Chapter 15
Policy

You might think that it would be a bold, giant leap to translate the parameters that the ULM ultimately places on learning into establishing policy. Actually, this is far from the case. Most of the logical extensions of the ULM into policy have been recommended, sometimes for years, and some have been studied.

Pre-school

Prior knowledge is the biggest factor in the ULM. Ability counts, but most people have enough core working memory capacity to succeed at nearly anything. Motivation counts, but is influenced strongly by one's prior knowledge and experience. Any policy that is likely to enhance prior knowledge should have payoffs. Preschool is an obvious policy. From the perspective of the ULM, preschool helps build a basis of literacy and general knowledge that can help expand working memory capacity in elementary school. Preschool helps to level differences in prior knowledge, especially in the areas of foundational vocabulary and concept development.[1] Preschool can also help develop positive motivations toward learning. Finally, preschool can help establish basic behavior routines. Students can transition smoothly to formal school settings with fewer distractions and less extraneous load.

One of the best-known studies was conducted in Michigan with "at risk" children in which the study paired participants with similar non-participants. (A discount rate takes into account the cost of money, and is a way of helping to judge investments):

> . . .The data show strong advantages for the treatment group in terms of higher lifetime earnings and lower criminal activity. For the general public, gains in tax revenues, lower expenditures on criminal justice, lower victim costs, and lower welfare payments easily outweigh program costs. At a 3% discount rate the program repays $12.90 for every $1 invested from the perspective of the general public; with a 7% discount rate, the repayment per dollar is $5.67. Returns are even higher if the total benefits—both public and private—are counted. . . . [2]

These results need considerable explication. A very large chunk of the economic benefit comes from reduced expenses due to incarceration; as a consequence there is significant gender difference.

D.F. Shell et al., *The Unified Learning Model*, DOI 10.1007/978-90-481-3215-7_15,

The Partnership for America's Economic Success estimates that the ultimate payback for investments in preschool is compounded at such a significant rate that preschool is at the cornerstone of this group's policy recommendations.[3] Nobel Laureate James Heckman has written a review that brings together much of what is known about the impacts of health and early schooling.[4]

Schools

Modern schools in the United States are about many things, of which instruction and learning are just two. Whatever the reasons for this may be, at least part of the justification for this is rooted in the fact that instruction is regarded more as an art than a science. If you buy the arguments made in this book, then much obfuscation about learning goes away. Learning involves managing working memory. Teaching involves helping learners to manage their working memories. How can we translate such an abstract notion of a model into meaningful policy?

School: Discourage Words Suggesting Innate Abilities

The last principle of the ULM is "working memory allocation is directed by motivation." As we have indicated, motivation depends very much on our beliefs. Everything we can do to support the notion that effort pays is likely to lead to enhanced learning. Put differently, there won't be anything more than episodic memory-based learning without effort. We work in a college where one of the most advocated slogans is "build talent into careers." The policy should change and move away from notions of "talent" and "smart" to those of effort. Talent inevitably implies something from birth:

talent:[5]
(a) special – often athletic, creative, or artistic aptitude
(b) general – intelligence or mental power, natural aptitude or skill

As we have previously discussed, one notion that becomes quite clear from detailed studies of experts and expertise is that talent really means skill, and that skills come about as the result of hard work and effort more than something we possess at birth. We've pointed out several references that essentially question the importance of innate talent.[6] Ross' *Scientific American* article provides an especially readable discussion of the development of talent.[7]

Children need to know and believe that learning is something they control through their effort. They need feedback and reinforcement that they can succeed, even if the going gets tough. In the ULM, the statement "all children can succeed" is not just a slogan; it is a fundamental principle. A good school policy, therefore, would be to *avoid using words like talent, smart, and IQ* when discussing student learning. One might say that they place the em*PHA*sis on the wrong syl*LAB*le.[8]

District, State: Organize Based upon Knowledge

The second principle of the ULM is that working memory's capacity for allocation is affected by prior knowledge. It is clear that a child arriving as a five-year-old at kindergarten who reads and comes from a rich literacy environment and one who arrives there with minimal reading from an environment with no books at all are not likely to make the same gains. This likely has nothing to do with ability and little to do with motivation. That is, both children can come from environments highly supportive of the notion that school is where you go to learn how to read. From a purely scientific viewpoint, expecting the same interventions for both children to achieve the same final outcome is unrealistic. It won't happen! It has nothing to do with teachers or desires; it has to do with how humans learn. When we understand learning from the perspective of the ULM, we can better clarify expectations for schools and project more reasonable learning outcomes for children. Preschool has come to be recognized for very large economic and social impacts.[9] Why? Preschool helps to level differences in prior knowledge. School year differences in rates of learning seem small when compared with differences that emerge over summers, especially with respect to reading.[10]

Currently schools are organized around calendar age. In the United States students start school in kindergarten when they are about five years of age, and they proceed through 12 grades. The physical organization of those schools varies, but usually includes elementary school, middle school (or junior high school), and high school. Some savvy parents tend to hold back those of their children who might just make it into kindergarten for an extra year before they start. Indeed, this sometimes makes a big difference in a child's apparent success. Gladwell makes a point of how many professional Canadian hockey players are born in the early months of the year (January–March) and how this increases the likelihood that they will become selected for development. One of us had this sort of experience with the game T-ball[11] where kids hit balls propped upon stands and then run bases akin to the game baseball. One year "our" team lost every game but went on the next year to win every game. As it happened, the kids during the second year were the same as they were in the first; the team roster was nearly identical. So, the entire team was older, more developed, and more experienced.

When children are sorted into groups in the current age-based structure, it more often than not is done on the basis of ability than anything else – so-called ability grouping. Ability is typically determined by some type of "intelligence" test. Ability grouping is controversial and has a history of mixed success.[12] There are a few situations (cross-grade reading, mathematics) where success seems significant, but across-the-board grouping (i.e., all subject areas) does not appear to be beneficial.

Rather than either age or intelligence/ability, it makes more sense from the ULM's learning perspective to group children according to what they know, and to let them flow through this grouping based upon both what they know and come to know. To make this work there would need to be several "out points," where a child could be described as "having finished" a curriculum. This used to be done in a quite different way, where students sought different high school diplomas. Until

recently, New York State was the only state with content-based exit requirements in the early 1990s.[13] Indeed, New York graduates did demonstrate higher levels of content knowledge than those of other states. They also generally fared better economically.

Any system of schooling essentially works to the advantage of those students coming from homes that nurture and support learning. Conversely, schools do not deal well with students from unsupportive home environments.

A system that allowed differentiated time periods to achieve learning goals could work to the advantage of those otherwise disadvantaged learners. In essence, longer times, extra time in school, and the attendant costs would minimize socioeconomic differences. Allowing students to flow through based upon learning also would accommodate differences in prior knowledge that arise from differences in advantage. The reality of the differences between current school practices and what the ULM tells us about learning is this: schools focus too much on what they call ability meaning intelligence or some other entity type talent and not enough on effort. As we stress in the ULM, in the end, ability really is prior knowledge, what one knows, and that comes about through effort.

Over the last few decades, special advantages become apparent during summers when school is not in session. Advantaged children can attend special programs for athletics, music, debate, science, computing, drama, and an enormous range of similar activities. These serve to magnify differences in knowledge based upon social or economic status.

The notion of organizing schools along the lines of what learners know certainly is not new. For example, B. S. Bloom recommended it in 1966:

> . . . but it is evident that the sequence of learning tasks from grade to grade is not given the same kind of attention that is now given to the sequence of learning tasks within a grade. This undoubtedly is an organizational problem arising from the assembly line notion of education in the graded system of education. Sequence in learning is not just the avoiding of unnecessary repetition or overlap from grade to grade. It is the planned movement of learning from one level of complexity or mastery to another. The development of sequence in learning requires not only the planning of subject matter and materials over time; it also requires the development of continuity in teacher-student relationships over time. . .[14]

While this type of individualized approach to school has been problematic to do in practice, technology may provide ways to implement a truly individualized, self-paced curriculum in the context of the formal school setting. We are likely not there yet, but it is possible to envision a virtual school where classes are composed of students drawn together from multiple physical locations, perhaps from around the world, based on similar levels of prior knowledge. These free floating classes would continuously recompose as students left or entered based on progress acquiring the subject matter knowledge.

Gifted Students, Skipping Grades, and Advanced Placement

Many school systems offer gifted programs; these vary in many ways. A report on such students sets forth its position in the title, *A Nation Deceived: How Schools*

Hold Back America's Brightest Students.[15] This two-volume document reviews the current national status with respect to gifted education. As you would expect, the ULM supports anything done for these students so long as a few guidelines are followed. First, the gifted label should be awarded based upon achievement with the regular curriculum rather than some test of ability or intelligence. Next, if the curriculum is a solid one, then the student should have an opportunity to move through *that* curriculum. Finally, if resources are available for individual students, payoffs are more likely to come from investing in the low performers rather than the high performers. That is, invest in those for whom mastery is a challenge.

The report, one with substantial research support, splits out 20 "most important" points. The first three are:

1. Acceleration is the most effective curriculum intervention for gifted children.
2. For bright students, acceleration has long-term beneficial effects, both academically and socially.
3. Acceleration is a virtually cost-free intervention.

One way to begin to identify those students likely to benefit from acceleration is to look at achievement scores and think about what is best for those students at the very top.[16] Rather than use an ability or IQ measure to select those for acceleration, however, it makes more sense to use a related-content test for older students. The report provides a discussion about this issue. The economics of this are rather clear. It probably costs $250–$500 to decide that a student should be accelerated. If the student skips an entire year, that is one less year the student will be in the district. Assuming that much of this one-year matriculation cost is recoverable, it can be applied for those with problems achieving mastery. Districts probably could have more of these resources if they paid the accelerating student. The risk here, of course, is in engendering performance rather than learning goals by having the students working for money instead of learning.

Twenty-five years ago, we offered placement tests in general chemistry. We used a standardized test and insisted on something like two thirds of the items being correct. We administered the test prior to having students pay the official fee to take the test. We risked abuse, but the test had a reputation such that no one with a poor chance of passing took the test. If the student passed the test, they then would pay their fee and be able to transfer the tuition to some other course (second semester chemistry, first semester physics, etc.). On balance that system worked very well for students, faculty, and the university – because most of those skipping "by examination" were really good students and most chose to stay for a full program.

The *Deceived* report advocates *Advanced Placement*. *Advanced Placement* programs have become increasingly popular. Because we are in a mid-sized city, many local advanced students prefer to take university courses. The young woman mentioned earlier for her math skills graduated high school, having completed college calculus and one semester each of differential equations and linear algebra. This gave her academic advantages she never lost. Though students like her were rare, they were by no means unique; there were five to ten who made similar accomplishments that graduated at the same time she did.

The downside of *Advanced Placement* programs is that they can overly focus on performance and task goals rather than learning. Too many *AP* courses epitomize "teaching to the test" consisting of little more than drill and practice for the *AP* Exam. This is far different from an accelerated or advanced curriculum based on more in-depth learning. Little in contemporary Advanced Placement programs seems directed at developing a "life long desire" for learning the subject matter. How much of the subject matter in *Advanced Placement* is remembered after the *AP* test is over and the college credit is received? We suspect little.

From the perspective of the ULM, a "gifted" program should be about learning more and in more depth. It should challenge students to acquire greater depth and breadth of knowledge and facilitate creation of larger more complex knowledge structures in memory. It shouldn't be just about getting through faster. But if students are able to learn in depth more quickly, the ULM would support opportunities for them to accelerate their studies.

State, National: Large Pre- and Primary School Impacts

Any system of schooling essentially always works to the advantage of those students coming from homes that nurture and support learning. Conversely, schools do not deal well with students from unsupportive home environments. Oftentimes, this ends up tracking socio-economic status. For example, SAT scores correlate with mean family income.[17] As a result of this, one way to assess the impact of any intervention is to express it in terms of gain (or loss) in equivalent family income. That is, intervention xyz has the mean effect of raising the family income by, say, $20,000.

Using such a yardstick, preschool, interventions with respect to mathematics have been shown to have a powerful impact.[18]

> Previous work with this sample had shown that the effect of 1 year of part-time preschool was equivalent to increasing family income by more than £10,000 (£ = British Pound Sterling) a year.[19] We show that the effect of primary school was even more important than preschool (0.39 versus 0.26 SD), but both were sufficiently large to be important for any government wishing to maximize educational achievement. They are greater than the effect for father's education and similar to that for family income but less than that for mother's education (see figure, page 1161). Analyses for low and higher income groups reveal that the effects for the HLE and preschool and school effectiveness are remarkably similar for both income groups, which indicates their importance across the income spectrum. These effects are predictive, but we cannot assume causality. Observational studies, such as this study, do not have random assignment, so it is always possible that results may reflect selection bias and/or the operation of unmeasured variables.[20]

Early-Career Teacher Mentoring

A teacher may end up having a 30–45 year teaching career. Some students must have that teacher during the teacher's first year or two of teaching. Generally, those years are not so good. While there is a theory to pedagogical content knowledge, practice is quite different; we never know what to expect.

After decades of teaching experience, one of us was with our Harvard-professor daughter when she was awaiting papers to be turned in at the end of first semester. She had two sections of eight students each, and was expecting a total of 48 papers. Two days before her deadline, only ten or so papers had been turned in. We made a small $20 wager in which "the experienced one" said that at least 10 papers would not come in, thinking that would be a "sure thing." All 48 papers were turned in on time. A sure thing at one college may be a sure loser at another. Successful strategies vary; expectations vary.

Moreover, when you begin, you're just not very good compared to what you are likely to become. As we noted before, it takes 10–15 years to become expert. This applies to teaching just like any other profession. If you work at your teaching, you'll become better at it, just as you become better in the kitchen or better on the golf course.

Every school would like to have a policy of never hiring new teachers but only those "broken in" elsewhere. Where we live, this happens – with large, urban schools often raiding rural schools for teachers once they've had some experience. In large urban areas, the reverse is often true. Large inner city schools often get the new teachers as the experience ones flee to the suburbs, which of course accounts for part of the problems inner city schools have.

While teachers of sophomore organic chemistry often complained about what was going on in freshman general chemistry – just one year of teaching freshmen almost always had them return to sophomores with a better appreciation of both sophomores and freshman chemistry instructors.

To make the system work better, policy should support mentoring of teachers early in their careers. Teachers identify many resources as being important during their early years, including mentors. Mentoring probably should extend to experienced teachers during their first year in a new setting. This of course implies that all schools have a mix of experienced and new teachers, with experienced teachers in the majority. This may also be the reasoning behind why one East Coast private school – The Benchmark School – requires their new teachers to apprentice with a master teacher for up to two years, then co-teach with a master teacher for one additional year before being designated a master teacher and assigned a classroom of their own.[21]

Policy Summary

The three core principles of the ULM are:

1. Learning is a product of working memory allocation.
2. Working memory's capacity for allocation is affected by prior knowledge.
3. Working memory allocation is directed by motivation.

When policies are developed for schools, they need to take these into account. Schools are places where students allocate working memory. That is, they are places

where students pay attention to things society expects them to know about: reading, arithmetic, appropriate behavior, democracy, and so forth. True enough, states in the United States have their own curricula, but they end up being similar to one another in most ways.

Schools are places where students acquire knowledge. A child's environment outside of school before and during the school years has a tremendous impact on what knowledge that child is likely to acquire in school. Policy needs to take that into account.

Perhaps most important, schools and school boards like "smart" kids. But, the science behind the ULM shows that effort matters more – much more. And the "smart" kids most often are smart because of what they know – the results of their prior efforts at learning, not because they possess some special ability. Policy needs to take that into account – right down to the ways in which schools and governments speak about learning.

Notes

1. Hart, B., & Risley, T. (1995). *Meaningful differences in the everyday experience of young American children.* Baltimore: Brookes Publishing Company.
2. Nores, M., Belfield, C., Barnett, W., & Schweinhart, L. (2005). Updating the economic impacts of the High/Scope Perry preschool program. *Educational Evaluation and Policy Analysis, 27*(3), 245.
3. http://www.partnershipforsuccess.org/index.php?id=01 (Accessed March 23, 2009).
4. Heckman, J. (2007). Economics of health and mortality special feature: The economics, technology, and neuroscience of human capability formation. *Proceedings of the National Academy of Sciences, 104*(33), 13250.
5. http://www.merriam-webster.com/dictionary/talent (Accessed March 23, 2009).
6. Bloom, B., & Sosniak, L. (1985). *Developing talent in young people*: New York: Ballantine Books; Gladwell, M. (2008). *Outliers: The story of success*. New York: Little, Brown, and Company; Ericsson, K., Prietula, M., & Cokely, E. (2007). The making of an expert. *Harvard Business Review, 85*(7–8), 114–121; Colvin, G. (2008). *Talent is overrated: What really separates world-class performers from everybody else*. New York: Penguin Group.
7. Ross, P. E. (July, 2006). The expert mind. *Scientific American, 295*, 64–71.
8. At the very end of the writing process, one of us noted that teachers often take tests intended to measure certain "talents" prior to hiring. We have addressed repeatedly the subject of talent. It is our view that data support an incremental model for talent rather than an entity view; that is, "talent" as we use this word in everyday language is something that can change through learning. The "other view" is expressed by those who advocate instruments to measure talent: "Skills can be learned, and knowledge can be obtained. However, talent – the key to strength and peak performance – must exist naturally within a person. A talent is a naturally recurring pattern of thought, feeling, or behavior that can be productively applied. They are spontaneous, top-of-mind, perhaps even subconscious, reactions to situations. Talents are what one does well 'without even thinking about it.' They are innate, non-teachable."[From http://www.careertrainer.com/Request.jsp?lView=View Article &Article=OID%3A113426 (Accessed March 23, 2009)]. The *Gallup Teacher Perceiver* Interview was often used by school districts, sometimes with respect to hiring practices. A meta-analysis of a version of the instrument in use until a few years ago was studied, and a "modest relationship (r=0.28) between the TPI and some measure of teaching quality" was reported. (Metzger, S. A., & Wu, M.-J. (2008). Commercial teacher selection instruments: The validity of selecting teachers through beliefs, attitudes, and values. *Review of Educational Research*,

78(*4*), 921–940.) Metzger and Wu state: "This could mean that the TPI chiefly reflects a teacher's ability to be liked by an administrator." [p. 931]. We have appealed to the scientific literature in making a case to reject the entity notion in favor of an incremental notion. It is widely acknowledged that a purpose of education is to develop skills in many areas, both those in which the student already has strength as well as those in which strength still is lacking. "Gallup research has proven that the best way to develop people – and net the greatest return on investment – is to identify the ways in which they most naturally think, feel, and behave as unique individuals, then build upon those talents to create strength, the ability to provide consistent, near-perfect performance in a specific task." [http://www.gallup.com/consulting/61/Strengths-Development.aspx (Accessed March 23, 2009)]. When leading an organization, one's goal more likely is to optimize what is at hand rather than to enhance employee skills in diverse areas. Thus, the kind of advice a manager is likely to obtain from Gallup is understandable in the context of what one might hope to learn from a management consultant. The *preponderant* United States view of talent is an entity attribute – you have it or you don't. In many ways, the TPI supports this view. There is an irony in this. The districts that employ tests such as the TPI most often do so in an attempt to identify prospective teachers that might have pro-student attitudes. *This pro-student view implies an incremental notion of ability*.

9. Nores, M., Belfield, C., Barnett, W., & Schweinhart, L. (2005). Updating the economic impacts of the High/Scope Perry preschool program. *Educational Evaluation and Policy Analysis, 27*(3), 245.
10. Alexander, K., Entwisle, D., & Olson, L. (2001). Schools, achievement, and inequality: A seasonal perspective. *Educational Evaluation and Policy Analysis, 23*(2), 171–191.
11. http://www.teeballusa.org/What_is_TBall.asp (Accessed March 23, 2009).
12. Slavin, R. (1987). Ability grouping and student achievement in elementary schools: A best-evidence synthesis. *Review of Educational Research, 57*(3), 293.
13. Bishop, J., Moriarty, J., & Mane, F. (2000). Diplomas for learning, not seat time: The impacts of New York Regents examinations. *Economics of Education Review, 19*(4), 333–349.
14. Bloom, B. (1966). Stability and change in human characteristics: implications for school reorganization. *Educational Administration Quarterly, 2*(1), 35.
15. Colangelo, N., Assouline, S. G., & Gross, M. U. M. (2004). A nation deceived: How schools hold back America's brightest students. http://www.accelerationinstitute.org/Nation_Deceived/ND_v1.pdf; http://www.accelerationinstitute.org/Nation_Deceived/ND_v2.pdf (Accessed March 23, 2009).
16. Paula Olszewski-Kubilius, "Talent searches and accelerated programming for gifted students," Chapter 7 of Volume 2 of *A Nation Deceived*.
17. Jaschik, S. (2007). SAT scores down again, wealth up again. *insidehighered.com*. http://www.insidehighered.com/news/2007/08/29/sat (Accessed March 23, 2009)
18. Melhuish, E., Sylva, K., Sammons, P., Siraj-Blatchford, I., Taggart, B., Phan, M., et al. (2008). The early years. Preschool influences on mathematics achievement. *Science, 321*(5893), 1161–1162.
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21. Gaskins, I. W. (2004). Professional development at Benchmark School. In D. S. Strickland & M. L. Kamil (Eds.), *Improving reading achievement through professional development* (pp. 195–213). Norwood, MA: Christopher-Gordon.