# Behavioral science and education reform:
## the Paideia Individualized Education technology

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**The Mechner Foundation**

# The need for K-12 school reform

**There is now widespread agreement that American K-12 schools need to be reformed and reconfigured.**

Diane Ravitch (2010), *The Death and Life of the Great American School System*, New York: Basic Books.

Sean Cavanagh (2012), *The Global Challenge: U.S. Education Pressured by International Comparisons*. *Education Week.*

M. Fullan (2011), *All Systems Go: The Change Imperative for Whole System Reform*, Thousand Oaks, CA: Corwin.

Jal Mehta, Robert Schwartz, and Fredrick Hess. (2012), *The Futures of School Reform.* Harvard Education Press, Cambridge, MA.

# Comprehensive reconfiguration

A reconfigured school must focus on how students learn and what teachers do.

To fix the way schools are structured and operated, we must apply all of our knowledge regarding education, the learning process, and organizational management.

# Keller's Personalized System of Instruction

In the 1960s, Fred S. Keller demonstrated how a personalized system of instruction (PSI) could be implemented in school settings, with teachers functioning as "learning managers" rather than as purveyors of knowledge (Keller, 1968).

# A successor of PSI:
## Paideia Individualized Education

In 1968 we founded the Armonk Paideia School, a K-12 school that sought to combine all of the known features of an ideal and complete education, based on the ideas of leading educators, going back to John Dewey.

# A successor of PSI:
## Paideia Individualized Education

*Result:* A completely reconfigured school in which every student receives an individualized education provided by a team of learning managers.

# An approach to K-12 education based on behavioral technology

**Paideia Individualized Education (PIE)** applies current knowledge of behavior analysis, educational theory, and organizational management theory to the education of children in the K-12 range.

# Today's implementation of the PIE model

The Mechner Foundation has
been operating New York's
Queens Paideia School since 2009.

A team of 4 Learning Managers
and 2 learning aides provides
individualized educations to 30
K-12 students.

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# The Team Approach

**The PIE model uses a collaborative team of 4 Learning Managers, each one proficient in one of the 4 core subject areas—math, science, language skills, and social studies.**

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- **Individualization of learning objectives and learning plans. Every student works at his/her level in every academic subject area, so that no student can fall behind or fail.**

# What is a learning objective?

A *learning objective* describes a learning outcome in a way that allows different parties, including the learner, to know whether it has been achieved.

The presentation of a learning objective can involve text, graphics (images, diagrams, graphs), and ancillary materials.

The specified achievement may be demonstrating a skill, knowledge, or creating a work product.

# What does individualization mean?

- **Every student works on a customized learning plan that consists of behaviorally specified learning objectives, in every subject.**

- **Every student works at his or her current level of achievement (i.e., can't fail or fall behind).**

- **<span style="color:darkred">Failure patterns are eliminated</span>, as students work at their actual current level, rather than at levels imposed by classroom pacing.**

# Benefits of self-pacing

**Students can move ahead without restraint and excel, and cannot fall behind.**

**All students move ahead at whatever pace works best for them.**

# Learning Plans

A student's personalized learning plan may list several dozen learning objectives in each of several academic and non-academic areas.

Students make explicit commitments to achieving their learning objectives.

# Students become independent learners

As a result of their daily routine of committing to achieving goals and learning objectives, students acquire a sense of ownership of their education and become independent, self-motivated learners.
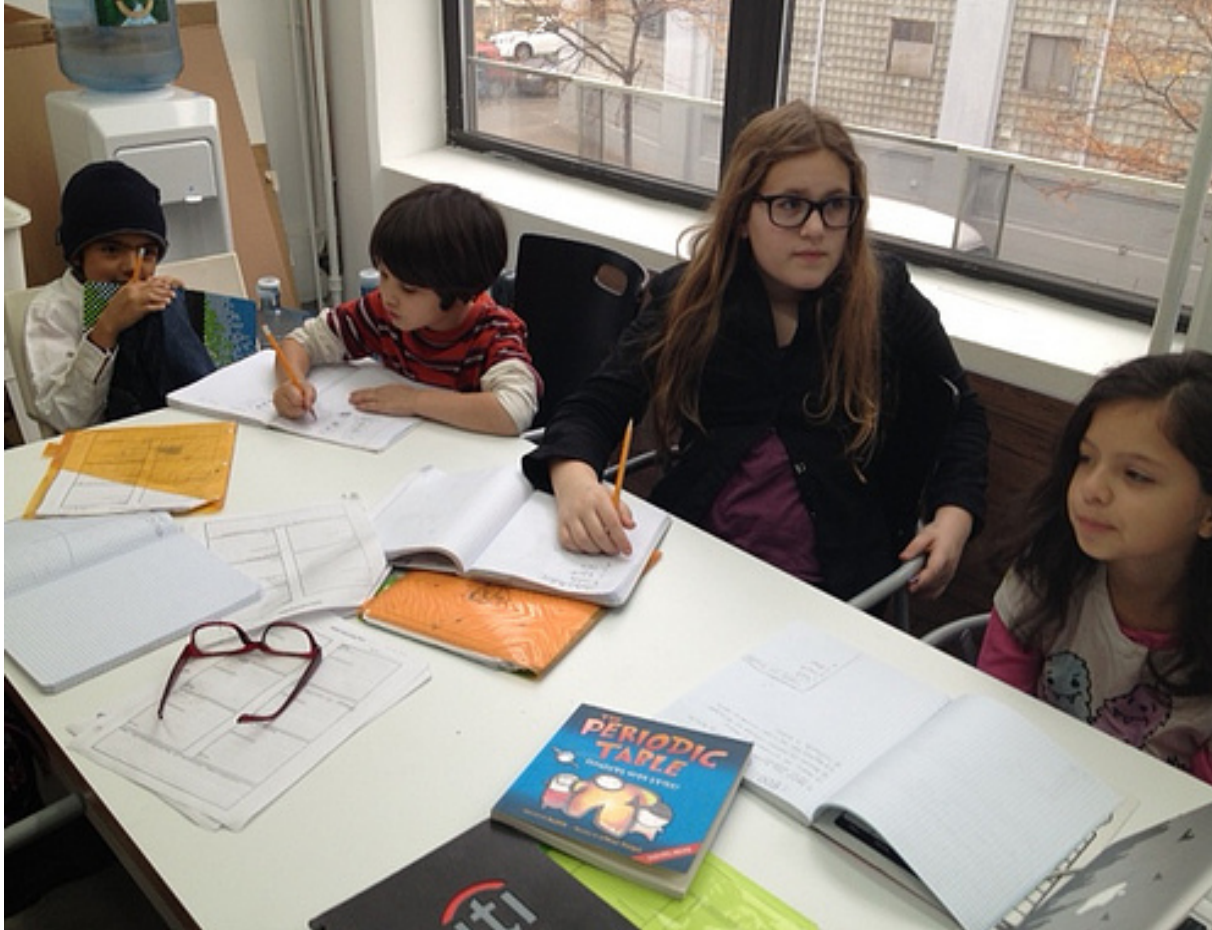
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- **Mixed-age groupings and diversity**

# Mixed-age grouping

At Queens Paideia School students of diverse ages share a common space in four rooms.

They may move around independently, provided they don't disturb others.

**An older student assisting a younger one.**

The mixed age grouping facilitates modeling, mentoring, and helping—which are beneficial to younger and older students alike.

# The student body is diverse

Since the education is individualized, the student body can be highly diverse with respect to age, culture, socio-economic or ethnic background, native language, and ability.

A PIE school has approximately 30 students, ranging in age from 5 to 17. Everybody knows everyone else well.

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- Equal attention to academic progress and non-academic personal development

- **Students are not ranked or given grades. Monitoring and assessment of achievement is continuous.**

# Corollary features of the PIE model

- **Multi-year relationships between students and learning managers, based on daily contact**

**A Learning manager provides individualized help to a student**

Learning Managers review students' work with them and give them frequent feedback regarding their interpersonal, self-management, and executive function skills.

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# Important Thinking Skills

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- **Applying appropriate heuristics**

# Critical thinking and inquiry skills

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**Students learn heuristics (self-talk) to apply in situations that require decision making (Mechner, Fredrick, & Jenkins, 2012).**

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- **Using analogies and comparisons**

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# Inclusion of special needs students

Individualization **treats *every* student's needs as unique and special.** That is why a PIE school, with its 6:1 ratio, can integrate and include many students who would be categorized as "IEP" or "special needs" in most other schools.

There is broad consensus that inclusion of these students averts damaging effects to self-esteem due to being stigmatized by such classifications.

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- **Every student has a permanent personal work station.**

**Every student has a permanent personal place of work**

**It is similar to an office which the student uses for the independent work sessions. The desk is used only by the student whose desk it is.**

# Learning objectives and LearningCloud

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**LearningCloud is the key to Queens Paideia School's individualized education technology.**

# The learning *resources*

**The LearningCloud database also identifies *learning resources* (books, computer-based programs, videos, games, materials, etc.) relevant to the achievement of the learning objectives.**

# LearningCloud: A tool for individualization

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LearningCloud enables a teacher to individualize instruction even when the student population is diverse.

**It gives teachers fast, convenient access to learning objectives that fit any particular student's unique abilities, needs, and stage of progress.**

# Building the LearningCloud database

**Continuing expansion and quality control of the LearningCloud database requires contributions from educators, teachers, and scholars in all disciplines.**

**LearningCloud will eventually be made available as an open source facility.**

# Observed effects on academic progress

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- Students normally progress faster than one grade level per year and do work that is typically done in higher grades.

- **Most students who have been at Queen Paideia School for two years score in the top percentiles on standardized tests.**

# Social-emotional behavior and self-management skills

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The Learning Managers provide **immediate feedback** for students' social interactions, and coach them on their **interpersonal, self-management, and executive function skills**.

# Continuous coaching and feedback for social interactions

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**The result? Accelerated social learning and emotional maturation.**

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**That is why this environment is a good incubator of social and interpersonal skills.**

# Observed results

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**Discipline problems are largely averted due to constant personal attention, emotional support, and instruction in constructive coping strategies.**

# Important non-academic areas

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- learning skills, work and study habits

- thinking skills, inquiry skills

- self-management techniques, executive function skills

- **goal setting, self-observation and reflection**

# Meaningful Assessment

**Student achievement and progress**

**<span style="color:darkred">is assessed continuously, in multiple ways,</span>**

**in every academic subject area as well as**

**in the social and self-management areas.**

# Assessing non-academic behavior

The system: five teachers who know every student well, based on daily personal contact, independently rate each student on a ten-point scale on each of many categories of non-academic competency.

# Validity and reliability

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**This consensus-based method of assessment is made possible by the PIE technology's team approach, in which several teachers have daily contact with every student.**

# Quantification of "consensus"

We look at the teachers' average rating for every behavior category for every student, and the clustering of their ratings (in terms of scatter).

We call the clustering "consensus" and we quantify it on a scale from 0 to 1, with 1 representing perfect consensus (all 5 ratings exactly the same) and 0 perfect disagreement (the broadest possible spread).

# Average rating and Consensus Index (C I)
## (on a scale from 0 to 1, with 1 representing perfect consensus)

| Category | Jim | | Jane | | Maria | | John | |
|---|---|---|---|---|---|---|---|---|
| | Mean | C I | Mean | C I | Mean | C I | Mean | C I |
| **Focus and attention span** | 3.8 | 0.61 | 5.6 | 0.63 | 7.4 | 0.69 | 4.6 | 0.69 |
| **Executive function skills** | 4.8 | 0.70 | 4.6 | 0.82 | 8.2 | 0.74 | 4.8 | 0.56 |
| **Patience and perseverance** | 3.8 | 0.91 | 4.8 | 0.83 | 7.4 | 0.69 | 5.8 | 0.78 |
| **Emotional self-control** | 4.8 | 0.91 | 3.4 | 0.69 | 6.0 | 1.00 | 6.2 | 0.83 |
| **Self-observation and reflection** | 3.4 | 0.69 | 3.8 | 0.56 | 7.2 | 0.74 | 6.6 | 0.82 |
| **Collaboration and cooperation** | 4.8 | 0.83 | 5.0 | 0.86 | 5.4 | 0.77 | 6.2 | 0.64 |

# Mathematical meaning of the Consensus Index

The Consensus Index refers to the probability that the ratings could have been due to chance.

The higher the Consensus Index (i.e., the more tightly the ratings cluster around their mean), the lower the probability that they were due to chance.

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four weeks of independent learning, during which students work on their learning plans in every subject, and

**two weeks of group activities in which students of similar levels present and discuss their work, perform experiments, discuss books, collaborate, or go on field trips.**

# Benefits of independent and group work

**During the independent learning periods, students work at their own levels of achievement in every subject area, regardless of what others may be doing.**

**Student do their independent work at their permanent personal work station (desk or carrel).**

**This also helps them learn housekeeping and self-management skills, and the value of stimulus control.**

# Benefits of independent and group work

During the independent learning periods, students work at their own levels of achievement in every subject area, regardless of what others may be doing.

**In the group phase, they learn to work with others—to cooperate, collaborate, and communicate.**

**A student presents her report to other students**

Students learn to prepare oral presentations and to communicate effectively with an audience: to project their voice, make eye contact, and answer questions.

**Group discussion session in science**

**During the group sessions, they learn to work with others, to communicate, collaborate, and interact in ways that prepare them for life beyond school.**

# Benefits to families and communities

When children do well academically, enjoy secure, long-term relationships, and develop a strong sense of personal identity, they are less likely to engage in delinquent behavior, drug use, crime, or to drop out of school.

Parental involvement in a child's education has positive and stabilizing effects on home life.

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Is there a way to make the 6:1 ratio economically feasible?

Yes. Large cost savings are achieved when many 30-student PIE modules are aggregated, in modular fashion, to form larger schools.

**The per-pupil costs are then 22% lower than the costs for most public schools.**

# How are such savings achieved?

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- **By savings due to reduced discipline problems with their hidden costs of teacher demoralization, dissatisfaction, absences, turnover, and attrition.**

# Additional sources of savings

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- Cost savings due to the increased efficiency of decentralized management

- **Distribution of fixed costs over many students: library, facilities for lunch, music, art, science labs, and physical education.**

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**For school reform this means creating working models of schools, designed from scratch to generate the desired student competencies at an affordable cost per student.**

# Prototyping the PIE technology

The practicality and viability of the small PIE school has been demonstrated, and is not questioned.

To evaluate its potential for school reform, a scaled up prototype, consisting of an aggregation of 18 Paideia modules, would have to be created and tested.

# Summary and Conclusions

The PIE technology and its demonstration at Queens Paideia School suggests a promising path to school reform.

THANK YOU!!