

Defining the Aims of Education in an Era of Hyper Pluralism

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This presentation informed by 20 years of NSF Curriculum and Teacher Professional Development Projects

- **2003-2012 The Math Science Partnership of Greater Philadelphia (MSPGP)** : 45 school districts, 125 schools 4000 secondary teachers, 13 Institutes of Higher Education ~ 100 faculty
- **1998 – 2003 The Greater Philadelphia Secondary Mathematics Project (LSC)**
17 school districts including Philadelphia 65 high schools
Bronx Superintendency 35 high schools
100,000 hours of PD
- **1993-2000 The Philadelphia Regional Interactive Mathematics Program** 19 Philadelphia high schools

Presentation adapted from our forthcoming book,

***The Hope of Education:
Embracing Complexity, Change and Challenge in the 21st Century***

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As we worked with many middle and high school teachers to implement NCTM standards based curriculum in our MSP we would begin with this question:

“What skills do you want your students to leave with mathematically when they leave your school?”

- Critical Thinking
- Reasonableness of the answer (Estimation Skills)
- Math is real life
- Problem Solvers
- Apply Logical Skills
- Basic Skills
- Learn to compensate when they don't know or remember
- To have confidence with their ability
- Work ethic/responsibility
- Money sense/ check book, shopping, tips, interest, etc.
- Understand expectation of others (College, Work, etc)

What do you want your students to come away with in mathematics at the end of the course of studies at your high school?

Math Exit Goals	Votes	Weight
Problem Solve (Variety of Strategies)	34	14.2%
Motivate/Excite-Confidence	29	12.1%
Skill Background	28	11.7%
See math related to real world	25	10.4%
Independent thinker and learner	23	9.6%
Think Logically	23	9.6%
Ability to apply	17	7.1%

Communication-oral and written	16	6.7%
Persistent to the end	12	5.0%
Technological skills	10	4.2%
Life-long learner	9	3.8%
Accuracy	6	2.5%
Beauty of Math	5	2.1%
College Prep	3	1.3%
	240	1.0

The notion that an important aspect of education is to develop a persons' general cognitive faculties has a long tradition:

“The real answer to the pessimist is that education is not merely the imparting of knowledge but the cultivation of certain aptitudes and attitudes in the mind of the young...These abilities in our opinion, are:

- to think effectively,
- to communicate thought,
- to make relevant judgments,
- to discriminate values...

Each is a indispensable coexistent function of a sanely growing mind”

1945 Report of the Harvard Committee *General Education in a Free Society* pgs 64,65

Drawing develops closeness of observation, accuracy of perception, vividness of imagination, quickness of eye facility of hand, care and judgment in expression. It cultivates a knowledge of relations, of fittingness and adaptation, all useful in the general duties of life...

Report of the Commission on Industrial Education Harrisburg, Pennsylvania. 1889 p 11

To the beginning of the first public school, Boston Latin in 1635

“We know our business is to discover to our pupil his intellectual resources, to excite his powers to profitable exertion, to get him upon a track of thought, and draw out the dormant energies of his soul by stimulating him to inquire, to think and to carry on process of thought for himself...To train up a community of independent thinkers, then, is the main object of school instruction. These are the only men who produce important results.”

Cole, (Rev.) David Classical Education The American Journal of Education. Vol. 1 1856 p 71

When asked to grade on average how well their senior achieve the kind of cognitive and affective outcomes they listed most times teachers will grade their students a “C”.

For example, A=0, B=1, C=8, D=2, F=0....thus the average is “C”

Even the “better” students are rated a B – C.

When we then asked teachers to

“List the obstacles that are preventing your from achieving your wants for your students.”

The following reasons listed are typical from high school math teachers:

Laziness

Transient Population

Motivation

Lack of support from home and neighborhood

Emotional factors at home

Drugs

Lack of confidence and basic skills

Low reading levels

Lack of discipline

Lack of focus into the future (not a priority)

Problem of enactment

When we asked curriculum directors, supervisors and central office administrators what they see as the obstacles, they typically lament their teachers’:

- inability to engage they students with inquiry based methods
- rigid adherence to a traditional curriculum
- inability to make connections with other disciplines and use real world examples
- Resistance to new approaches

Concerns about effective teaching to develop such cognitive abilities are new:

At a Boston meeting in 1880 of the *American Association for the Advancement of Science*, for example, a scathing report was issued on “certain radical deficiencies in current science teaching.”

“The scientific method is simply a systematic exercise in truth seeking and is the only mode of using the human mind when it is desired to attain the most accurate and perfect form of knowledge. **Our public schools, unhappily, make but little use of this method...**

As thus treated the sciences have but little value in education...They are not made as a means **of cultivating the observing powers, stimulating inquiry, exercising judgment in weighing evidence, nor forming original and independent habits of thought...**the student becomes a mere passive accumulator of secondhand statements.

Where it is all talk and no work.. And the pupil has nothing to do but to be instructed , every sound principle of education is outraged and science is only made ridiculous.

“In reality, no one can teach mathematics. Effective teachers are those who can stimulate students to learn mathematics. Educational research offers compelling evidence that students learn mathematics well only when they construct their own mathematical understanding.

To understand what they learn, they must enact for themselves verbs that permeate the mathematics curriculum: ‘examine,’ ‘represent,’ ‘transform,’ ‘solve,’ ‘apply,’ ‘prove,’ ‘communicate.’ This happens most readily when students work in groups, engage in discussion, make presentations, and in other ways take charge of their own learning.”

(p. 58)

The Mathematical Sciences Education Board (MSEB) of the National Research Council, *Everybody Counts: A Report to the Nation on the Future of Mathematics Education*. 1989,

But beyond enactment is a more fundamental problem we asked both teachers and students:

Why are you teaching/learning *this* particular lesson?

This particular unit?

This particular course?

In short, “Why are we learning this?”

Students would shrug their shoulders

Teachers would say things like:

To prepare them for the next course

To prepare them for college

Because it's on the state test

Because it is part of our curriculum

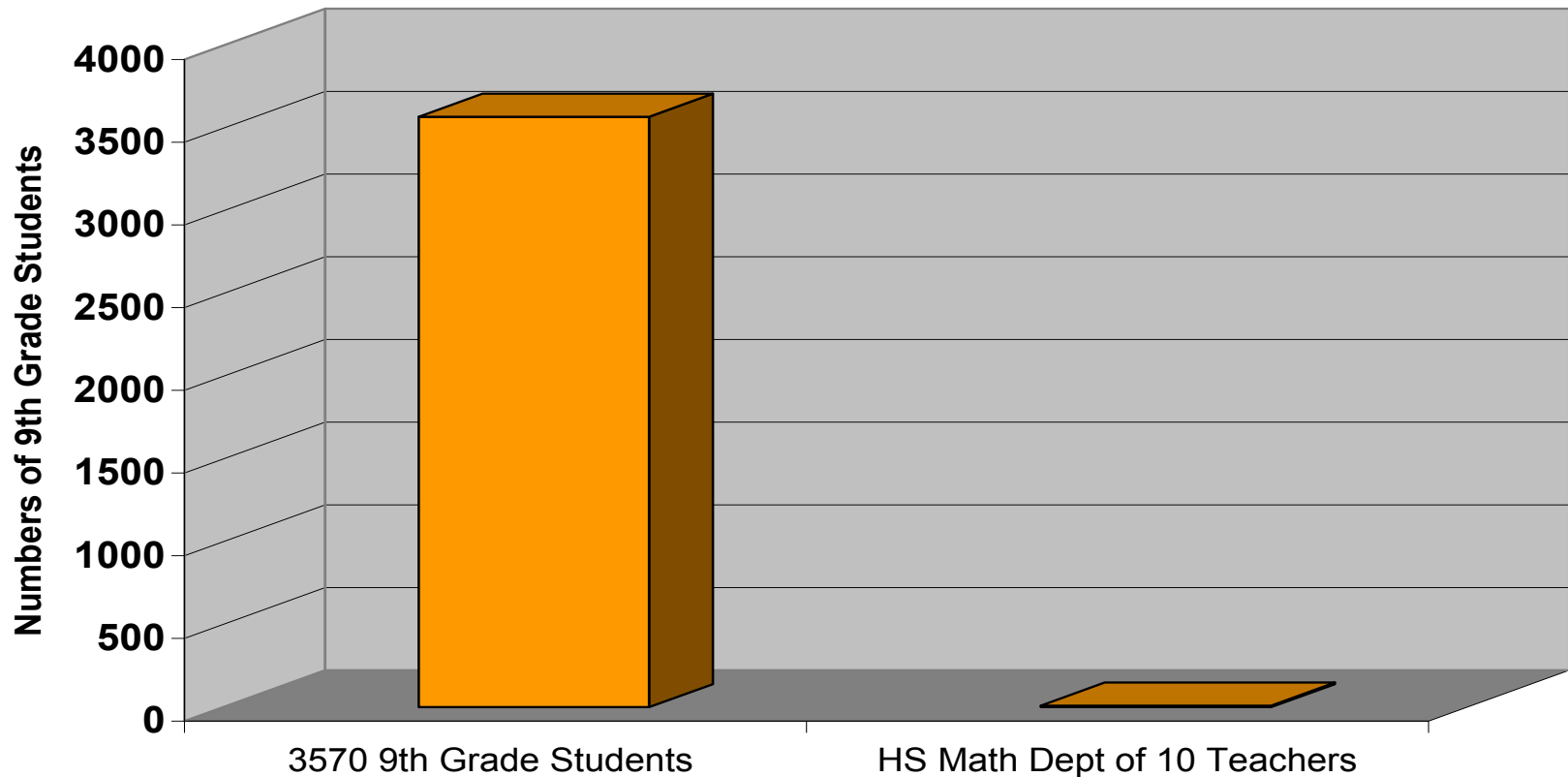
Rarely would teacher say because it develops critical thinking, problem solving skills , inspires student to love math, shows them how they can use math in the real work.

In short all of the things they listed as wish for their student to achieve at the end is disconnected from what teachers and students actually do day in and day out in actual classrooms with textbooks.

It soon becomes clear that the main reason that math teachers teach what they teach is to reproduce.

But reproduction is highly inefficient

Number of 9th Grade Students to Get 10 Math Department Teachers



But we realized there was an even more fundamental problem than the lack of purpose of a mathematics curriculum,

What very often prevented STEM reform was the overall lack of purpose, the lack of a guiding philosophy for the whole school itself to cohere and unify the purposes of education and in so doing make sense of all curriculum and modes of teaching.

Instead, we found schools to be rhetorical repositories of reactions to a diverse and vocal set of competing constituents and purposes while clinging to familiar habits and routines of school, textbooks and grading. In short, a condition political scientists call “hyper-pluralism.”

Constituents

US Congress, Executive Branch & National Orgs
e.g, NCTM, NRC, MSEB

States

School Boards
and District
Administrators

Math Department
Heads

Classroom Teachers

Parents

Achievement Concerns

International tests,
PISA, TIMMS, NAEP

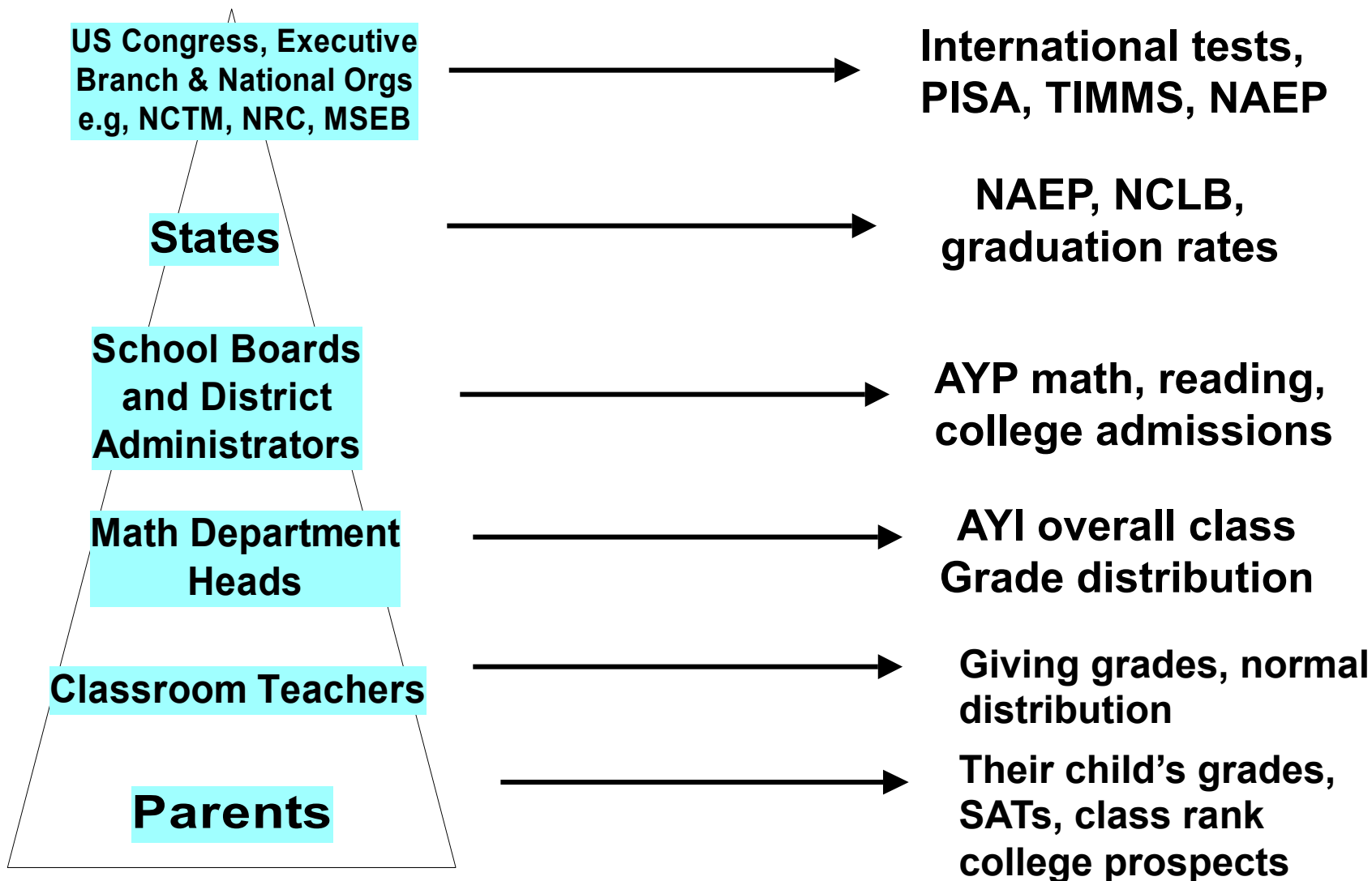
NAEP, NCLB,
graduation rates

AYP math, reading,
college admissions

AYI overall class
Grade distribution

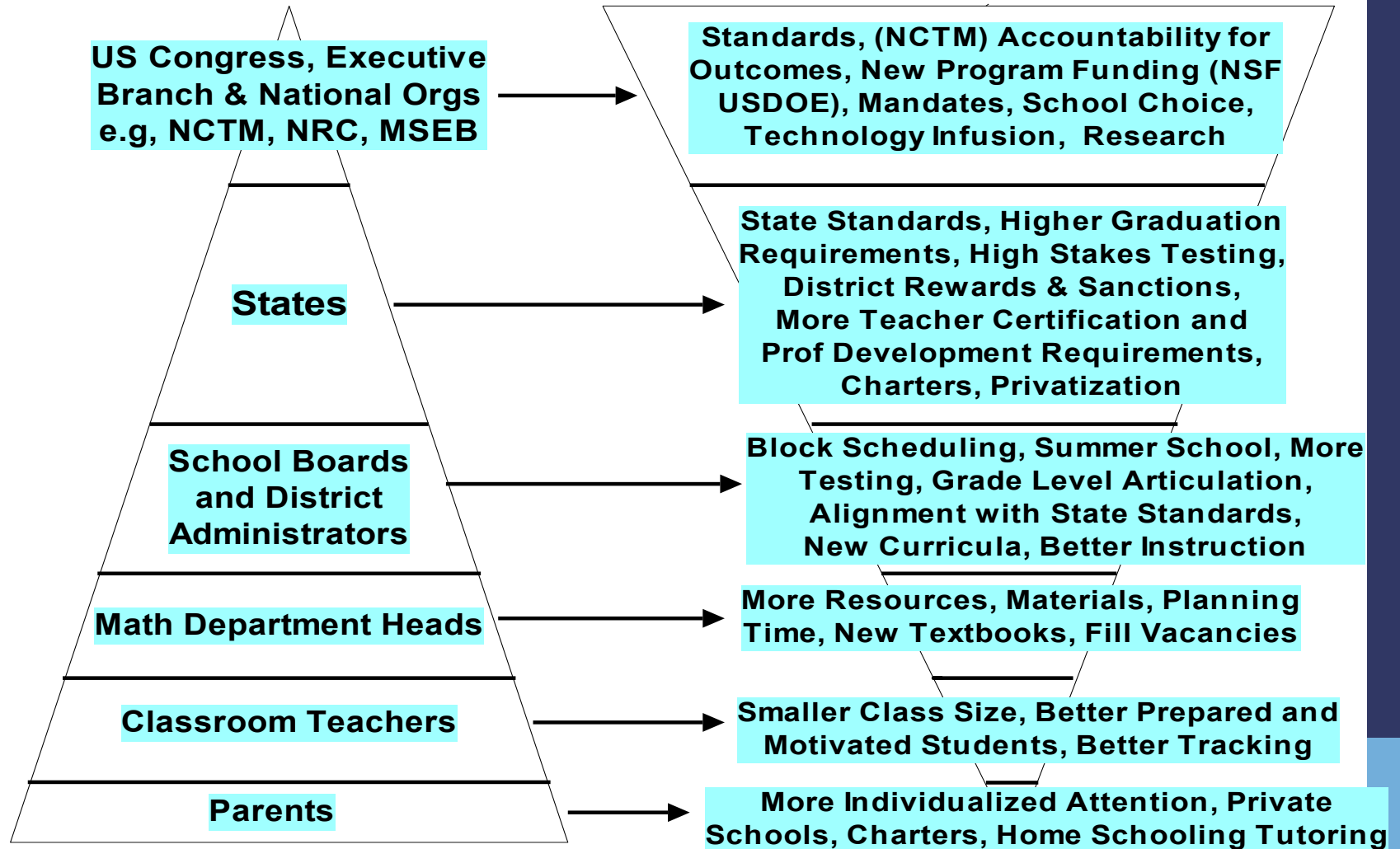
Giving grades, normal
distribution

Their child's grades,
SATs, class rank
college prospects



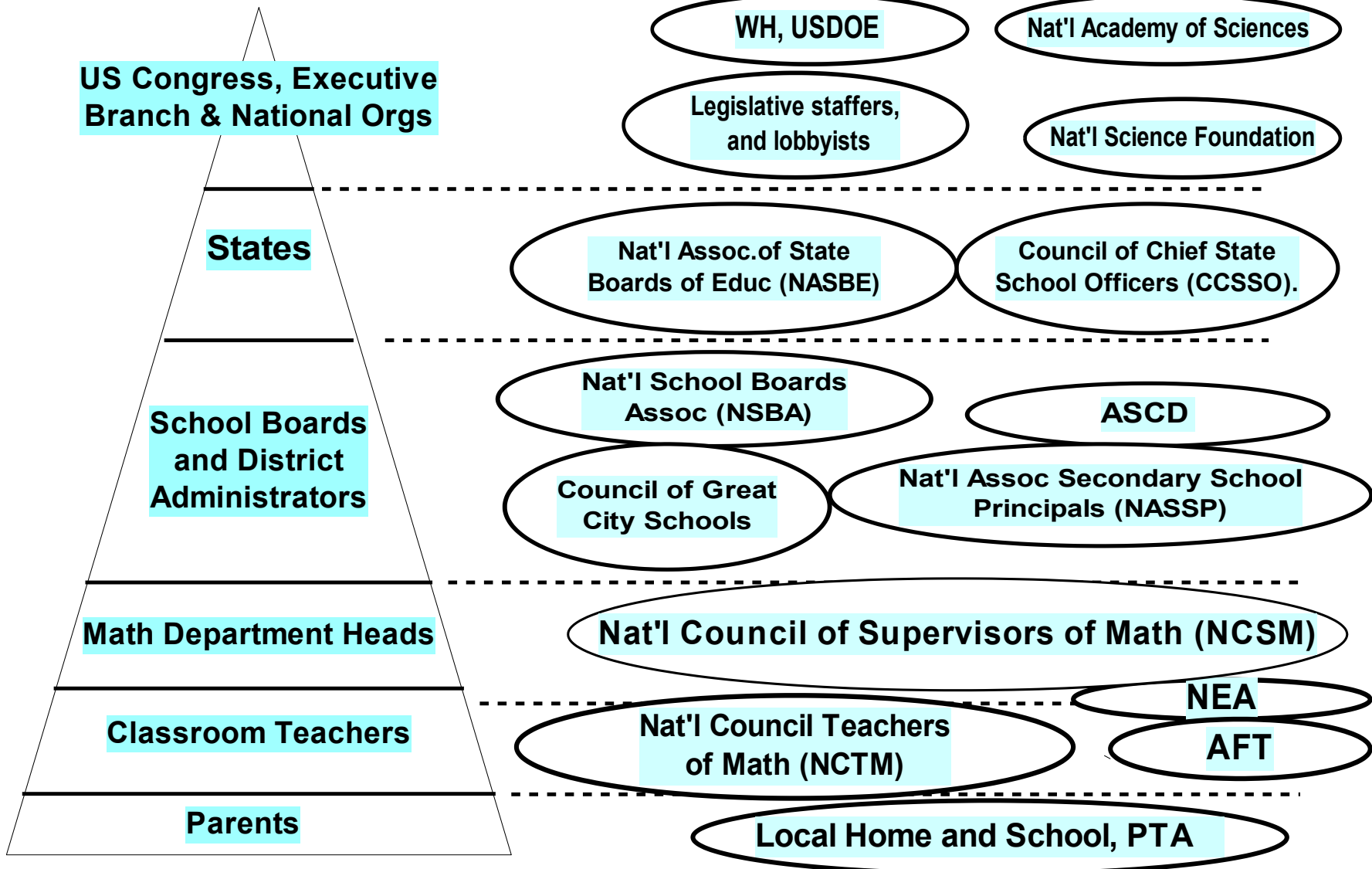
Constituents

Response to Concerns



Constituents

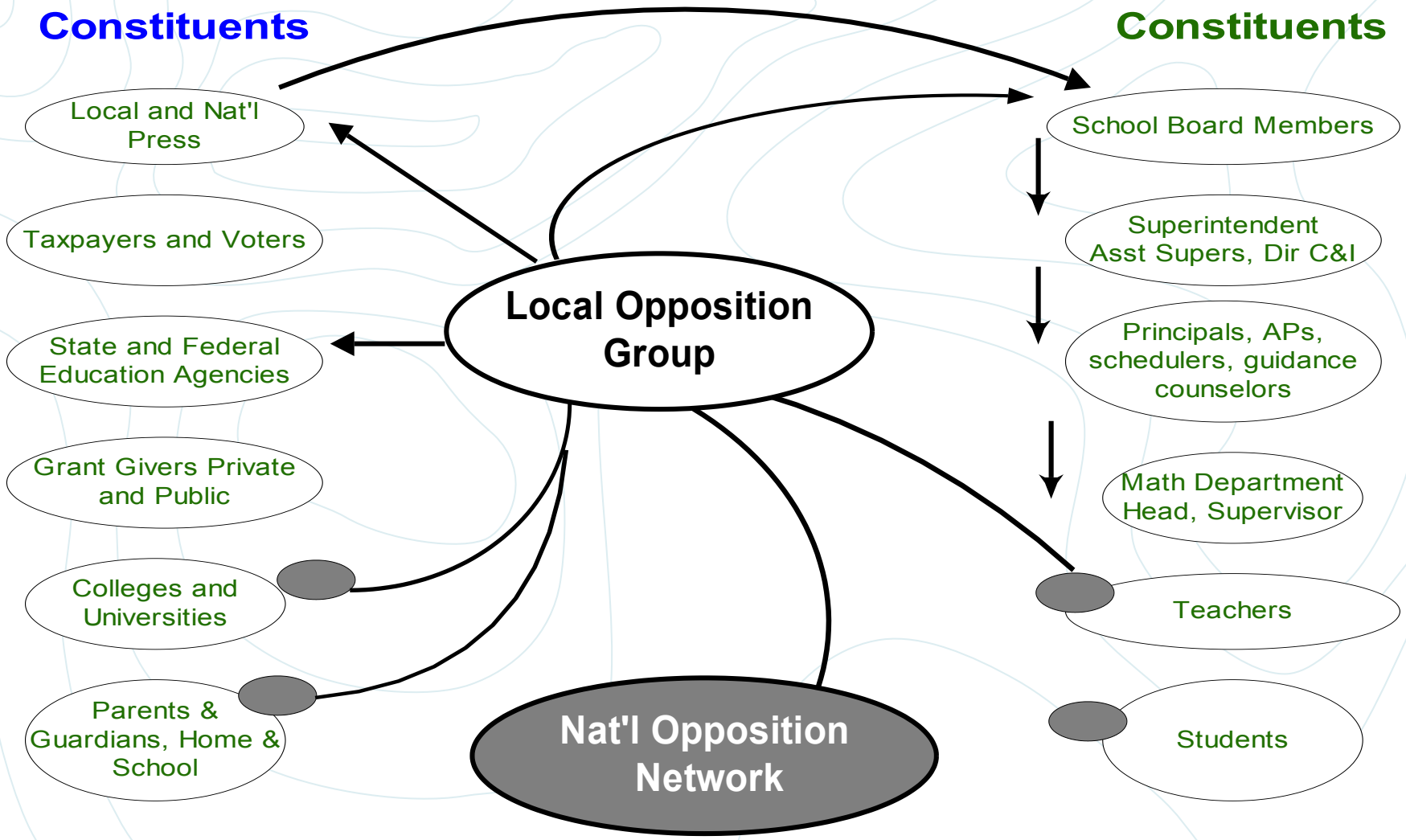
Circles of Associations



HYPER-PLURALISM: The Typical Opposition-to-Change Dynamic

External Constituents

Internal Constituents



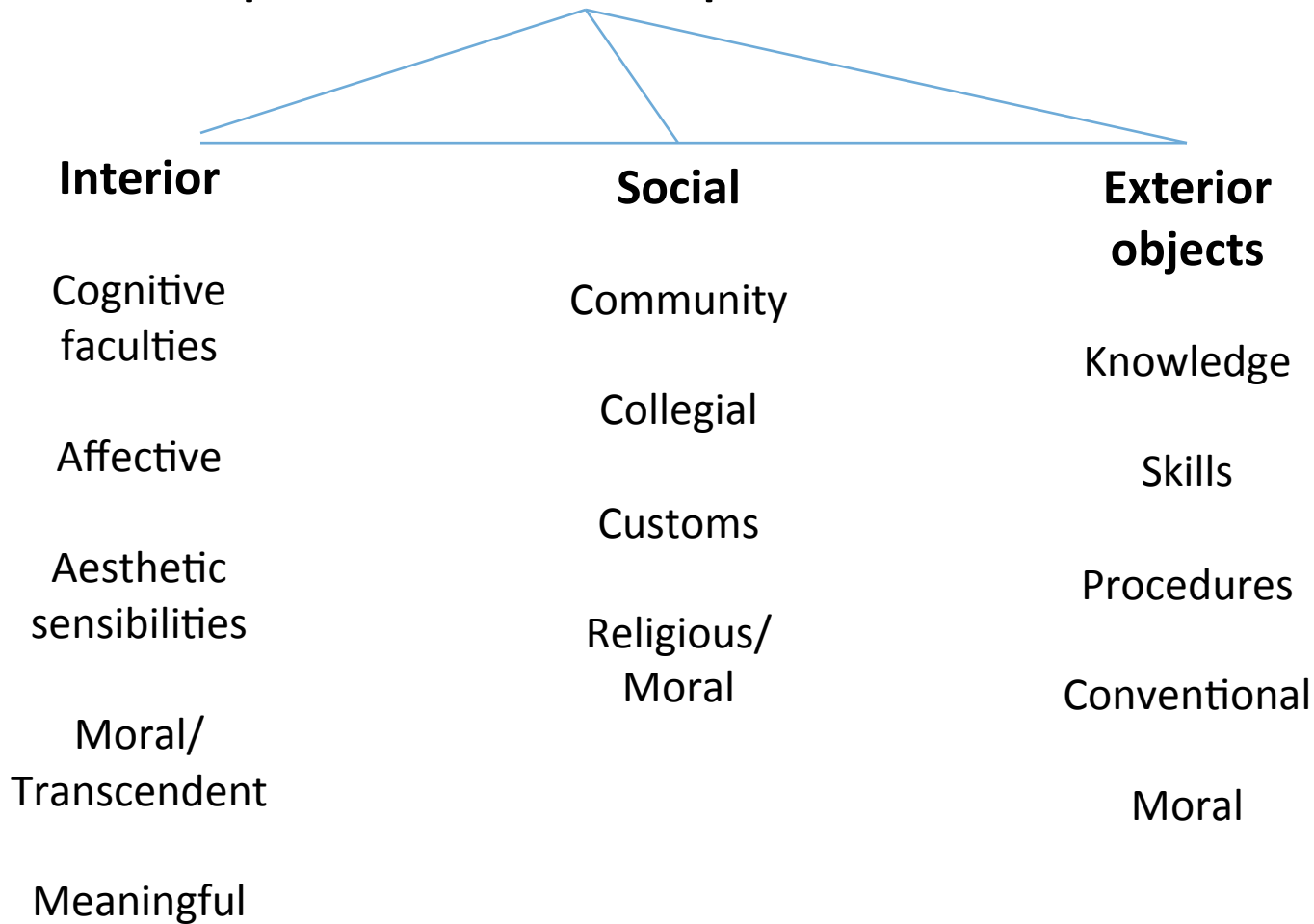
We offer the following argument:

No subject, no discipline, no area of study, is larger than the school itself and the overall educative purposes of it which should inform all activities and courses of study within it.

The *object* of effective teaching, thus, is dependent on the ultimate purposes or aims of education of a school, which is a value statement. It therefore involves a choice.

Whereas the *methods* of effective teaching is dependent on the objects of learning informed by and aligned to such particular purposes. It is, thus, an empirical question.

**By “aim” we mean a particular configuration of three spaces.
An aim speaks to all of these spaces and their dimensions**



Over the course of almost 400 years of US American history , we submit there have emerged about 15 different aims of education that still exist today : from salvation to sustainability.

To cultivate one's "inner light" (1689)

For the practical and useful (1749)

To preserve democracy and the republic (1790)

To serve state economic need and growth sectors (1862)

To be the agent of social transformation (1911)

To provide direct vocational opportunities (1917)

To maintain the scientific nuclear military industrial complex (1950)

To produce a generally better skilled workforce for global economic competition (1983)

To solve the grand challenges of society through innovation (2000)

We submit the most effective and successful schools with the most effective STEM teaching are those that have a clear purpose, consensus about that purpose, a coherent curriculum aligned to such purposes , teachers and administrators with the talent to serve those purposes, methods of teaching that enact those purposes and multiple indicators to assess their accomplishment.