A theory may or may not include a mechanism for the effects it describes and predicts. Another important feature of the example is that it challenges a common perception of scientific revolutions. However, it did not invalidate all that had gone before; instead, it showed clearly both the limitations of the previous theory and the domain in which the previous theory is valid as an excellent close approximation, useful because it is much simpler both conceptually and mathematically than the full general theory of relativity. This is a key understanding: Such theories are tentative in domains in which they have not yet been tested, or in which only limited data are available, so that the tests are not yet conclusive but are far from tentative in the domains in which they have repeatedly been tested through their use in new scientific inquiries. Argument In everyday usage, an argument is an unpleasant situation in which two or more people have differing opinions and become heated in their discussion of this difference. Argumentation in science has a different and less combative or competitive role than either of these forms Kuhn, It is a mode of logical discourse whose goal is to tease out the relationship between ideas and the evidenceâ€”for example, to decide what a theory or hypothesis predicts for a given circumstance, or whether a proposed explanation is consistent or not with some new observation. The goal of those engaged in scientific argumentation is a common one: Alternative points of view are valued as long as they contribute to this process within the accepted norms of science and logic, but not when they offer alternatives that are viewed as outside those norms. Page 34 Share Cite Suggested Citation:

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Page 3 Share Cite Suggested Citation: A Guide for K Science. The National Academies Press. In so doing, the Committee was responding to the request of teachers for instructional materials that would enable them to teach science using a standards-based approach. Without these standards, many teachers will continue to teach science as they have in the past, and the efforts to increase student achievement will falter. The Committee recognized early on that the selection instrument would have to be flexible in order to accommodate both national and state standards, as well as the diversity of standards and interests involved in decision-making at the local level, including teachers, principals, science supervisors, parents, scientists, and school board members. Consequently, the selection instrument, which begins on page 41 of this report as the Guide to Selecting Instructional Materials, has been designed for use with whatever standards have been adopted by the relevant school district. These discussions reflect two fundamental conclusions. First, a basic understanding of science is vital for everyone, because science and technology have become relevant to enterprises as varied as business, agriculture, manufacturing, law, and government, and they have a profound impact on many contemporary personal, social, and political issues. Thus, science education in U. While we have made some progress, much work remains. Even if the TIMSS data and interpretation are flawed in some respects â€" as some have argued Rotberg, ; as referenced in Schmidt and McKnight, â€" we should take them as a serious challenge as we continue our efforts to improve instruction and performance. They implicitly recognize that U. It is expected that, depending on local interests and needs, diverse routes will be taken to reach the goals of the standards. Nevertheless, national standards are important if all children are to experience successful science instruction. Currently, there is enormous local variability in the quality and quantity of science programs. These two documents are referred to as national standards â€" both being intended to provide guidance nationally and being largely consistent with one another AAAS, While these differ extensively in content, breadth, and rigor, the adoption of standards of some kind by all states marks a significant advance. Nevertheless, without a continuing effort to bring state or national standards into the classroom, even those school systems poised to reform can fail to accomplish change. Data from earlier initiatives to improve science teaching suggest that teachers often do not receive the needed intellectual, financial, and administrative support for new initiatives Bybee, , ; Hutchinson and Huberman, The development of the Standards took into account various factors that contribute to the ineffectiveness of current science education. These include excessively broad curricula with no time to cover topics in-depth; absence of hands-on participation in science experiments; the didacticism of much science education; the absence of inquiry-based instruction; poor initial and continuing teacher education in science and science teaching; inadequate provision of necessary materials and equipment; and the poor quality of many available teaching materials, especially textbooks. Hundreds of teachers, scientists, school administrators, educational researchers, and others participated in the development, Page 6 Share Cite Suggested Citation: Since the publication of the Standards, the National Research Council has established the Center for Science, Mathematics, and Engineering Education and has published various reports designed to help school districts and others apply the Standards NRC, b, a,b, forthcoming. The longterm goal of these activities is achieving quality science education for all K students in the United States. The Standards encourage teachers to engage students in the process of scientific inquiry by directing them to ask questions about the natural world, design experiments to answer these questions, interpret the experimental results, and discuss the results with their peers. Such inquiry-based teaching enhances student understanding of scientific concepts NRC, forthcoming , and it is intended to equip all students with the analytical skills they will need in the future to interpret the world around them. Importantly, although the Standards stress inquiry-based teaching, they do not assume that all science can be learned through an inquiry process, given the amount and diversity of scientific concepts that should be learned. Besides describing scientific content to be learned by grades 4, 8, and 12, and encouraging research-based teaching methods, the Standards present standards for school district administrators, principals, and policy makers, including local school boards NRC, The document also contains guidance to help schools develop effective science education programs, specifying a need for: Page 7 Share Cite Suggested Citation: Finally, for science teaching programs to achieve the goals of the Standards, teachers and students will require access to instructional materials that are accurate in science content, clear in their presentation of scientific concepts and processes, appropriate for the age of the children who will use them, and suitable for the local community, as well as consistent with the aims of the Standards. This report deals with this issue. Not only are these materials a primary source of classroom science learning, but because the professional development for teachers is often structured around instructional materials, they also play a profound role in the education of teachers. Thus, to achieve the learning goals of the Standards or Benchmarks, students and teachers must be provided with instructional materials that reflect these standards. Moreover, teachers will be more likely to provide the requisite classroom experiences if professional development programs provided by school systems are grounded in standards-based instructional materials. For these reasons, the selection of instructional materials that reflect the learning goals of the standards is a central issue. This is no simple task, since schools and school districts must select from among the broad array of materials produced by U. As documented in the TIMSS project, many instructional materials used for teaching science in the United States emphasize breadth of coverage at the expense of a deep understanding of fundamental scientific concepts Schmidt et al. Ultimately, teachers decide what to teach in the classroom, and many teachers â€” especially elementary school teachers â€” base their lesson plans on the class textbook and on other instructional materials rather than on the "intended" curriculum specified by official policies Woodward and Elliott, In , Horizon Research, Inc. Page 8 Share Cite Suggested Citation: Thus, instructional materials play an unexpectedly important role in education: Another important effect on what teachers teach arises from assessment practices. Statewide assessments can dictate much of what teachers teach. Not surprisingly, teachers want instructional materials that can help them prepare students for mandated assessments. The approaches to science education in the Standards stress classroom assessment as a critical component of instruction. Such assessments are needed by the teacher in order to identify what the students have learned and not learned, thereby informing the subsequent instructional topics and processes. However, statewide assessments generally have a different purpose. They are designed to measure what a student has learned at a given point in time. Moreover, the dependence of the tests on a multiple-choice format tends to put a premium on memorized and isolated facts in comparison to understanding of science concepts. Teachers, principals, school district administrators, and parents may question whether instructional materials that are aligned with standards will enable students to do well on the statewide assessments. In addition, instructional materials affect teaching indirectly by influencing the greater community. For instance, parents use the content of the student materials or textbooks to examine what their children are learning. Often the sole link to the classroom, these materials can determine whether parents support or object to the school science programs. Page 9 Share Cite Suggested Citation: Some states mandate that state adoption guides, recommended lists, or state standards be considered; and political issues sometimes affect the development and enforcement of state policies. Ultimately, however, the local level is where the final decisions are made about which science instructional materials will make it into the classroom. According to information gathered by the Council of Chief State School Officers, 13 states specify that the state will determine which instructional materials may be used or that the state will publish a list of materials from which local school districts may choose. In another 8 states, state authorities recommend materials, but the selection is actually carried out by the local districts. In all of these states but one Idaho, where districts are restricted by law and must choose only state-approved materials , districts can choose other materials by following a waiver process CCSSO, In California, for example, a school district can seek approval from the state board of education to spend state instructional material allocations on materials not on the state adoption list IMF, State adoption lists influence the education of many U. Consequently, adoption or recommendation is, for publishers of instructional materials, a high-stakes make-or-break business that provides access to large markets. Competition for adoption or recommendation causes publishers to adopt cost-saving measures by publishing a single textbook that is acceptable in several states Tyson, To do so, textbook publishers often sacrifice quality for quantity by covering multiple curricula many of which are broad to begin with , thereby sacrificing depth for breadth Tyson, As outlined in A Splintered Vision: An Investigation of U. Science and Mathematics Education Schmidt et al. State and local selection procedures for instructional materials may require vendors to make formal presentations Page 10 Share Cite Suggested Citation: Small vendors often lack the resources to provide such services and are therefore virtually excluded from consideration. However, small suppliers may offer quality science instructional materials. The effect of these practices is to limit the availability of materials that could substantially contribute to attaining the learning goals. Common Considerations in the Local Selection of Science Instructional Materials In the 29 states where there are no state-level policies for selection or recommendation of instructional materials, the challenge of finding appropriate instructional materials falls entirely on individual districts or schools. Local school districts may receive some assistance from the state educational authorities. The amount and kind of support, which varies from state to state, may include technical support from state science supervisors or state science consultants, who bring varying degrees of science content expertise to the selection. In comparison to state selection committees, the district or individual school selection committees may be less familiar with standards, and they often lack sufficient human and financial resources for establishing a well-informed and thorough selection procedure. In these 29 states, publishers play a lesser role. Those charged with making selections can make use of various publications that describe and, in some cases, evaluate instructional materials. Just as there is great variation across states regarding the policies and practices for selecting science instructional materials, each local context is different in terms of culture, capacity, and process. Nevertheless, there are several issues that arise repeatedly during local decision-making: What is the budget for the review and selection process? From whom can the committee obtain current information about expenditures for such items as instructional materials and professional development? What student performance and enrollment data are currently available? From whom can the committee get additional data? Does the district have in place the facilities and systems to support a standards-based science program? Page 11 Share Cite Suggested Citation:

Chapter 5 : Student Learning Goals | Department of Mathematics at University of California Berkeley

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CA Calculus and analysis: For real analysis, construction of the real numbers, rigorous derivation of basic calculus facts e. Matrices and linear transformations, vector spaces, determinants, eigenvectors and eigenvalues, characterizations of invertible matrices, inner products, normal forms, and applications to linear differential equations, Fourier analysis, linear programming. Math 54, , , ANC Algebra, number theory, combinatorics: Basic theory of groups, rings and fields. Elementary enumeration methods, generating functions, discrete probability theory, etc. Math 55, , , , , In addition, math majors take elective courses from among the following subject areas: GT Geometry and topology: Basic theory of curves and surfaces, Gauss and mean curvature, isoperimetric inequality, Gauss-Bonnet Theorem. Math , , , , AM Applied mathematics and modeling: Modeling physical and other phenomena with ordinary and partial differential equations. Approximation and optimization techniques, linear programming, game theory. Transfinite cardinals, transfinite induction, and the Axiom of Choice. Math A, , In addition: TC Majors in Mathematics with a Teaching Concentration are expected to acquire a professional level of mastery in elementary arithmetic, geometry, and algebra. Math , , AM Majors in Applied Mathematics must in addition complete a three course elective cluster concerning some advanced application of mathematics. Curriculum Map The following tables show how both sets of learning goals are addressed in the mathematics curriculum. General Skills Most of the goals relating to general skills are addressed in all courses. For example, the ability to formulate precise mathematical statements and reason logically with them is a key skill used and taught in all courses. However, some skills are more naturally learned or re-inforced, in certain courses. Some connections are indicated in the following table.

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Chapter 6 : Everday Mathematics Goals - Everyday Mathematics

"I was truly amazed at the interest and determination First in Math created in my students, motivation was NO problem! Not only did they learn math and improve their ability to focus, they also learned the importance of setting and achieving daily short-term goals to eventually achieve things that in the beginning were only dreams.".

Nevertheless, having high ambitions is laudable, and setting targets to focus attention on key issues is a worthy objective in its own right. The UN deserves considerable credit for keeping these issues in the spotlight. Without education, the others cannot succeed, and without education in the STEM subjects of science, technology, engineering and mathematics, development cannot be sustainable. Child mortality has fallen dramatically, as has maternal mortality. Progress is being made on infectious diseases, the current Ebola outbreak notwithstanding. Ensuring environmental sustainability remains a work in progress to say the very least, as does the establishment of a global partnership for development. Good progress on some fronts, stagnation or even backwards progress on others. And the thing that can make things better is education. Education has long been high on the development agenda, and links to poverty reduction are well established. Educating children, particularly girls, is widely considered the best way of lifting communities out of poverty. Educated girls are more active in many walks of life and they are better equipped to take part in decision-making processes. This is so well documented that it even has a name â€” the girl effect â€" and has given rise to a movement whose supporters include the United Nations Foundation, which aims to leverage the potential of the estimated million adolescent girls living in poverty today. The development agenda, as its name suggests, is strongly focused on the developing world. This to me is dangerous and complacent. Development is equally relevant in the so-called developed world, where if we lose our focus we risk going backwards. In some sense, this is already happening â€" in part to due educational shortcomings occasioned by the increasing breach between science and society. And the subject areas that we need to focus on are STEM subjects. Bacterial infections, once distant memories, are overcoming our antibiotic defences because we have failed to use antibiotics appropriately. Education, formal and informal, is key in addressing the kinds of behaviours that have led us to this situation, as well as in training the scientists who will have to take us beyond antibiotics as the war on disease moves on to the next front. It is a similar story when looking at environmental sustainability. The world needs both a STEM-literate population capable of taking collective decisions in a rational, evidence-based way, as well as the scientists and technologists who can deliver the kinds of technologies that reconcile the conflicting requirements of improving standards of living and reducing environmental impact. I for one can only see a technological way forward. I do not see the planet collectively making the necessary lifestyle changes that would be the alternative. The key part of that context is, in my opinion, the increasing and urgent need for an educated, particularly STEM-educated, population. What I would like to see in those goals is education built into each one, as well as being a goal in its own right. Only then may we stand a chance of mastering the new global context. A teacher helps his student with a physics experiment at the Oxford International College in Changzhou, Jiangsu province January 10,

Chapter 7 : Mathematical Me: What are your goals for math class this semester? How are you doing so far

The Science of Setting and Achieving Goals Jane Porter | December 15, When Angela Duckworth was 27, she left her high-pressure management-consulting job for an even tougher gig: teaching seventh-grade math at a New York City public school.

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Without education, the others cannot succeed, and without education in the STEM subjects of science, technology, *engineering and mathematics, development cannot be sustainable. Before going on to consider why, let's take a look at how the world has done in delivering on the MDGs.*