

Paideia Individualized Education Technology: An Approach to Reconfiguring K-12 Schools

Francis Mechner, Tim Fredrick, Victor Fiallo

The Mechner Foundation

Abstract

The Paideia Individualized Education (PIE) technology integrates what is known today about education, the learning process, and the management of organizations, to form a reconfigured type of K-12 school. First demonstrated at the Armonk Paideia School (1968-1973), this model has been receiving further development at Queens Paideia School since 2009. A team of 4 learning managers, each proficient in math, science, language arts, or social studies, is in long-term charge of the education of approximately 30 students of diverse ages, backgrounds, and abilities. Every student follows a personalized curriculum and learning plan consisting of learning objectives that cover the academic subjects as well as competence in self-management, social and emotional learning, and thinking skills.

Most students advance rapidly, academically as well as in their personal development. Failure patterns are eliminated because students work at their actual level of achievement and at their personal best pace. They take increasing ownership of their education as they make daily explicit commitments to achieving learning objectives. Many who might be categorized as “special needs” are integrated and mainstreamed. The resulting learning environment is supportive, stimulating, respectful, and non-punitive, thereby averting most discipline problems.

Preliminary studies suggest that when a number of PIE schools are aggregated as modular, self-contained units of a larger school, the benefits of the PIE technology are preserved, at a per-pupil cost well below that of most present-day public schools.

Search terms: Individualized instruction, personalized education, IEP, special needs, school reform, Common Core Standards, socio-emotional competence, self-management, learning paradigms, Paideia, K-12 schools.

Introduction

The Paideia Individualized Education (PIE) technology is a team teaching approach to the individualization of K-12 education. It integrates modern knowledge of educational theory, the learning process, psychology, and organizational management theory. The PIE technology originated at the Paideia School that operated in Armonk, New York, from 1968 to 1973,¹ and has been receiving further development and refinement since 2009 at Queens Paideia School in Long Island City, New York.

This article describes the PIE technology's features, its benefits to the education system's various stakeholders, and its potential as a generally applicable approach to the individualization of K-12 education. The meanings of the term "individualized," as used here, include those of "personalized" and "differentiated."

The learning objectives that define basic competency in reading, writing, arithmetic, self-management, and social interaction competencies are assumed to apply to most students, though different students may achieve these objectives at different times and rates, and by different paths. Many other learning objectives apply to some students only, in accordance with differences in their interests, learning styles, and abilities.

Defining Features of the PIE Technology

If an education is to be responsive to every child's unique needs and potentialities it must be individualized, and if the education is to be complete it must cover the basic academic subjects as well as the non-academic social-emotional and self-management aspects of development. The goal is the child's eventual competence as a well-

¹ Documents available in Mechner papers, Archives of the History of American Psychology, The Cummings Center for the History of Psychology, The University of Akron. Background information can also be found in Mechner, 2015.

functioning adult. Individualization is necessary because children differ in important ways, especially when the student body is culturally diverse. Only an individualized education can adequately address the details of each student's unique learning style and status.. These are the PIE technology's basic features:

The team approach. Given that a complete education must cover language arts, math, science, and social studies, no single teacher (“learning manager”²) can be sufficiently proficient in all of these areas to provide a complete education even to a single student, even if the situation were one-on-one. It takes a team, in which each member is proficient in at least one of the four areas.

The low student-teacher ratio. For every K-6 student to receive an individualized education, with the required amount of personal attention and support, experience to date suggests that the average student-staff ratio cannot exceed 6:1, a ratio consistent with four learning managers, two to three learning aides, and approximately 30 students.³ The ratio for any given student at any given time will deviate from this average, ranging from an occasional 1:1 to an occasional 10:1.

Learning plans and learning objectives. The learning managers provide each student with a customized learning plan comprised of learning objectives that cover the 4 major academic content areas (mathematics, science, language arts, and social studies), as well as competencies in self-management, social interaction, executive function, and learning skills. The competencies variously called critical thinking, inquiry, and problem solving, are targeted directly as learning objectives rather than as vague goals (Mechner, Fredrick, & Jenkins, 2013). Learning managers obtain most of the learning objectives in real time, as they need them, by accessing a large, searchable, relational database termed LearningCloud (Mechner, Jones, &

² To emphasize that their function is to create conditions in which learning will occur, rather than just to present information.

³ 6:1 is an average, with different ratios used in different circumstances.

Fiallo, 2013).

The customized learning plans replace formal age-based grades and classes. Students advance along their personalized learning plans at their best pace in steps of the right size for smooth progress, always working at the level at which their diverse stages of progress place them. Students who have special gifts or talents in certain areas can move ahead without constraint and excel, but all students move forward at whatever pace is most comfortable for them.

Approach to curriculum. The PIE technology is neutral as to curriculum approach: It can accommodate any type of curriculum, as well as instruction in foreign language, the arts, and physical education provided by part-time teachers with proficiency in those areas. The individualized approach permits personalization of curriculum and of learning resources.

The number of students in the school. A team of four learning managers assisted by two learning aides can provide individualized educations to approximately 30 students of diverse ages, cultural backgrounds, and abilities. Each learning manager maintains detailed knowledge of every student's learning status at all times.

Social and emotional development. The PIE technology regards social-emotional development and self-management competencies as no less important than academic achievement. To promote these non-academic competencies, the learning managers need a steady flow of opportunities to provide students with coaching and immediate feedback. The PIE school environment provides that flow.

Incidents of unacceptable behavior are handled by coaching and conflict resolution methods rather than by punishment to avoid its pernicious effects of fear, anger, and aggression. At the same time, the tight-knit and cohesive community of a PIE school, in which students and learning managers interact daily and stay together over a number of years, leads to the formation of educationally valuable long-term bonds.

Students become proactive and self-motivated learners. This happens naturally when students make daily explicit commitments to achieving specific learning objectives. As students frequently set goals for themselves and then strive to achieve them, they take increasing ownership of their education and become motivated by the achievement of learning objectives rather than by competitive grades or rankings.

Meaningful assessment. Student achievement and progress is assessed continuously, in multiple ways, in every academic subject area as well as in the non-academic social and self-management areas.

Mixed-age grouping. Students of diverse ages share a common space in which each has a permanent personal desk. Students may move around to stretch or take short breaks, provided they don't disturb others.

Parent involvement. Learning managers make proactive efforts to engage parents in their children's education, often in the context of discussing homework, behavior management, sleep patterns, or nutrition.

Inclusiveness and diversity. Because the PIE education is individualized, it is appropriate for students of all backgrounds and abilities, including students whose native language is not English.

Special needs and IEP students. Since the PIE technology considers every student's needs unique and special, it integrates and mainstreams many students who would be categorized as "IEP" or "special needs" in most other schools. Inclusion of such students averts the stigma and damage to self-esteem that special needs diagnoses often engender (Forest, 1988; Roach, 1995; Rogers 1993; Stainback et al., 1992).

College readiness and high test scores. These are normal byproducts of the PIE education rather than direct targets. The overarching goal is to prepare students to function effectively beyond school, in the world of their adulthood.

The joint and synergistic effect of the above-listed features is a school culture that is, itself, an important feature of the PIE technology—a culture in which the focus is always on the behavior and competence of individual students. It is this set of features, working together, that generates the described benefits to students, teachers, and families.

Teachers who have basic experience and competencies in dealing with children can learn to perform the job of the learning manager fairly quickly. The PIE learning manager job is learned more easily than the job of teaching in traditional classroom situations.

Background of the Underlying Philosophy

The ideas that comprise the PIE technology are not new. In the early 1900s John Dewey was already advocating education reform, arguing that the goal must be to prepare students for a changed and changing world (Dewey, 1897, 1900, 1902, 1938). Some decades later, Jerome Bruner of Harvard University wrote that learning should be active and interest-driven (Bruner, 1960, 1961, 1966; Bruner, Goodnow & Austin, 1956), a thesis later expanded in Howard Gardner's influential work on multiple intelligences (Gardner, 1983). Bruner's contemporary at Harvard, B. F. Skinner, argued that effective instruction requires focus on the details of the individual learner's behavior, including active responding, self-pacing, successive approximation strategies for achieving desired learning outcomes, feedback to both learners and teachers, and the acquisition of self-management and self-observation skills (Skinner, 1953, 1968).

In the 1960s Fred S. Keller of Columbia University demonstrated at a Brazilian university how a personalized system of instruction (PSI, also known as the Keller Plan) could be implemented in school settings, with teachers functioning as “learning managers” rather than purveyors of knowledge (Keller, 1968). Students work their way through learning modules independently, at their own pace, with only occasional assistance from learning managers or other students.

These are some of the ideas that stoked the educational reform movement of the 1960s and 1970s. But existing schools were not in a position to integrate and implement these ideas. Over time, it became clear that doing so would require a radically new and reconfigured type of school (de la Fuente, 2013; Fullan, 2011; Mehta et al., 2012; Ravitch, 2010).

Implementations of the PIE Technology

In 1968, Dr. Mechner, through his company UEC Inc., founded the original Paideia School in Armonk, NY, to develop and demonstrate the PIE technology (Mechner, 1966).⁴ This school, together with UEC's related projects in the pre-school field, stimulated widespread interest (Mechner, 2015).⁵

In 2009, the Mechner Foundation founded Queens Paideia School (QPS) to continue development of the PIE technology's potential for the education reforms advocated by the U.S. Office of Education and by others.

Experience and Observed Results

The experiences of QPS are similar to those of the Armonk Paideia School. Many students routinely advance rapidly in the academic areas, and do work typically encountered in higher grades. The

⁴ In the following years, the Paideia name came to be applied to educational endeavors unrelated to the PIE technology. For instance, in 1982 Dr. Mortimer Adler of Columbia University published *The Paideia Proposal* (Adler, 1982), and then formed the Paideia Group. His proposals, related to the Paideia School by name only, were directed at the education of older students with focus on the classics and seminar discussion skills. Many schools have since taken the Paideia name, without connection to the PIE technology.

⁵ In October of 1969, the White House National Goals Research Staff, under Leonard Garment and Dr. Daniel Patrick Moynihan, asked Dr. Mechner for his "observations and comments about education today and what it might become tomorrow." In September of 1971, Mechner testified before the Senate Finance Committee in the hearings for the Mondale-Brademas Comprehensive Child Development Act of 1971, which was passed by Congress in late 1971 and vetoed by President Nixon in 1972 (Mechner, 1971).

benefits, both academic and non-academic, usually become fully evident after a year or so in the school. As students' ability to make good choices regarding ways to achieve learning objectives improves (an aspect of "learning to learn"), they pursue their studies with growing independence and take increasing ownership of their education. The Armonk students who later took the standardized SATs scored in the top percentiles, and most students who have been at QPS for more than one year perform in the upper percentile ranges of their age group on the annually-administered standardized tests, despite having received no preparation or experience in test taking. Beyond tests results, most students produce portfolios containing remarkable work products.

The small size and intimate environment of PIE schools generates a copious flow of social interactions among students, providing learning managers with frequent on-the-spot opportunities for coaching and feedback. The emotional and behavioral problems that students sometimes bring with them gradually diminish. Typical school discipline problems like bullying and aggressive behavior are rarely seen. The dynamics are more akin to those of functional families—collaborative relationships, small but easily resolved squabbles, and strong bonds. Parents regularly receive information about their children's learning activities and progress.

A striking aspect of the culture that emerges in this type of environment is the student-centered mind-set. The learning managers' and learning aides' attention is constantly focused on the details of the academic achievements and non-academic behaviors of individual students.

Most of the observations made at the Armonk school have been and are continuing to be corroborated at QPS—improved competence in communication, collaboration, executive function, and ability to forge and manage friendships. Systems for quantifying, measuring and tracking these non-academic competencies are under continuous development at QPS.

Benefits of PIE Schools

Educational benefits

- Most students make rapid progress in the academic subjects, and many move ahead to more advanced work in areas that interest them.
- Failure patterns are eliminated because students always work at their actual level of achievement and at their own best pace, in every subject, rather than at levels imposed by classroom pacing or age-linked achievement standards.
- Students become more competent in self-management, executive function, and social/interpersonal interactions.
- Students who have been in a PIE school for several years tend to become independent self-motivated learners.
- The interactions between students of diverse ages include older ones assisting younger ones and providing role models for them, with benefits to both.
- The PIE work environment and team approach is satisfying, non-stressful, and rewarding for the learning managers.
- Nearly all students enjoy school and most discipline problems are averted.
- The dynamics lead to the formation of cohesive social units and the development of valuable long-term relationships among students and learning managers.

Benefits to teachers

The PIE technology's team approach eliminates situations in which the burden of teaching a classroom of 25+ students depends on a single teacher's competence, disposition, or energy level. In a PIE school, the quality of the education students receive is a function of the collaborative efforts of a close-knit team of learning managers who support each other constantly. When functioning as members of

such a team, teachers don't burn out, and can experience the satisfaction of being in constant touch with the impact of their frequent small decisions on the lives and educational progress of their students.

In many public schools, many teachers chafe at being held accountable for standardized test scores over which they have no control, or that define educational achievement too narrowly or even invalidly. The PIE technology, by contrast, defines and tracks student achievement in terms of the learning objectives that learning managers control daily and directly—a paradigm that makes accountability fully acceptable.

Community and social benefits

The educational benefits described above also have far reaching societal ramifications. When children do well academically, never fail, are not stigmatized for inadequacies, and are engaged socially, they are less likely to engage in delinquent behavior, drug use, crime, or drop out of school. And the parent involvement that the PIE system promotes tends to have stabilizing effects.

The Socialization Issue

It may seem paradoxical that a small-school environment like that of a PIE school can promote social learning better than the large-school environments of traditional schools. When there are hundreds of children, students can gravitate to their social comfort zones, often with self-segregation by gender and socio-cultural factors, with self-isolation being an additional option often taken by those most in need of social learning.

In the tight environment of a PIE school, on the other hand, close friendships routinely develop between children who might not otherwise be inclined to seek each other out. Not all relationships need to result in significant friendships, but all relationships, including difficult ones and those with the learning managers, hone the com-

petencies needed to make and keep friends and manage the normal challenges of dealing with others. The intimate, safe, and nurturing social environment of the PIE school functions as a good incubator of the competencies that family and work situations require.

In short, the PIE school environment produces more social learning and emotional maturation than do the more superficial and transient relationships that typically form in large schools.

LearningCloud—the PIE Database

LearningCloud, PIE's database of learning objectives and learning resources, is a core element of the PIE technology (Mechner, Jones, & Fiallo, 2013). This database consists of a theoretically unlimited number of learning objectives, with links to learning resources (workbooks, electronic lectures, exercises, texts, etc.) that may help achieve those learning objectives.

Rudimentary versions of LearningCloud, with over nine thousand learning objectives, have been in use at Queens Paideia School where it is being developed, and a development team is working on the upgrading of its functionalities. LearningCloud also helps implement the Common Core Standards by defining them operationally and specifying their learning outcomes by means of well-defined learning objectives.

LearningCloud will eventually be made available to schools and educators throughout the world as an open source learning facility.

How LearningCloud is used

LearningCloud provides learning managers with fast and convenient access to a database of learning objectives from which they can draw ones that fit any particular student's needs at a particular time. Learning managers can check, at any time, what each student recently did and achieved in every content area, and on what learning objectives s/he is currently working. They can search LearningCloud for learning objectives and units they consider appropriate next

steps, basing their selection on their observation and knowledge of the particular student.

For more mature learners (usually at the 6-12th grade levels) as well as in higher education, LearningCloud can function in self-instructional modes, as when students use it to find learning objectives to pursue. LearningCloud is not only an essential tool of the PIE technology, but also one that can be used in all schools to promote increased individualization of education (Mechner, Jones, & Fiallo (2013). It will also promote increased individualization of the many new types of on-line learning resources becoming available for use in schools and beyond (de la Fuente et al. 2013).

The PIE assessment system

Purposes of the assessment system

The learning outcomes generated by the PIE technology's use of learning objectives are also one of the means for ongoing detailed and quantitative assessment. Data comprised of learning outcomes and work products provides information on student progress in the academic content areas.

For the hard-to-measure non-academic competencies—social interaction, communication, self-management, executive function, and thinking skills, assessment and tracking is accomplished mainly by means of rating scales. The PIE team approach, in which every learning manager and learning aide observes every student every day, permits the ratings to be averaged and a consensus index calculated. The reliability and validity of such an index is quantified in terms of the probability that the consensus is not due to chance. A rating based on the consensus of several independent raters is more reliable and valid than traditional single-observer ratings. The learning managers track and rate a sufficient number of categories of behavior to provide a meaningful and valid picture of status and progress in those areas.

Once or twice a year, standardized tests are administered to track the students' performance in every academic subject as a percentile ranking against national norms.

The issue of validity

A general problem in the social sciences is that performance indices are often chosen for the ease with which they lend themselves to measurement rather than for their validity in providing information about the phenomena that are considered important. This issue assumes special importance in the field of education. The PIE technology addresses this issue by identifying and measuring the competencies that ultimately matter—the ones that are societally relevant.

One recent prominent and contentious instance of the validity issue is the use of standardized test scores to assess academic achievement and teacher performance. A criticism of this practice is that such test scores, though quantitative and obtainable, often don't measure the important aspects of the education students have actually been receiving or should have been receiving, or of teacher performance, and may even deflect attention from these. Aside from this point—that what is being measured misses the target and is, in that sense, invalid—the practice of holding teachers and schools accountable for test scores often produces unintended and destructive side effects, like teaching to the test and grading fraud.

Accommodating Diverse Curriculum Philosophies

The PIE technology is applicable to a broad spectrum of educational goals and curriculum philosophies. Different cultures teach their children different belief systems, ways of behaving toward others, and ways of leading their lives. The PIE technology can accommodate any particular set of these by selecting applicable subsets of learning objectives from LearningCloud in the creation of learning plans. When LearningCloud does not contain learning objectives that would be needed for a particular set of educational goals, such

learning objectives can be generated and added to LearningCloud.

Simulating outside-of-school situations

The overarching goal of the PIE technology is to prepare students to function as competent and productive adults in their lives beyond school. One way it accomplishes this is by simulating within the school setting some of the features of the world they are to learn to navigate.

One such feature is the mixed-age grouping, which promotes social learning by generating richer and more varied interactions than those in same-age groupings. Other features simulate the types of situations and interactions that occur in the world of work—for example, independent work sessions balanced with collaborative activities and group meetings where students present their work and ideas to each other and discuss them.

Motivating academic achievement

When such extrinsic motivators as test scores and grades are the main ones, retention will often fade quickly after a test. Research has shown that intrinsic motivators, those that will continue to be forthcoming outside the learning situation, like contextual relevance, are more effective and longer-lasting.

The PIE technology relies mainly on intrinsic motivators. Examples of these are the achievement of results, practical applications of skills and knowledge, the experience of increasing competence, connecting new material to things already known, becoming able to do something that was previously out of reach, satisfaction of curiosity, or relating to others who are interested in the same thing.

These intrinsic rewards are more effective motivators than extrinsic ones like test scores, competition, tokens, money, or other rewards that will not be forthcoming outside of the learning situations. For praise, acknowledgement, or recognition to be intrinsically rewarding, it must make contact with the substance of the achievement ra-

ther than its mere occurrence.

Alternative configurations of PIE schools

PIE schools can be implemented in any configuration that preserves the PIE technology's key features:

- A team of learning managers assisted by learning aides educates a group of 20-40 students of mixed ages with an average student-teacher ratio of 6:1.
- Each of the core academic content areas has a learning manager who is proficient in that area.
- The education is individualized, with equal emphasis on the academic and the non-academic competencies.
- Each student has a customized learning plan that consists of clearly defined learning objectives.
- All students have permanent personal work stations.

The configurations accommodate different grade-equivalent levels and ages. One possible set of ranges is K-6 and 6-12.⁶ If the range is too narrow, the benefits of the mixed-age feature are diminished.

Within a PIE school, the students can be grouped in different ways for different purposes. Here is one effective grouping approach:

- Mixed-age groups for the standard independent work sessions (for the core content areas) in which every student works on his or her personal learning plan, with occasional one-on-one or two-on-one assistance from learning managers or learning aides.
- Periodic re-grouping by similar ability level for discussion sessions, presentations, collaborative projects, and feedback from peers relating to work that was done independently.

⁶ The grade-equivalents implied by these ranges are based on achievement level as well as age. The "grade-equivalent" concept takes into account academic as well as the non-academic competencies.

- Similar-ability groupings for physical education, dance, music, art, and foreign language instruction.

The logistics of implementing good groupings require careful planning, thought, and care.

The 6th to 12th grade range in the PIE technology

Differences from traditional educations

The PIE approach to middle school and high school education differs from traditional ones in both philosophy and method. Though it shares the traditional goals of high academic achievement and preparation for college, it has certain additional goals. It also uses different methods to achieve goals.

Important differences reside in the features designed to promote personal maturation, motivation to learn, self-management competencies, and desire to take charge of his or her own education and pursue it independently, both in and outside of school. Given PIE's overarching goal of preparing students for life beyond school, the education they receive must generate the required competencies.

Academic learning

In the academic areas, students move ahead when they are able and motivated to do so, even to college level material and beyond, with mentoring, guidance, and support from learning managers. Learning managers make sure that students' learning plans don't contain curriculum gaps, and monitor progress to help students meet their commitments, maintain their schedules, use the best learning resources, and remain properly motivated.

Students regularly present their work to peers for discussion and feedback. In the organized group and team activities, focus is on the competencies of communicating effectively, collaborating, persuading, negotiating, attentive listening, note-taking, and inquiry.

Non-academic learning--interpersonal competencies

Socialization and social interaction competencies are addressed in terms of specific learning goals. In the intimate environment of a PIE school, where learning managers and students stay together over a number of years and get to know each other well, learning managers are able to target the social interaction competencies in which particular students need coaching and feedback.

Students learn to act toward others with courtesy, respect, consideration, and kindness, and develop a reputation for reliability, dependability, and honesty. These types of learning occur as a result of continuous mentorship and coaching from the learning managers, as well as from a school culture in which those behavior patterns are the norm.

Self-management and executive function

In a 6-12 PIE school, the learning objectives place increasing emphasis on the competencies often referred to as executive function--learning objectives that target working, communicating, and collaborating with others, along with time management and organization of the physical work environment.

Self-management competencies include goal-setting, impulse control, self-observation, and reflection. Secondary schools that have higher student-teacher ratios cannot address these competencies. The PIE technology, by addressing them, prepares students not only for success in college but also for productive and satisfying lives.

Special features of the 6th-12th grade education

At the 6-12 level, commitment to the achievement of learning objectives and the completion of projects is more formal than at the lower levels. Learning plans cover more advanced academic content, normally exceeding the types of goals stated in the Common Core Standards. Students are encouraged to zoom ahead when motivated and able to do so. Students periodically take tests and discuss the re-

sults with their learning managers.

Independent learning is balanced with presentations to peers, discussion sessions, collaborative projects, and field work. Students meet in small groups to discuss what they have read, researched, written, and learned. Questions and responses from peers and learning managers help develop competency in the thinking skills. Students are regularly challenged to defend their assertions, present multiple sources, clarify their points of view, and consider alternative viewpoints. They are encouraged to delve deeply into subjects that interest them, independently and in collaboration with fellow students.

Learning objectives aimed at independent learning

- Students pursue self-originated learning objectives (“SOLOs”) that reflect their particular interests. Learning managers make sure that the objectives are achievable and educationally useful.
- Students choose “large” learning objectives or projects from menus that learning managers offer them. Some such projects, like performing a science experiment, writing a short history of a theorem, publishing a newsletter, or collaborating in writing a conjecture of how history might have been different if . . . , may take weeks or months to complete. Over the years of secondary school, these projects become more challenging and complex, and students may work on more than one at a time.
- Students develop increasing competence in expository writing (persuasive, descriptive, analytical, and so forth), and in their ability to learn by listening to a speaker, e.g., note-taking and reviewing those notes. The increasing prevalence of on-line learning (MOOCs)—lectures and videos that can be reviewed multiple times—offer important new learning resources.
- Students improve their test taking and studying techniques: they learn to formulate anticipatory test items on all types of material; allocate time wisely; and using good guessing strategies

when they don't know an answer.

- On an organized and planned basis, learning managers regularly make arrangements for students to work outside the school, as aides in laboratories, educational institutions, business offices, or helping professions. The goal is to expose students to diverse work environments, types of jobs performed, and people who perform them.

Long-term effects of this type of education

As students begin to function as independent, self-motivated learners, they accomplish an increasing amount of their academic learning on their own, often doing advanced work. As their self-confidence grows, they take ever greater charge of their education and make ever better choices as to where to apply their efforts.

Many begin to function somewhat like graduate students motivated by the acquisition of knowledge or proficiency. Their work products become increasingly sophisticated and their competencies in communication, collaboration, and research continue to improve. These types of growth are similar to those targeted by many business management and executive training programs.

The PIE technology prepares students for college work and online learning, as well as for graduate work in which students take ownership of their education. But the main end product of the PIE education is general competence—preparation for all aspects of a productive, successful, and satisfying life.

Implications for Public Education

There is now widespread agreement that implementation of the education reforms called for by the U.S. Office of Education and others will require a reconfiguration of schools, classrooms, and the roles of teachers, and that one-size-fits-all approaches must be rethought and replaced (Fullan 2011; Mehta et al., 2012; Ravitch, 2010). It has also been noted that small schools have advantages over large

schools, mainly in the areas of individualization and social cohesion (Barker, 1986; Clowes, 2003; Cushman, 1997).

A large-scale public education system consisting of stand-alone schools that are as small as 30-student PIE schools is clearly unfeasible. PIE schools can, however, be aggregated in modular fashion to form larger schools within which the small PIE schools operate as self-contained and relatively decentralized units, with preservation of their benefits at an acceptable per-pupil cost. The Mechner Foundation has created a detailed implementation plan and financial analysis to show that in an aggregation of, say, 18 PIE schools—a total of approximately 610 students—the per-pupil cost would be approximately 22% below that of present-day public schools, even with inclusion of many IEP students.⁷ The economies are due in large part to the elimination of the high cost of many IEP and special education programs, of remediation programs, discipline incidents, reduced teacher stress, and the efficiencies of the team approach and decentralized mode of operation (Drucker, 1954). The first step in the implementation of such a model would be to create a prototype that can be improved and perfected based on beta testing over a period of years.

Summary and Conclusions

The PIE technology for configuring and operating K-12 schools offers a way to deliver individualized educations to diverse student populations, with significant benefits to students, teachers, families, and communities. Schools based on the PIE technology may also serve as modular units that can be aggregated to form larger schools in which the modular units operate in decentralized fashion. Such schools would preserve the benefits of PIE-based schools at financially acceptable per-pupil costs.

⁷ PIE schools can also be operated as tuition-based private schools, either singly or with several self-contained PIE schools in the same physical premises, but such schools would benefit only those able to afford them.

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