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A summary of results from CAPT's multiyear study of the effects of training teachers in using type in the classroom, and the changes in student performance as a function of type and grade level.

Student Type, Teacher Type, and Type Training: CAPT Type and Education Research 2008–2011 Project Summary

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ABSTRACT

The results of a large scale type measurement and teacher training research project in ten (one high, four middle, five elementary) schools in four states, involving 129 teachers and more than 2600 students, are reported. There was evidence for a small but significant improvement in student grades following the introduction of type training to teachers, limited to schools where the research was successfully implemented. Standardized test scores, however, were not impacted. The relationship of student type preferences to academic performance and attitudes towards teachers and schools differed in elementary and middle schools. For example, Extraverted students outperformed Introverts in elementary school, but the reverse was true for middle school. Likewise, J students lagged behind P students in elementary school, but did better than P students in middle school. Some relationships of teacher preferences to student performance and attitudes also changed from elementary to middle school—for example, students of Introverted teachers did better than students of Extraverted teachers in middle school. Student performance and attitudes generally declined as students progressed from elementary to middle school as well.

Note: For the Myers-Briggs Type Indicator® (MBTI®) instrument, the eight preference categories are the following: Extraversion (E) versus Introversion (I), Sensing (S) versus Intuition (N), Thinking (T) versus Feeling (F), Judging (J) versus Perceiving (P).

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INTRODUCTION

Research involving the theory and application of psychological type to the field of education has a long history. Data from students (medical, nursing, engineering, and other disciplines) played a critical role in the development and validation of the Myers-Brigg Type Indicator®, or MBTI® instrument. The original *MBTI® Manual* (Myers, 1962) devotes many pages and tables to educational research. The two most recent editions of the MBTI manuals (Myers & McCaulley, 1985; Myers, McCaulley, Quenk, & Hammer, 1998) dedicate entire chapters to the subject. The chapter on education in the book *MBTI Applications: A Decade of Research on the Myers-Briggs Type Indicator®* (DiTiberio, 1996) cites about 250 research studies on the topic spanning the decade from the mid-1980s to the mid-1990s. Gordon Lawrence's million-selling book *People Types and Tiger Stripes* (1979, 1982, 1993, and 2009) is now in its fourth edition, summarizing research and practice in the application of type to education.

The many research studies can be broadly placed into four categories of topics involving education:

1) Validation studies, in which one or more MBTI scales, presumed to represent or relate to different kinds of styles of learning, are correlated with other measures relevant to education.
2) Studies of the characteristics and/or performance of students (and sometimes teachers) with different type preferences. A variant of this kind of research involves comparing the type distributions of students of different schools, ethnicities, or other demographic variations to "normative" type distributions (e.g., Chesborough & Campbell, 2010; Melear & Alcock, 1999)[2].
3) Matching studies, in which different styles of teaching (or teacher types) are crossed with different styles of learning (or learner types) in an effort to improve learning outcomes, including learner satisfaction and performance.
4) Studies in which type training or type-based tools are introduced into the classroom in an effort to improve learning.

Results from the first two kinds of studies show patterns largely consistent with type theory predictions. Regarding correlations with other instruments, for example, a number of studies (Hinkle, 1986; Konopka, 1999; Luh, 1991; Myers & McCaulley, 1985; Penn, 1992) have found a relationship between MBTI Extraversion and the Active Experimentation scale of Kolb's Learning Style Inventory (Kolb, 1984). Examples of consistent student performance differences include higher aptitude test scores for Intuitive preference students (e.g., McCaulley & Natter, 1974; Schurr & Ruble, 1986) and higher achievement/grades for Introverts (e.g., DiRienzo, Das, Synn, Kitts, & McGrath, 2010; McCaulley & Kainz, 1974). Regarding learner characteristics, Extraverts have been found to prefer collaborative learning environments (Elliott & Sapp, 1988), whereas Introverts prefer lecture format instruction (Fourqurean, Meisgeier, & Swank, 1990).

However, the results from studies matching teacher and student learning styles (bullet three in the above list), well summarized by DiTiberio (1996, 1998), show "mixed results at best" (DiTiberio, 1998, p. 263). There is little consistent evidence to indicate that tailoring different types of instruction to match different learner types improves either satisfaction or performance. Note that this summary can be reconciled with the more positive conclusion of Lawrence (1997) that results from "over 200 separate research studies [in which] people were grouped by their MBTI type preferences . . . showed very clear learning preferences" (p. 1). In a review of the learning styles literature, Pashler, McDaniel, Rohrer, and Bjork (2009) acknowledge that students "will, if asked, volunteer preferences about their preferred mode of taking in new information and studying" and that "the existence of preferences with some coherence and stability is not in dispute" (p. 108). What is lacking is evidence for what Pashler et al. (2009) call the *meshing hypothesis*, an interaction of learning and teaching styles in which various approaches to teaching work best for some and worse for other learners, based on a meshing of the styles of presenting and receiving information. These authors level their criticism at all measures of learning style, not only the MBTI assessment. Such an interaction of teaching and learning styles is a particularly high standard of evidence unmet by learning style research, which as a whole "needs independent, critical, longitudinal, and large scale studies with experimental and control groups" (Coffield, Moseley, Hall, & Ecclestone, 2004, p. 143).

Coffield et al. (2004) also suggest that learning style measures may produce a benefit if they are able to teach metacognition skills and greater self-awareness to students, regardless of and distinct from the use of any learning style framework to individualize instruction.

Improvements in learning have been reported in studies that have introduced type-based tools and/or strategies into the classroom. However, these studies are

generally lacking in design rigor and thus fail to offer compelling evidence. A common weakness is reliance on volunteer teachers as research subjects (e.g., Fischetti & Mentore-Lee, 2001; Kise, 2004) and a lack of valid comparison data such as a control group of untrained teachers. Thus, improvements in student grades or attitudes may be attributable to teacher motivation, student acclimation over the course of a school year, variations in the content being learned, demand characteristics of research participation, and/or simply providing teachers with an opportunity to review and reflect on teaching skills, leading to improved effectiveness with or without type knowledge. Two recent studies (Reeder & McPeek, 2011; McPeek, Urquhart, Breiner, Holland, & Cavalleri, 2011) found grade improvements in fourth and sixth graders following the incorporation of type strategies by their teachers, but design limitations failed to eliminate compelling rival explanations. For example, the results of Reeder and McPeek (2011), despite random assignment of students to classrooms where type was introduced at two different times, could be attributable to the greater choice offered to students during the type lessons, leading to greater engagement. McPeek et al. (2011) were not able to use a control group of teachers, relying instead on a pre-post comparison of grades incapable of eliminating other explanations for higher academic performance. For example, teachers may have awarded better grades after working on teaching skills, or because deeper appreciation of student differences led to more sympathetic (lenient) grading, or simply in response to the demand characteristics of participating in a research project. Such alternative explanations would explain why grades improved but standardized test performance did not.

The CAPT Education Research Project. With these considerations in mind, CAPT embarked upon a large scale study designed to foster metacognitive skills in teachers and students, using the framework of psychological type. Teacher training programs were instituted in 10 schools: four elementary (grades 3–5), four middle (grades 6–8), one high (remedial math students in grades 9 and 10), and one K–8 school (grades 3, 4, 5 and 7), in four states (Colorado, Texas, New York, and Florida). In one middle school, teachers were randomly assigned to training or control conditions; in the remainder, student performance (grades and standardized test scores) was compared before and after the introduction of type awareness. Students and teachers at all schools completed type assessments; at five of them (one elementary, two middle, and the high school), students were also given their assessed results and introduced to the concepts of psychological type as it applies to learning and social relationships. In addition, students were surveyed two or more times during the school year regarding attitudes towards school, teachers, classmates, and themselves. Student grades and standardized test scores were collected in both the year of the study and the previous school year.

METHOD

Selection of schools. The project was conducted in schools where a local staff member indicated an interest in acting as coordinator for the teacher training, administration of assessments, and collection of data, and where school authorities approved research-related activities. All but one of our schools (a Christian middle school in Colorado) were public schools.

Project coordinators. Five project coordinators, in conjunction with CAPT staff, managed research activities at the ten schools. Each school's team included a staff member trained in psychological type theory and application. One coordinator, in Colorado, was paid for her time by a grant from the Myers & Briggs Foundation. The others volunteered their time, though CAPT did pay one coordinator's travel expenses, subsequent to the study, to attend a conference where results were presented. All coordinators were provided with a package of support materials from CAPT's research department, outlining responsibilities, deadlines, and the purpose of the research, as well as all assessment materials for both teachers and students.

The main coordinator for three (one elementary, one middle, and one high school, all in the same district) of the four Texas schools had two volunteer assistant coordinators who served as onsite counselors at the elementary and middle schools, respectively.

Teacher training. Teacher participation was voluntary and open to all teachers at participating schools. Local coordinators recruited them through presentations, explaining the potential benefits of training for both students and teachers, including Continuing Education credits and/or the opportunity for self-development and improved teaching skills. (Teachers in the K–8 and Christian middle schools were each paid $200 or $400 for their participation, using funds from a grant from the Myers & Briggs Foundation.) Participating teachers were trained by project coordinators in the theory and application of psychological type in the classroom for

approximately 10 hours. Training included teachers completing the MBTI instrument and receiving feedback in the form of a report and an interpretation session. Additionally, teachers received approximately two hours training devoted to the explanation of and teaching exercises focused on each of the four psychological type domains (Extraversion–Introversion, Sensing–Intuition, Thinking–Feeling, and Judging–Perceiving). A core component of all type training emphasized the appreciation and utilization of individual differences, including differences in student abilities and learning and personality styles. The training also covered ethical use of the instrument.

Following training and throughout the school year, teachers received short weekly email "tips" for applying different type principles in the classroom. In some schools, the local project coordinator hosted additional optional meetings with teachers, individually or in small groups, to facilitate implementation of the training. In the New York middle school, CAPT provided funds to pay an experienced educational consultant familiar with type theory and application to coach teacher teams, meeting several times over the school year.

Student participation. Student participation was also voluntary but required parental permission. Students and parents were provided written information explaining the project and potential benefits (improved self-awareness, study habits, and relationships with peers and teachers) and assurances of privacy protections. Students and parents were informed of their rights to withdraw from the study at any time without consequence. Student names were not used; instead, codes were assigned by coordinators or chosen by students to allow data tracking.

In five schools, students completed a type assessment and were given detailed information about type and its usage, feedback about their type results, and an opportunity to agree with their results or identify another "best fit" type. Students in the remaining five schools completed a type instrument, but did not receive feedback. These students also read very brief descriptions of type preferences and made self-evaluations of their preferences.

Timeline. Our work in the schools was timed to coincide with the school year, from late summer (August or September) to late spring (May or June). Teacher training took place as early in the school year as possible, though with multiple training sessions this sometimes took a couple of months to complete. Student and teacher type assessment took place near the beginning of the school year. Student questionnaires were administered two, three, or four times during the year, always including an early-in-the-school year and late-in-the-school year assessment as a minimum.

Measurements. The psychological type preferences of students were measured using the Murphy-Meisgeier Type Indicator for Children®, or MMTIC®, a validated psychological type instrument designed with a reading level of age 7 or older.[3] Schools also provided grades and standardized test scores for all participating students. In most instances, grades and standardized test scores were obtained for the same students one year/one grade earlier, as well as data for a prior year student cohort (of unknown types) of the same teachers for the same subjects and grade levels.

Teacher types were determined by Myers-Briggs Type Indicator, or MBTI, administration, done as part of the training process. Training also included providing teachers with feedback and verification of best-fit type.

The student surveys asked them to evaluate teachers on various effectiveness measures; to indicate their attitudes towards their classroom environment and experience; to rate the amount of pressure to succeed they felt from teachers, parents, peers, and themselves; and to provide self-ratings of qualities like confidence, comfort level, and ability to succeed.

Design. In the Colorado middle school, teachers were randomly assigned to type-trained or control (no training) conditions. At schools with no control group, data from the research year were compared to results from the year prior to training, a simple pre-post design. In the two elementary schools in New York, type training was implemented in the first year in one and in the second in the other, allowing comparison of the two schools in year one as well as changes in the second school from one year to the next.

Academic performance data. Student grades and standardized test scores were collected for students in both the study year and the prior year. Grades given by teachers were also collected for both their study year classes and, when possible, matched classes (same subject, same grade level) taught in the prior year. The standardized tests for all schools but one (the Christian middle school, which used the Stanford Achievement Test) were the proficiency tests designed by state boards of education.

"Standardized" test results for different schools presented an analysis challenge, as different tests reflected

different scoring methods and different content (even tests for the same grade and same subject differed from one school year to the next and could not be directly compared with confidence). Standardized test scores were therefore converted to *z*-scores, using the statewide means (set to zero) and standard deviation units (above or below the mean) for the tests being evaluated (matched for subject, grade, and year).[4] The resulting scores thus measured students' proficiency on standardized tests *relative to their peers within the same state at the same time*.[5] Standardized test scores for both math and verbal (English or reading) assessments were collected.

Different schools also used different grading scales and grade periods, rendering combining or comparisons of raw results impossible. For each school, grades for all subjects, all grade levels, all classes, and all grade periods over the year (after first converting letter grades to numbers) were averaged, and individual raw grades were converted to *z*-scores *within each school separately*. This enabled a comparison of grades before and after type training across all schools, as well as grades of one subgroup to another (e.g., Extraverted students to Introverted), or one grade to another within each school. However, direct comparison of grades from one school to the next was not possible, as the *z*-score conversion set mean grades at each school to zero.

Analyses of grades compared two different cohorts of students (one in the prior year and one in the study year), whereas standardized test scores compared results in the study year (earlier grade) to the same students' results in the prior year. Thus, the grade analyses were between-subjects comparisons, and the standardized test scores were within-subjects comparisons, reflecting the amount of change from one year to the next.

Effect size. The thousands of data points collected (involving many teachers and students, courses, grades, and questionnaire responses) risk making conventional significance testing too lenient a criterion for evaluating results. To avoid the problem of minor differences of little, if any, practical significance being imbued with exaggerated importance by statistical significance accruing from the added power of high numbers of cases, only mean differences of a minimum of .1 standard deviation (*SD*) were reported. (An overall *SD* unit difference makes no sense for two-way interactions, so we looked at *SD* unit differences separately for the interacting variable of interest for each level of the second independent variable.)[6] A difference of .1 *SD* is a more lenient threshold than suggested by Cohen (1988), whose guidelines identify this estimate of effect size (which Cohen labels *d*) as small if $d > .2$, medium if $d > .5$, and large if $d > .8$. The lower criterion reflects the exploratory nature of this research, but low *d*-value results should be evaluated cautiously.

Having converted grades and standardized test scores to *z*-scores also converted the units of measurement to standard deviations. Thus the mean difference when comparing *z*-scores was already measured in *SD* units and equal to Cohen's *d*.

RESULTS

Participation summary. Table 1 (See page 26.) summarizes the demographics and the number of teacher and student participants for our ten different schools. Data were collected for 129 teachers of known type (based on taking the Myers Briggs Type Indicator instrument and verifying their type as part of their training) and more than 2600 students.

Success of implementation. Table 2 (See page 28.) summarizes factors for the schools deemed relevant to the success of the implementation of the research design and training reception. Four schools (Mid1, Mid2, K–8, and Mid3) stood out as having excellent onsite management, administration support, and teacher engagement, based on interviews with and reports from coordinators and teachers. Two of these four (Mid1 and Mid3) also provided a deeper level of type training, including presentation of personal results and an explanation of concepts measured, to students. One of these four schools (Mid2) allowed random assignment of teachers to type-training or control (no training) conditions.

The remaining schools were far less successful in implementing the research, for a variety of reasons:

1) The ability to compare results from two years for Elem 1 and Elem 2, both from the same community but with type training delayed for a year in one school, was frustrated by a number of factors. First, one school was well established and staffed by experienced, successful teachers, whereas the other was new and staffed primarily by less experienced teachers or those with an erratic or troubling history at other schools. The number of participating teachers (six) in each school was small. The onsite coordinator was a New York state employee living in a different community and unfamiliar with the local staff, who visited the schools to conduct training and occasional follow-ups. Promised support from the administration was not delivered,

Table 1. Demographic Information About Participating Schools in the CAPT Education Research Project.

		Community Information			School Information			Participant Information	
School ID	Location/ Kind of School	Median Income (year)	Poverty Rate	Ethnicity*	Student Ethnicity	Great schools rating	Grades in Study	Trained Teachers N	Typed Students N
Mid1	Bronx, NY Public Middle	$27,611 (2010)	31%	54% H 30%B 11%W	Not available	5/10	6,7,8	35	319
Elem1	Long Island, NY Public Elem	$63,672 (2000)	5%	92% W 4% H 1% B	61% W 24% H 14% B	8/10	4,5	6	144
Elem2	Long Island, NY Public Elem	$57,000 (2000)	7.8%	90% W 11% H 3% B 1	72% W 12% H 1% B	6/10	4,5	6	136
Mid2	Denver suburb Private Christian	$100,000 (2000)	<2%	90% W 5% H 1% B	75% W 2% H 2% B	Not rated	6,7,8	17	253
K–8	Denver Public	$46,410	19.1%	63% W 33% H 10% B	86% W 7% H 2% B	10/10	3,4,7	6	240
Mid3	Dallas-Fort Worth suburb Public Middle	$56,751 (2000)	3.9%	87% W 11% H 2% B	52% W 36% H 7% B	5/10	6	27	250
Mid4	Dallas suburb Public Middle	$41,143 (2010)	16.7%	70% W 33% H 4% B	40% W 32% H 16% B	5/10	6,7,8	5	586
Elem3	Dallas suburb Public Elem	$41,143 (2010)	16.7%	70% W 33% H 4% B	40% W 24% H 20% B	5/10	3,4,5	14	272
High1	Dallas suburb Public High	$41,143 (2010)	16.7%	70% W 33% H 4% B	42% W 45% H 8% B	3/10	9,10,11,12	4	231
Elem4	Gainesville, Florida Public Elem	$28,164 (2010)	26.7%	65% W 23% B 10% H	Not available	3/10	3,4,5	9	183

Note: Great Schools rating is an independent rating by a web-based service.

and teacher commitment to training and especially implementation was minimal. There were disturbing episodes of teachers bristling at direction from an "outsider" and the time demands necessitated by the study. Documents that teachers agreed to file as part of their participation to indicate compliance with the study were never completed. Students were not engaged in understanding type; their types were assessed, but concepts were not discussed. In summary, the assessment of the coordinator was that adherence to the research protocol was not successful.

2) Three schools (Mid4, Elem3, and High1), all from the same school district, were managed by one district coordinator (with two onsite assistants). Many factors suggested this voluntary time commitment, involving the training of teachers at three schools and administration of multiple rating forms at multiple times as well as providing type results and feedback to more than 1,000 students, was unrealistic. The situation was worsened by a health crisis of one assistant and the end-of-school-year career relocation by the main coordinator. As a result, there were recurrent instances of the use of incorrect student questionnaire rating forms, incorrect instructions (e.g., rather than using assigned codes or code names to encourage candid ratings, students were instructed to use their real names), or a failure to administer the forms at all. Teacher commitment and administration buy-in were handicapped by the coordinator's outsider status and inability to follow through with assessments of implementation success. Type verification data collected from students deviated markedly from similar data collected in other locations and by other researchers, suggestive of cursory understanding of type results and constructs by students. In summary, much of the data was compromised, and the impact of the intervention was blunted by the inability of our local coordinator to manage the scale of the project.
3) Our Florida school (Elem4) was severely compromised by the resignation of the school principal (an enthusiastic supporter of the research) less than a week before the beginning of the school year and the research program. The school was undergoing a very difficult crisis, and the new principal had little interest or support for her predecessor's project. Teacher morale plummeted under a barrage of new paperwork requirements, and our project was crippled.

STUDENT TYPE

Tables 3, **4**, and **5** (See pages 29–31.) show the distributions of types and preference combinations for elementary and middle school, as well as significant chi-square differences for all of the above between elementary and middle schools. All of the whole types (ISFJ, INFJ, INTJ, ESFJ, and ENFJ) which significantly declined in middle school included the Judging preference, which dropped from 69.9% in elementary school to 51.6% in middle school, $\chi^2(1, N = 2439) = 81.35$, $p < .0001$. Four of the five declining whole types included a Feeling preference, which also declined from 66.8% in elementary school to 55.2% in middle school, $\chi^2(1, N = 2439) = 32.43$, $p < .0001$. Students' preference for Extraversion increased significantly in middle school as well, from 51.1% in elementary school to 55.7% in middle school, $\chi^2(1, N = 2439) = 4.97$, $p = .03$.

Ethnicity and type. Most schools provided data on the ethnicity of their students. Overall, our sample was slightly over 50% White, about 25% Hispanic, just under 11% Black, and about 7% Asian-Pacific. Less than 1% was identified as Native American, Biracial, or Other.

There were large differences in the percentages among the schools, however, with the student populations from our two Colorado suburban schools over 80% White, our Texas schools with more than 33% of students identifying as Hispanic, and two of the Texas schools (one middle, one elementary) attended by a population about 14% Asian.

Asian students (51.5%) were more likely to test as Introverts than all other ethnicities combined (41.5%). White students (43.8%) more frequently indicated a preference for Intuition than other ethnicities combined (29.5%). Hispanic students (59.1%) were slightly overrepresented as having a Judging preference compared to the other three groups combined (54.8%).

STUDENT GRADE LEVEL EFFECTS

To facilitate better understanding of results from subsequent analyses, changes in academic performance and student questionnaire data were evaluated across different grade levels. The data showed a downward trend (with some exceptions) in grades, standardized test scores, and key student attitudes from elementary to middle school. Details are as follows:

1) The most common grading system, based on the

Table 2. Factors Affecting Success of the Implementation of the Research.

School	Research Design	Location Support	Coordinator Performance	Administration Support	Teacher Support	Student Involvement with Type
Mid1	Pre/post	Volunteer onsite coordinator (staff teacher) & paid outside consultant	Excellent	Excellent—priority support from principal	Highly engaged and active	Assessment feedback and verification
Elem1	Pre/post	Volunteer offsite, non-staff coordinator	Excellent, committed professional, but handicapped by "outsider status" and no campus presence.	Poor communication and minimal commitment.	Resistant, small number of teachers, only one of whom took the project seriously.	Assessment and brief type verification activity
Elem2	Pre/post	Volunteer offsite, non-staff coordinator	Excellent, committed professional, but handicapped by outsider status and no campus presence.	Passive, minimal cooperation.	Minimal commitment and effort. A training ground for inexperienced teachers.	Assessment and brief type verification activity
Mid2	Random assignment	Paid onsite coordinator (non staff consultant)	Excellent committed independent consultant (paid)	Excellent support from principal	Highly engaged and active	Assessment and brief feedback verification activity.
K–8	Pre/post	Paid onsite coordinator (non staff consultant)	Excellent committed independent consultant (paid)	Excellent support from principal	Highly engaged and active support	Assessment and brief verification activity
Mid3	Pre/post	Volunteer onsite coordinator (staff counselor)	Excellent	Excellent support from principal	Engaged and active support	Assessment, verification, feedback
Mid4 Elem3 High1 remedial math	Pre/post but no previous year grades available	Volunteer offsite coordinator (district counselor) with volunteer onsite assistant (staff counselor)	Minimal. Frequent missed deadlines, failures to follow prescribed procedures (identifiable student ratings), and our instances of failure to collect key data. Lame duck, overcommitted status of main coordinator, health issues from assistant at critical times.	Minimal involvement/ commitment.	Moderate involvement/ commitment.	Assessment feed-back and verification of suspect quality. Toomany students in 3 schools (>1000) for adequate feedback from single feedback provider. Evidence from poor best-fit agreement, lack of any best-fit data, and/or previous year academics not provided.
Elem4	Pre/post. But no previous year grades available.	Volunteer offsite coordinator (CAPT staff)	Poor access granted.	Poor. Last minute change of principal from the one who invited us in.	Limited by dealing with a school in crisis. Poor teacher morale.	Assessment only

Table 3. Elementary School Students.

The Sixteen Complete Types

ISTJ *n* = 89 (9.10%) + + + + + + + + +	ISFJ *n* = 170 (17.38%) + + + + + + + + + + + + + + + + +	INFJ *n* = 55 (5.62%) + + + + +	INTJ *n* = 30 (3.07%) + + +
ISTP *n* = 38 (3.89%) + + +	ISFP *n* = 31 (3.17%) + + +	INFP *n* = 30 (3.07%) + + +	INTP *n* = 35 (3.58%) + + +
ESTP *n* = 24 (2.45%) + +	ESFP *n* = 45 (4.60%) + + + +	ENFP *n* = 62 (6.34%) + + + + + +	ENTP *n* = 29 (2.97%) + +
ESTJ *n* = 59 (6.03%) + + + + + +	ESFJ *n* = 189 (19.33%) + + + + + + + + + + + + + + + + + + +	ENFJ *n* = 71 (7.26%) + + + + + +	ENTJ *n* = 21 (2.15%) + +

Dichotomous Preferences

E	500	(51.12%)
I	478	(48.88%)
S	645	(65.95%)
N	333	(34.05%)
T	325	(33.23%)
F	653	(66.77%)
J	684	(69.94%)
P	294	(30.06%)

Pairs and Temperaments

IJ	344	(35.17%)
IP	134	(13.70%)
EP	160	(16.36%)
EJ	340	(34.76%)
ST	210	(21.47%)
SF	435	(44.48%)
NF	218	(22.29%)
NT	115	(11.76%)
SJ	507	(51.84%)
SP	138	(14.11%)
NP	156	(15.95%)
NJ	177	(18.10%)
TJ	199	(20.35%)
TP	126	(12.88%)
FP	168	(17.18%)
FJ	485	(49.59%)
IN	150	(15.34%)
EN	183	(18.71%)
IS	328	(33.54%)
ES	317	(32.41%)
ET	133	(13.60%)
EF	367	(37.53%)
IF	286	(29.24%)
IT	192	(19.63%)

Jungian Types (E)

	n	%
E–TJ	80	8.18
E–FJ	260	26.58
ES–P	69	7.06
EN–P	91	9.30

Jungian Types (I)

	n	%
I–TP	73	7.46
I–FP	61	6.24
IS–J	259	26.48
IN–J	85	8.69

Dominant Types

	n	%
Dt. T	153	15.64
Dt. F	321	32.82
Dt. S	328	33.54
Dt. N	176	18.00

***N* = 978 + = 1% of *N* *I* = Selection Ratio Index **p*<.05 ***p*<.01 ****p*<.001**

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Table 4. Middle School Students.

The Sixteen Complete Types

ISTJ *n* = 146 (9.99%) + + + + + + + + + +	ISFJ *n* = 202 (13.83%) + + + + + + + + + + + + +	INFJ *n* = 27 (1.85%) +	INTJ *n* = 26 (1.78%) +
ISTP *n* = 79 (5.41%) + + + + +	ISF-P *n* = 46 (3.15%) + + +	INFP *n* = 60 (4.11%) + + + +	INTP *n* = 61 (4.18%) + + + +
ESTP *n* = 111 (7.60%) + + + + + + +	ESFP *n* = 110 (7.53%) + + + + + +	ENFP *n* = 143 (9.79%) + + + + + + + + +	ENTP *n* = 97 (6.64%) + + + + + +
ESTJ *n* = 117 (8.01%) + + + + + + + +	ESFJ *n* = 162 (11.09%) + + + + + + + + + + +	ENFJ *n* = 57 (3.90%) + + +	ENTJ *n* = 17 (1.16%) +

Dichotomous Preferences

E	814	(55.72%)
I	647	(44.28%)
S	973	(66.60%)
N	488	(33.40%)
T	654	(44.76%)
F	807	(55.24%)
J	754	(51.61%)
P	707	(48.39%)

Pairs and Temperaments

IJ	401	(27.45%)
IP	246	(16.84%)
EP	461	(31.55%)
EJ	353	(24.16%)
ST	453	(31.01%)
SF	520	(35.59%)
NF	287	(19.64%)
NT	201	(13.76%)
SJ	627	(42.92%)
SP	346	(23.68%)
NP	361	(24.71%)
NJ	127	(8.69%)
TJ	306	(20.94%)
TP	348	(23.82%)
FP	359	(24.57%)
FJ	448	(30.66%)
IN	174	(11.91%)
EN	314	(21.49%)
IS	473	(32.38%)
ES	500	(34.22%)
ET	342	(23.41%)
EF	472	(32.31%)
IF	335	(22.93%)
IT	312	(21.36%)

Jungian Types (E)

	n	%
E–TJ	134	9.17
E–FJ	219	14.99
ES–P	221	15.13
EN–P	240	16.43

Jungian Types (I)

	n	%
I–TP	140	9.58
I–FP	106	7.26
IS–J	348	23.82
IN–J	53	3.63

Dominant Types

	n	%
Dt. T	274	18.75
Dt. F	325	22.25
Dt. S	569	38.95
Dt. N	293	20.05

***N* = 1461 + = 1% of *N* *I* = Selection Ratio Index **p*<.05 ***p*<.01 ****p*<.001**

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Table 5. MMTIC® Comparison of Middle School WIth Elementary School Students.

The Sixteen Complete Types

ISTJ *n* = 146 (9.99%) *I* = 1.10 + + + + + + + + + +	ISFJ *n* = 202 (13.83%) *I* = 0.80* + + + + + + + + + + + + +	INFJ *n* = 27 (1.85%) *I* = 0.33*** +	INTJ *n* = 26 (1.78%) *I* = 0.58* +
ISTP *n* = 79 (5.41%) *I* = 1.39 + + + + +	ISFP *n* = 46 (3.15%) *I* = 0.99 + + +	INFP *n* = 60 (4.11%) *I* = 1.34 + + + +	INTP *n* = 61 (4.18%) *I* = 1.17 + + + +
ESTP *n* = 111 (7.60%) *I* = 3.10*** + + + + + + +	ESFP *n* = 110 (7.53%) *I* = 1.64** + + + + + + +	ENFP *n* = 143 (9.79%) *I* = 1.54** + + + + + + + + +	ENTP *n* = 97 (6.64%) *I* = 2.24*** + + + + + +
ESTJ *n* = 117 (8.01%) *I* = 1.33 + + + + + + + +	ESFJ *n* = 162 (11.09%) *I* = 0.57*** + + + + + + + + + + +	ENFJ *n* = 57 (3.90%) *I* = 0.54*** + + +	ENTJ *n* = 17 (1.16%) *I* = 0.54 +

Dichotomous Preferences

E	814	(55.72%)	*/* = 1.09
I	647	(44.28%)	*/* = 0.91
S	973	(66.60%)	*/* = 1.01
N	488	(33.40%)	*/* = 0.98
T	654	(44.76%)	***/* = 1.35
F	807	(55.24%)	***/* = 0.83
J	754	(51.61%)	***/* = 0.74
P	707	(48.39%)	***/* = 1.61

Pairs and Temperaments

IJ	401	(27.45%)	***/* = 0.78
IP	246	(16.84%)	*/* = 1.23
EP	461	(31.55%)	***/* = 1.93
EJ	353	(24.16%)	***/* = 0.69
ST	453	(31.01%)	***/* = 1.44
SF	520	(35.59%)	***/* = 0.80
NF	287	(19.64%)	*/* = 0.88
NT	201	(13.76%)	*/* = 1.17
SJ	627	(42.92%)	***/* = 0.83
SP	346	(23.68%)	***/* = 1.68
NP	361	(24.71%)	***/* = 1.55
NJ	127	(8.69%)	***/* = 0.48
TJ	306	(20.94%)	*/* = 1.03
TP	348	(23.82%)	***/* = 1.85
FP	359	(24.57%)	***/* = 1.43
FJ	448	(30.66%)	***/* = 0.62
IN	174	(11.91%)	*/* = 0.78
EN	314	(21.49%)	*/* = 1.15
IS	473	(32.38%)	*/* = 0.97
ES	500	(34.22%)	*/* = 1.06
ET	342	(23.41%)	***/* = 1.72
EF	472	(32.31%)	**/* = 0.86
IF	335	(22.93%)	***/* = 0.78
IT	312	(21.36%)	*/* = 1.09

Jungian Types (E)

	n	*%*	*Index*
E–TJ	134	9.17	1.12
E–FJ	219	14.99	0.56***
ES–P	221	15.13	2.14***
EN–P	240	16.43	1.77***

Jungian Types (I)

	n	*%*	*Index*
I–TP	140	9.58	1.28
I–FP	106	7.26	1.16
IS–J	348	23.82	0.90
IN–J	53	3.63	0.42***

Dominant Types

	n	*%*	*Index*
Dt. T	274	18.75	1.20*
Dt. F	325	22.25	0.68***
Dt. S	569	38.95	1.16***
Dt. N	293	20.05	1.11

Base *N* = 978, Sample and Base are Independent + = 1% of *N* *I* = Selection Ratio Index *p<.05 **p<.01 ***p<.001

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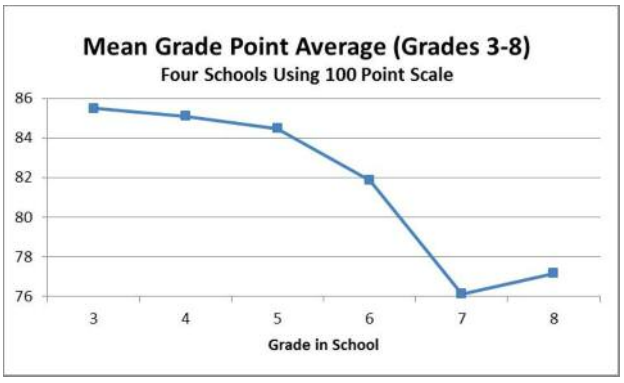
familiar 100-point scale, was used by five schools in the study (four in Texas, all in the same school district, and one in New York).[7] Data from the Texas high school were discarded, as students there were attending remedial math classes and thus poorer students with lower grades. The remaining four schools included students in grades 3 through 8. As shown in **Figure 1**, grades given to students dropped with each successive grade level except grade 8, a 9.4-point difference (.89 *SD*) between highest and lowest means, $F(5, 9426) = 218.09$, $p < .001$). Post hoc Tukey tests revealed that elementary school scores (grades 3, 4, and 5) were significantly higher than middle school scores (grades 6, 7, and 8), $p < .001$. Students in both grades 7 and 8 also earned lower grades than students in grade 6, $p < .001$.

Figure 1.



2) Standardized test scores (transformed to *z*-scores against the state or other averages) dropped significantly from elementary to middle school for both math, $t(2917) = 6.95$, $p < .001$, and verbal, $t(2906) = 4.27$, $p < .001$.[8]
3) As shown in **Table 3**, middle school students reported significantly greater pressure to succeed in school from parents, $t(2725) = 19.22$, $p < .001$; teachers, $t(3802) = 10.34$, $p < .001$, and themselves, $t(2728) = 15.71$, $p < .001$, as compared to elementary school students. Perceived pressure from parents and teachers was negatively correlated with grades—significantly more so in elementary school, $r(757) = -.26$ and $r(834) = -.18$, respectively (both $p < .001$), than in middle school, $r(1915) = -.09$ and $r(2880) = -.05$, $p < .01$ (the *z*s for the differences in correlations = 4.09 and 3.35, both $p < .001$). Self-pressure to succeed was negatively related to grades in elementary school, $r(758) = -.18$, $p < .001$, and positively related in middle school, $r(1913) = .15$, $p < .001$, a highly significant difference, $z = 7.76$, $p < .001$. Thus, self-applied pressure was positively related to higher grades in middle school; otherwise, pressure from teachers, parents, or oneself was negatively related.
4) Also evident in **Table 3**, middle school students rated their teachers more negatively on all five teacher items of the student questionnaire. Older students also reported significantly less confidence about succeeding in school.
5) Middle school students rated their teachers less favorably than elementary school students on several questions, including teachers' ability to make new information understandable, to help them learn in new ways, to prepare for tests, and to make learning interesting and fun.

There were a few exceptions to this overall downward movement (See **Table 3** on page 9.):

1) Middle school students reported feeling more respected by their peers and being "more comfortable sharing my ideas in this class" than elementary school students did.
2) Students at the Colorado middle school received very high grades; 60% of all grades given were A or A minus. Standardized test scores at this school were also high above the normative means, .66 *SD* higher for math and .76 *SD* for verbal tests.

STUDENT ACADEMIC PERFORMANCE

Two measures of student academic performance, grades and standardized test scores, were analyzed for differences associated with type training of teachers.

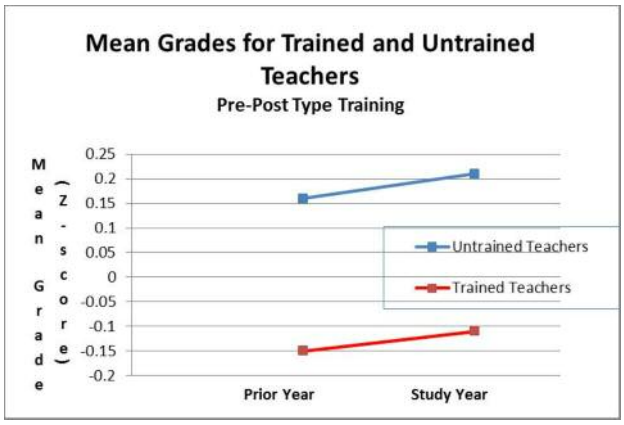
Middle School 2 Post-Training Results. Mid2 was the only school in which teachers were randomly assigned to type training or control conditions. However, a direct comparison of students' grades from trained teachers to student grades from control teachers made little sense with only 17 teachers spread across a wide variety of courses. Easier courses, for example, were characterized by higher grades.

This problem was solved by looking at the changes in grades given by trained and untrained teachers compared to the previous year grades for the same course taught at the same grade level, term by term. There were matched course grades for seven untrained and five trained teachers. Mean grades given by trained teachers went up for six different course-term combinations, were unchanged for 22, and declined in none,

whereas grades for untrained teachers improved for five terms, were unchanged for 35, and declined in 11. The pattern of terms with positive, neutral, or negative grade changes was significantly more favorable for trained teachers' students (Fisher's exact $p = .009$).

However, while the number of terms with improvements or declines showed a more positive effect for students of type trained teachers, grade averages did not differ significantly, as is evident in **Figure 2**.

Figure 2.



Evidence for improvement resulting from training teachers would take the form of a significant interaction, with greater improvement for students of trained teachers. However, the interaction of training x school year was non-significant, $F(1, 1401) = 0.002$. The only significant difference in this analysis were higher grades given by untrained teachers, $F(1, 1401) = 34.92$, $p < .001$, Cohen's $d = .32$. As this difference is evident in the year before the study, it may reflect existing cohort differences in ability, greater leniency in the untrained teachers, and/or differences inherent in the grades or subjects taught.

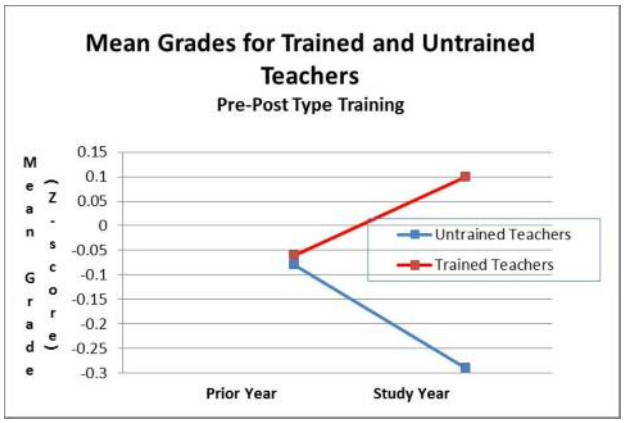
Further evidence that the untrained teachers' students were better scholars is evident in the results for standardized verbal tests, where these students outperformed students of trained teachers across both the prior and study years, $F(1, 189) = 7.07$, $p = .009$, $d = .27$. There was a significant training x test year interaction, $F(1, 189) = 3.61$, $p = .059$[9], attributable to the much larger decline over the two years of verbal test scores for untrained teachers' students ($d = .18$) than for trained teachers' students ($d = .04$).

Neither main effects nor interaction were significant for math standardized scores.

K–8 School Post-Training Results. As we were not able to randomly assign teachers in an experimental design at any other school besides Mid2, we instead analyzed student data using a separate sample pretest-posttest, quasi-experimental design (design 12 in Campbell & Stanley, 1969). Such an analysis compares two groups at two different times[10], with only one group experiencing a "treatment" (in this case, type training) between the two measures.

The student grades from eight teachers (four trained and four untrained) at the K–8 school who taught the same courses in the prior and study years were compared. Results of this analysis are shown in **Figure 3**.

Figure 3.



Grades for students of trained teachers were significantly higher than grades for students of untrained teachers, $F(1, 1417) = 12.49$, $p < .001$, $d = .10$. This difference is due to the increase of grades following training ($d = .16$), compared to a decrease in grades ($d = 0.22$) for students of untrained teachers, an interaction between the year the data were collected and teacher training, $F(1, 1417) = 10.94$, $p < .001$.

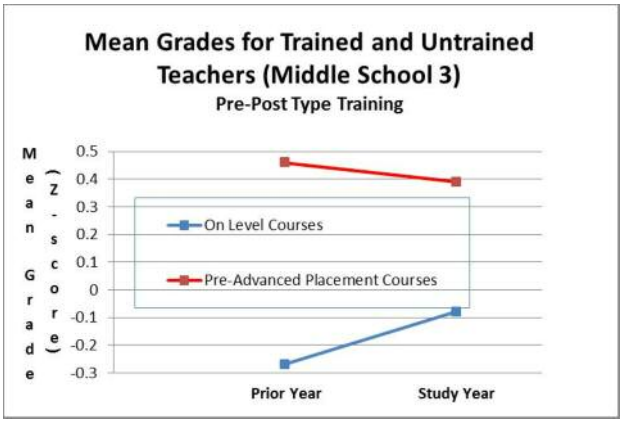
There were no significant differences comparing the math or verbal standardized test scores for students of trained and untrained students, nor did students' test scores change significantly from their prior year results for either trained or untrained teachers.

Middle School 3 Post-Training Results.[11] The school offered core curriculum subjects (English language arts, reading, mathematics, science, and social studies) at three levels: Pre-Advanced Placement (PAP), on-level (OL), and special education (SE). In most cases, choice of course level for each subject is left to students and their parents. We collected grade data from seven type-trained teachers (two English, reading, and science teachers and one math teacher) who taught the same course at the same level in both the type and

prior school years. No match existed for the fifth core curriculum subject, social studies. One English and one reading teacher taught only on-level (OL) track students, while the other teacher in each pair taught both OL and Pre-Advanced Placement (PAP) students. One science teacher taught OL courses and one PAP. The math teacher taught only PAP courses in both years. Because of small enrollments and lack of year-to-year matches, data from special education courses were excluded.

Academic grades were averaged across all six terms for all four subjects and analyzed using a 2 x 2 analysis of variance (ANOVA), with student cohort (prior or type year) and course level (OL or PAP) as the two independent variables. The results are shown in **Figure 4**.

Figure 4.



A very strong significant main effect was detected for course level, $F(1, 1279) = 146.41$, $p < .001$, $d = .58$, confirming that students in advanced courses earned higher grades. The interaction between student year and course level was also significant, $F(1, 1279) = 7.33$, $p = .007$, indicating that OL students' grades improved more (mean gain = +.19 *SD*) from one year to the next than PAP students (mean change = -.07 *SD*). The main effect for improvement in the second year was thus wholly attributable to OL students.

Standardized test scores, however, failed to show improvements for trained teachers' students. We compared the fifth and sixth grade scores of our two student cohorts, one group taught by type-trained teachers in sixth grade and one taught by the same teachers the previous year, using a 2 (prior/type cohort) x 2 (repeated measures, fifth and sixth grade tests) ANOVA. There was a main effect indicating a decline from fifth to sixth grades for both math scores, $F(1, 419) = 75.80$, $p < .001$, $d = .28$, and reading scores, $F(1, 413) = 7.98$, $p < .001$, $d = .14$. The prior year students also performed better on both math, $F(1, 419) = 10.80$, $p = .001$, $d = .30$, and reading $F(1, 413) = 7.19$, $p = .008$, $d = .23$. The slope of the decline, however, was similar for both cohorts and thus there were no significant training x year interactions (p for both standardized tests > .66).

Middle School 1 Post-Training Results. As all teachers involved at this school were type trained, our only option for analysis was to compare student grades given the prior year to the study year (post-training) for the seven teachers who taught the same course at the same grade level over the two years. There were seven teachers (three science, two social studies, one English Language Arts, and one teacher who taught all subjects to a special education class) who met these criteria.

The post-training mean of these grades was significantly higher, $F(1, 854) = 7.38$, $p = .007$, $d = .19$, than the prior year mean. The standardized tests of students in the study year compared to their scores in their prior year declined, however, for both major subjects: very slightly for math, $F(1, 359) = 4.05$, $p = .045$, $d = .07$, and more clearly for English, $F(1, 350) = 36.54$, $p < .001$, $d = .25$.

Remaining Schools Post-Training Results. For two of our other schools (Elementary School 4 and our one high school), we had no control teachers and never received the grades given by teachers in the previous school year. We were thus unable to evaluate changes in grades following teacher training. The high school never provided students' previous year standardized test scores, either, precluding any analysis of study year test scores.

None of the grades received by students of post-training teachers improved relative to pre-training grades in any of our remaining four schools, all beset by implementation challenges. There were no significant declines or improvements. For standardized tests, there was no consistent pattern. Math scores for Elementary School 1 students of type-trained teachers significantly improved (by .31 *SD*) on their previous year scores, $F(1, 238) = 4.62$, $p = .03$. This improvement was greater for students of teachers who completed the type training program ($d = +.40$) compared to students whose teachers started but did not complete the training (scores declined, $d = .13$), a significant completion x prior year interaction, $F(1, 238) = 17.83$, $p < .001$. Verbal scores, however, did not change significantly for students of either category of teachers.

Middle School 4 students showed a significant

improvement (+.19 *SD*) in verbal standardized tests in the study year compared to their prior year results, $t(383) = 3.64$, $p < .001$. However, their math scores declined significantly (-.36 *SD*), $t(381) = 8.67$, $p < .001$.

Elementary School 2 students improved on their prior year math scores in the study year (a gain of .15 *SD*), $t(144) = 2.38$, $p = .02$, but verbal scores changed very little (-.03 *SD*), $t(139) = 0.48$, $p = .63$).

Neither math nor verbal standardized test scores changed significantly from prior to study years for students at Elementary Schools 3 or 4 (all $p > .10$).

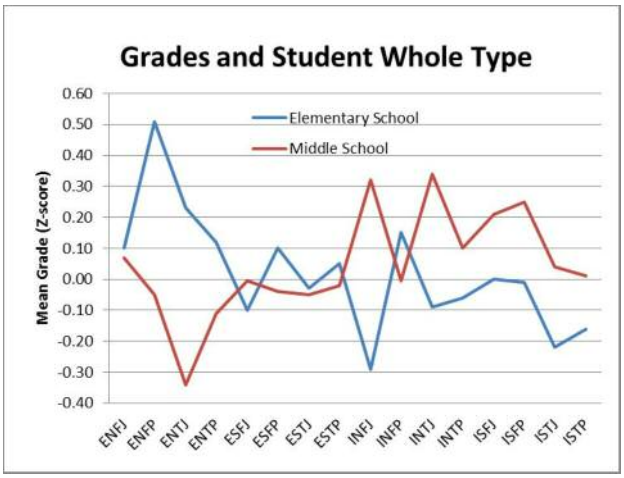
Student Type and Academic Performance. Because differences in student preferences were unlikely to have been affected by adherence to our teacher type training program, we combined data from all schools to compare academic performance (grades and standardized tests) for students of opposite preferences and different whole types.[12]

Figure 5 shows the annual average grades (again, standardized within each school) as a function of whole type, divided into elementary and middle schools. There are significant effects for type, $F(15; 12{,}701) = 8.45$, $p < .001$, maximum d between any two types = .36, and the type x school level interaction, $F(15; 12{,}701) = 11.76$, $p < .001$.

The patterns of grades achieved were very different for elementary and middle school students, as evident in three significant preference x school level interactions. Extraverts outperformed Introverts in elementary school ($d = .10$), but the pattern was reversed in middle school ($d = .16$), $F(1; 12{,}729) = 50.09$, $p < .001$. Similarly, Perceiving students outperformed Judging students in elementary school ($d = .16$), but did worse than Judging students in middle school ($d = .07$), $F(1; 12{,}729) = 35.13$, $p < .001$. Intuitive students did much better than Sensing students in elementary school ($d = .25$), but Intuitive students grades declined and Sensing students' grades improved by middle school, when mean performance was about equal, a significant interaction, $F(1; 12{,}729) = 49.87$, $p < .001$. Feeling students outperformed Thinking students in elementary school ($d = .14$), but the difference was minimal by middle school ($d = .03$), another significant preference x school level interaction $F(1; 12{,}729) = 6.71$, $p = .01$.[13]

The most consistent result for standardized tests was a decline from elementary to middle schools on both math scores, $t(2917) = 6.95$, $p < .001$, $d = .26$ and verbal scores, $t(2906) = 4.27$, $p < .001$, $d = .21$. Students

Figure 5



who preferred Intuition outperformed students who preferred Sensing on both math and verbal scores, regardless of school level, $F(1, 2474) = 51.93$, $p < .001$, $d = .30$ and $F(1, 2487) = 59.26$, $p < .001$, $d = .33$, respectively. Similarly, students with a Perceiving preference outperformed students who preferred Judging across the board, $F(1, 2474) = 29.31$, $p < .001$, $d = .15$ for math and $F(1, 2487) = 44.28$, $p < .001$, $d = .23$ for verbal. Thinking and Feeling students did not differ significantly on either standardized test ($d < .07$), with slightly higher scores for Fs, and Extraverted–Introverted student test score differences were also small, $d < .08$, slightly favoring Extraverts. Only one preference x school level standardized test interaction was significant, with Extraverts outperforming Introverts on math scores in elementary school ($d = .14$), but negligibly underperforming Introverts in middle school ($d = .04$), $F(1, 2474) = 5.05$, $p = .025$.

STUDENT QUESTIONNAIRE RESPONSES

Any potential effect of type training on student questionnaire responses could not be evaluated. Unlike grades and standardized test measures, there were no prior year data to serve as baselines for comparison to post-intervention results. In our one school with random assignment of teachers to type training or control conditions, we had student questionnaire data from only six trained and seven control teachers, with a disproportionate overrepresentation of 8th graders in our teacher-trained classes. (As will be discussed, higher grade levels produced less satisfied students.) Thus, we looked only at the effects of student type preferences (across all schools) and school level (elementary vs. middle) on their questionnaire responses. We also

excluded questionnaire data from Middle School 4, Elementary School 3, and our one high school, because the data were collected in the wrong classrooms, with students given the wrong instructions and wrong forms, and/or completed using real student names rather than code names (precluding anonymity, likely a requisite for candid teacher ratings). We included data from three elementary and three middle schools. Except when indicated, the results presented represent the average response over two or three administrations of the student questionnaires over the course of the school year.[14]

An important note is that all results for student questionnaire ratings were reverse scored, meaning that lower scores are indicative of higher agreement with the item.

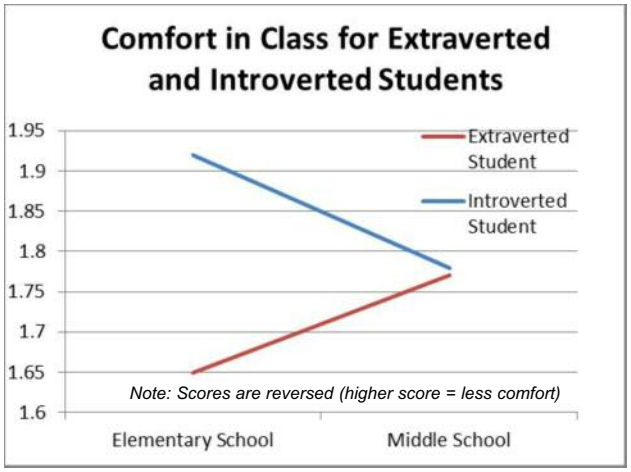
Extraversion (E)–Introversion (I). Differences in student questionnaire ratings for Extraversion–Introversion and other preference domains are also shown in **Table 6** (37–88.).

Extraverts overall reported higher levels of feeling respected by other students, $F(1, 3467) = 23.14$, $p < .001$, $d = .11$ and experiencing greater comfort sharing ideas, $F(1, 3465) = 54.01$, $p < .001$, $d = .25$.

However, as with academic performance, Extraverted and Introverted students' questionnaire responses generally differed during elementary and middle schools. Differences between the two preferences changed, either narrowing or even reversing direction as children advanced to higher grades. For all questionnaire items, Extraverted students changed in a negative direction (e.g., less confident, more pressured), while Introverted students either changed negatively (but less than Extraverts) or became more positive. This consistent pattern resulted in significant Extraversion–Introversion x school level interactions for all questionnaire items in **Table 6** except questions 3, 7, 8, and 9.

The clearest interaction of the Extraversion–Introversion preference with school level is shown in **Figure 6**. Overall, there was no significant difference between Extraverted and Introverted students, but the latter were much less comfortable in class than Extraverted students in elementary school ($d = .27$). The mean Extraversion–Introversion difference was negligible by middle school ($d = .01$), manifesting statistically as a significant Extraversion–Introversion x school level interaction, $F(1, 3467) = 14.88$, $p < .001$.

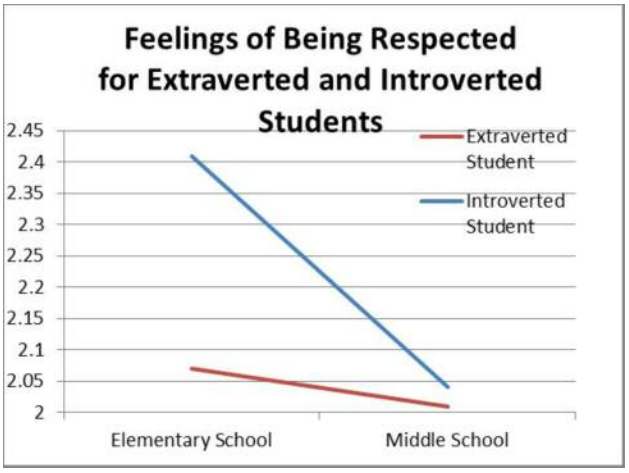
Figure 6.



Note: Scores are reversed (higher score = less comfort)

Other such interactions took a different form, with both Extraverts' and Introverts' responses changing from elementary to middle schools, but Extraverts' responses changing more. An example is the item *I feel respected by other students in this class*, shown in **Figure 7**. Extraverts reported feeling more respect than Introverts do, $F(1, 3467) = 23.14$, $p < .001$, $d = .33$, but Introverts sense of feeling respected improved dramatically by middle school, and the mean difference was negligible ($d = .03$). The interaction was significant, $F(1, 3467) = 15.93$, $p < .001$.

Figure 7.



Note: Scores are reversed (higher score = less comfort)

Sensing (S)–Intuition (N). There were fewer S–N than E–I differences on student questionnaire responses, and no significant interactions of preference with elementary-middle school enrollment. S students rated

Note: Lower

Table 6. Student Questionnaire Ratings Means and Standard Deviations by School Level and E–I Preferences.

Questionnaire Item Number and Wording	All Students E–I Preference				Elementary				Middle				Significant Results	
	E	n	I	n	E	n	I	n	E	n	I	n	Elem vs. Mid	Other
1 I put pressure on myself to succeed in school.	2.34 (1.34)	1522	2.41 (1.08)	1063	3.02 (1.22)	387	2.85 (1.16)	347	2.11 (1.30)	1135	2.20 (.97)	716	*t* = (2728) = 15.71*** *d* = .63 MS>ES	Interaction I>E elem; E>I mid
2 I feel pressure from my parents to succeed in school.	2.28 (1.20)	1520	2.44 (1.25)	1061	3.08 (1.37)	385	2.98 (1.39)	345	2.01 (1.01)	1135	2.17 (1.08)	716	*t* = (2725) = 19.22*** *d* = .77 MS>ES	Interaction I> E elem; E>I mid
3 Some things in school are hard for me, but I've learned what to do to succeed anyway.	2.08 (.75)	1287	2.12 (.78)	836	2.22 (.86)	152	2.36 (.82)	120	2.06 (.73)	1135	2.08 (.77)	716	*t* = (3805) = 4.18*** *d* = .27 MS>ES	
4 I am comfortable with the way I learn in school, even if nobody else does it like I do.	1.80 (.75)	1521	1.79 (.77)	1063	1.64 (.76)	386	1.77 (.85)	347	1.85 .74	1135	1.80 .73	716	*t* = (2728) = 4.77*** *d* = .20 ES>MS	Interaction E>I elem; I>E mid
5 My teacher makes new information easy for me to understand.	1.89 (.79)	1936	1.87 (.74)	1537	1.77 (.74)	424	1.88 (.79)	385	1.93 (.80)	1512	1.86 (.73)	1152	*t* = (3809) = 3.47*** *d* = .13 ES>MS	Interaction Decrease in mid school (E only) E>I elem; I>E mid
6 My teacher helps me to learn in new ways.	1.95 (.82)	1934	1.92 (.76)	1537	1.63 (.64)	422	1.73 (.68)	385	2.05 (.85)	1512	1.98 (.78)	1152	*t* = (3806) = 11.19*** *d* = .42 ES>MS	Interaction E>I elem; I>E mid
7 My teacher helps me to come up with good ideas about how to do well on tests.	2.04 (.90)	1933	2.02 (.85)	1537	1.71 (.80)	422	1.80 (.84)	385	2.14 (.90)	1511	2.10 (.84)	1152	*t* = (3805) = 10.97*** *d* = .42 ES>MS	
8 My teacher makes me feel like I'm important.	2.02 (.91)	1557	2.03 (.90)	1212	1.95 (.82)	189	198 (.87)	158	2.03 (.92)	1368	2.04 (.91)	1054	*t* = (3039) = 2.25* *d* = .13 ES>MS	
9 My teacher makes learning interesting and fun.	2.12 (1.04)	1557	2.03 (.90)	1211	1.84 (.77)	189	1.88 (.73)	158	2.16 (1.07)	1368	2.05 (1.01)	1053	*t* = (3038) = 4.72*** *d* = .26 ES>MS	

continued >>

Table 6. Student Questionnaire Ratings Means and Standard Deviations by School Level and E–I Preferences. (*continued*)

Questionnaire Item Number and Wording	All Students E–I Preference				Elementary				Middle				Significant Results	
	E	n	I	n	E	n	I	n	E	n	I	n	Elem vs. Mid	Other
10 I feel pressure to succeed from my teacher.	2.79 (1.23)	1932	2.76 (1.16)	1535	3.35 (1.25)	421	2.99 (1.17)	384	2.63 (1.18)	1511	2.69 (1.15)	1151	t = (3802) = 10.34*** d = .40 MS>ES	Interaction I>E elem; E>I mid
11 I feel pressure to succeed from other students in my class.	3.49 (1.15)	1934	3.43 (1.15)	1536	3.59 (1.15)	422	3.39 (1.16)	385	3.47 (1.15)	1512	3.45 (1.15)	1151	No sig difference	Interaction I>E only in elem school
12 I feel respected by other students in this class.	2.03 (.93)	1934	2.14[c] (.99)	1537	2.07 (.99)	423	2.41 (1.05)	385	2.01 (.91)	1511	2.04 (.95)	1152	t = (3803) = 4.47*** d = .17 MS>ES	Interaction E>I overall but gap narrows in mid
13 I feel comfortable in this class.	1.74 (.84)	1935	1.81 (.87)	1536	1.65 (.86)	423	1.92 (.94)	385	1.77 (.83)	1512	1.78 (.84)	1151	No sig difference	Interaction I increases, E declines in mid
14 I am comfortable sharing my ideas in this class.	2.10[c] (.98)	1934	2.36[c] (1.06)	1535	2.27 (1.02)	423	2.66 (1.10)	384	2.05 (.97)	1511	2.26 (1.02)	1151	t = (3803) = 7.71*** d = .30 MS>ES	Interaction E>I overall but gap narrows in mid
15 I am confident that I will succeed in this class.	1.71 (.81)	1933	1.73 (.79)	1535	1.53 (.68)	421	1.71 (.77)	384	1.76 (.83)	1512	1.74 (.79)	1151	t = (3804) = 5.27*** d = .21 ES>MS	Interaction E > I elem only

Note: Lower scores indicate greater agreement with the questionnaire statement.

**p < .05, ***p < .001.*

Means with a letter c superscript differ significantly from each other (p < .001).

Table 7. Student Questionnaire Ratings Means and Standard Deviations by School Level and S–N, T–F, and J–P Preferences.

Questionnaire Item Number and Wording	S–N Student Preferences				T–F Student Preferences				J–P Student Preferences				Significant Interactions Preference x School Level
	S	n	N	n	T	n	F	n	J	n	P	n	
1 I put pressure on myself to succeed in school.	2.33 (1.33)	1606	2.44 (1.58)	979	2.35 (1.41)	1061	2.38 (1.10)	1524	2.34 (1.37)	1423	2.40 (1.06)	1162	
2 I feel pressure from my parents to succeed in school.	2.31 (1.22)	1602	2.41 (1.23)	979	2.21[a] (1.37)	1059	2.44[a] (1.39)	1522	2.40 (1.27)	1421	2.28 (1.17)	1160	J>P elem; P>J mid (*p* = .025))
3 Some things in school are hard for me, but I've learned what to do to succeed anyway.	2.07 (.73)	1297	2.14 (.81)	826	2.12 (.75)	897	2.08 (.77)	1226	2.02[b] (.73)	1096	2.17[b] (.78)	1027	
4 I am comfortable with the way I learn in school, even if nobody else does it like I do.	1.78 (.75)	1605	1.82 (.77)	979	1.83 (.79)	1061	1.77 (.73)	1523	1.75 (.74)	1422	1.85 (.77)	1162	F>T elem more than F>T mid (*p* = .04); J>P elem; P>J mid (*p* = .007)
5 My teacher makes new information easy for me to understand.	1.87 (.75)	2304	1.91 (.80)	1169	1.90 (.77)	1601	1.87 (.77)	1872	1.84[c] (.75)	1949	1.94[c] (.79)	1524	
6 My teacher helps me to learn in new ways.	1.91[b] (.79)	2302	2.00[b] (.82)	1169	1.98 (.81)	1601	1.91 (.79)	1870	1.87[c] (.77)	1947	2.03[c] (.83)	1524	
7 My teacher helps me come up with good ideas about how to do well on tests.	2.00[b] (.86)	2302	2.10[b] (.90)	1168	2.07 (.89)	1599	2.01 (.87)	1871	1.95 (.85)	1948	2.14[c] (.89)	1522	
8 My teacher makes me feel like I'm important.	2.02 (.90)	1851	2.03 (.93)	918	2.09 (.93)	1330	1.96 (.88)	1439	1.98 (.90)	1497	2.07 (.91)	1272	
9 My teacher makes learning interesting and fun.	2.07 (.99)	1850	2.09 (.96)	918	2.11 (1.03)	1329	2.05 (.93)	1439	2.03 (.99)	1496	2.13 (.97)	1272	
10 I feel pressure to succeed from my teacher.	2.75 (1.19)	2299	2.83 (1.21)	1168	2.71 (1.17)	1598	2.83 (1.22)	1869	2.76 (1.22)	1946	2.80 (1.18)	1521	
11 I feel pressure to succeed from other students in this class	3.46 (1.17)	2301	3.49 (1.15)	1169	3.48 (1.16)	1599	3.46 (1.15)	1871	3.41[c] (1.19)	1947	3.54[c] (1.10)	1523	
12 I feel respected by other students in this class	2.04[a] (.94)	2302	2.14[a] (.99)	1169	2.13[c] (.99)	1601	2.02[c] (.92)	1870	2.06 (.96)	1947	2.09 (.95)	1524	J>P elem more than J>P mid (*p* = .05)

continued >>

Table 7. Student Questionnaire Ratings Means and Standard Deviations by School Level and S–N, T–F, and J–P Preferences. (*continued*)

Questionnaire Item Number and Wording	S–N Student Preferences				T–F Student Preferences				J–P Student Preferences				Significant Interactions Preference x School Level
	S	n	N	n	T	n	F	n	J	n	P	n	
13 I feel comfortable in this class.	1.75 (.84)	2302	1.82 (.89)	1169	1.81 (.87)	1600	1.75 (.84)	1871	1.75 (.85)	1947	1.81 (.87)	1524	
14 I am comfortable sharing my ideas in this class.	2.20 (1.03)	2300	2.23 (1.02)	1169	2.21 (1.05)	1600	222 (1.00)	1869	2.21 (1.03)	1946	2.22 (1.02)	1523	F>T elem; T>F mid (*p* = .0004)
15 I am confident that I will succeed in this class.	1.69 (.79)	2299	1.76 (.82)	1169	1.76^b (.83)	1600	1.68^b (.77)	1868	1.67 (.78)	1944	1.77^a (.82)	1524	

Note: Lower scores indicate greater agreement with the questionnaire statement.
Means for preference opposites with the same letter superscript differ significantly from each other.
Superscript a indicates p < .05; b indicates p < .01, c indicates p < .001.

their teachers as better at "help[ing] me learn in new ways" (item 6), $F(1, 3467) = 9.66$, $p = .002$, $d = .11$ and helping prepare "to do well on tests" (item 7), $F(1, 3466) = 8.69$, $p = .003$, $d = .11$. They also reported greater respect from other students (item 12), $F(1, 3467) = 4.87$, $p = .03$, d = .10. Significant findings for S–N, as well as T–F and J–P, are summarized in **Table 7** (See pages 39–40.).

Thinking (T)–Feeling (F). F students reported greater respect from student peers (item 12), $F(1, 3467) = 14.79$, $p < .001$, $d = .11$ and greater confidence they would succeed in class (item 15), $F(1, 3468) = 7.06$, $p < .01$, $d = .10$. There were two significant T–F x school level interactions, for items 4 and 14, $F(1, 2580) = 4.38$, $p = .04$ and $F(1, 3465) = 15.81$, $p < .001$, respectively. Elementary students with a preference for F reported being more comfortable with both "the way I learn in school" and "sharing my ideas in class" than T students ($d = .16$ and .29, respectively), but T students improved by middle school enough to rate themselves negligibly higher on these measures than Feeling students ($d = .01$ and .05, respectively).

Judging (J)–Perceiving (P). The most consistent J–P student differences indicated a greater appreciation of teachers, more comfort and confidence, and more pressure to succeed reported by J students. There were significant main effect differences (J>P) for the three teacher ratings focused on learning—item 5 (*teacher makes new information easy to understand*), $F(1, 3469) = 14.25$, $p < .001$, $d = .13$; item 6 (*teacher helps me learn in new ways*), $F(1, 3467) = 12.68$, $p < .001$, $d = .20$; and item 7 (*teacher helps me prepare for tests*), $F(1, 3466) = 15.84$, $p < .001$, d = .22. Judging students also reported greater pressure to succeed from fellow students (item 11), $F(1, 3466) = 10.66$, $p = .001$, $d = .11$; greater confidence they would succeed in class (item 15), $F(1, 3464) = 5.53$, $p = .02$, $d = .13$; and greater past success (item 3), $F(1, 2119) = 7.83$, $p = .005$, $d = .20$.

There were three significant J–P x school level interactions, for item 2 (parent pressure), $F(1, 2577) = 5.06$, $p = .025$, item 4 (comfort with own learning approach), $F(1, 2580) = 7.23$, $p < .01$, and item 12 (feeling respected), $F(1, 3467) = 3.93$, $p = .05$. For items 2 and 4, J students made higher ratings than P students in elementary school ($d = .20$ and .06, respectively),

but lower ratings in middle school than Perceiving students (d = .04 and .13, respectively). For item 12, Judging students made higher ratings in elementary school (d = .18), but Perceiving students' ratings were more similar to the Judging students' ratings in middle school (d = .02).

TEACHER TYPE

Teacher type distribution. Of the 126 elementary and middle school teachers for whom we collected type data, a majority preferred Extraversion (61.1%), Sensing (59.5%), Feeling (63.5%), and Judging (69.0%). No single preference or whole type frequencies differed significantly between middle and elementary school teachers. The only significant difference was a higher percentage (34.1%) of the NP combination in elementary school teachers, compared to 9.4% for middle school teachers, $\chi^2(1, N = 126) = 11.97$, $p < .0001$.

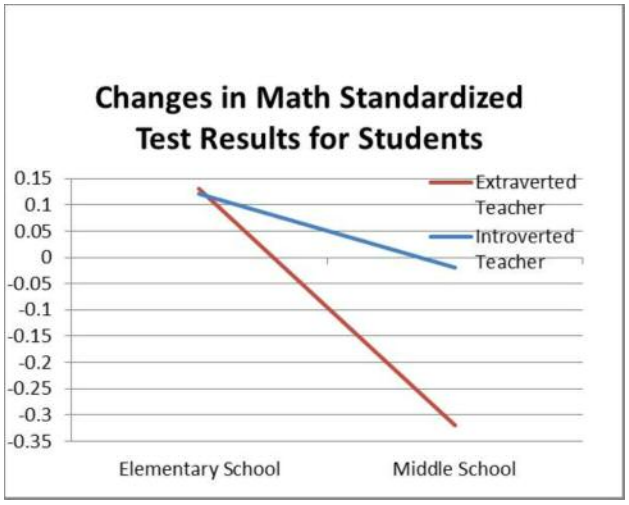
Teacher type and student performance. There were student grade results from 102 teachers of known type, which allowed a minimum of 11 teachers for each MBTI preference in both elementary and middle schools. Low numbers for some of the 16 types precluded whole type analyses.

Math and verbal standardized test results were analyzed only for math and English or reading teachers (including elementary school teachers, who taught all subjects). This reduced the size of the teacher sample, especially for middle school, where only two reading/ELA teachers had a Perceiving preference and only five preferred Intuition or Thinking. Additionally, there were only six middle school math teachers with a Perceiving or Intuitive preference. Otherwise, there were at least eight and as many as 29 teachers with each preference for both elementary and middle schools. The low count conditions are less reliably attributable to type effects, since a small number of teachers allows other unknown individual characteristics to strongly influence results.

Teacher Extraversion (E)–Introversion (I). Students of I teachers earned higher grades than students of E teachers, $F(1; 12{,}336) = 45.09$, $p < .001$, d = .12. I middle school teachers' grades were only slightly higher in elementary school (d = .04), but I teachers' grades improved while E teachers' grades declined by middle school, producing a larger gap (d = .20) and a significant Teacher E–I x school level interaction, $F(1; 12{,}336) = 21.05$, $p < .001$.

As shown in **Figure 8**, similar results emerged from an analysis of change scores on standardized tests

Figure 8



(subtracting each student's previous year z-score from the study year result). The mean change (-.15 *SD*) for students of Extraverted teachers was significantly worse on math scores than the change for students of Introverted teachers (M = .03), $F(1, 1683) = 14.36$, $p <$ .001, d = .18. A closer look indicated that the only negative change in math scores occurred with Extraverted teachers in middle school, evidenced by a significant Teacher E–I x school level interaction, $F(1, 1683) = 17.90$, $p < .001$.

Extraverted teachers' students also showed more negative change (M = -.15) than students of Introverted teachers (M = .01) on verbal standardized test scores, $F(1, 1336) = 14.16$, $p < .001$, d = .16. The Teacher E–I x school level interaction was not significant ($F < 1$, p = .45). Verbal test scores changed more positively for Introverted teachers' students in both elementary and middle schools. Overall, middle school changes were significantly more negative than elementary school changes, $F(1, 1336) = 20.57$, $p < .001$. Math scores also declined more in middle school, $F(1, 1683) = 61.05$, $p < .001$.

Teacher Sensing (S)–Intuition (N). Differences in the grades for students of Intuitive teachers (M = .03) and Sensing teachers (M = -.02) were negligible overall and in both elementary and middle schools ($d < .15$). Sensing teachers' students (M = -.14) also were more likely to have declines in their math test scores than Intuitive teachers' students (M = .01), $F(1, 1683) = 5.42$, p = .02, d = .15, but student verbal score changes did not differ significantly (F = .11, p = .74).

Teacher Thinking (T)–Feeling (F). There was a significant Teacher T–F x school level interaction, such

Table 8. Elementary School Teachers.

The Sixteen Complete Types

ISTJ *n* = 3 (7.32%) + + + + + + +	ISFJ *n* = 5 (12.20%) + + + + + + + + + + + +	INFJ *n* = 0 (0.00%)	INTJ *n* = 1 (2.44%) + +
ISTP *n* = 0 (0.00%)	ISFP *n* = 0 (0.00%)	INFP *n* = 6 (14.63%) + + + + + + + + + + + + + +	INTP *n* = 0 (0.00%)
ESTP *n* = 2 (4.88%) + + + +	ESFP *n* = 0 (0.00%)	ENFP *n* = 6 (14.63%) + + + + + + + + + + + + + +	ENTP *n* = 2 (4.88%) + + + +
ESTJ *n* = 3 (7.32%) + + + + + + +	ESFJ *n* = 8 (19.51%) + + + + + + + + + + + + + + + + + + +	ENFJ *n* = 4 (9.76%) + + + + + + + + +	ENTJ *n* = 1 (2.44%) + +

Dichotomous Preferences

E	26	(63.41%)
I	15	(36.59%)
S	21	(51.22%)
N	20	(48.78%)
T	12	(29.27%)
F	29	(70.73%)
J	25	(60.98%)
P	16	(39.02%)

Pairs and Temperaments

IJ	9	(21.95%)
IP	6	(14.63%)
EP	10	(24.39%)
EJ	16	(39.02%)
ST	8	(19.51%)
SF	13	(31.71%)
NF	16	(39.02%)
NT	4	(9.76%)
SJ	19	(46.34%)
SP	2	(4.88%)
NP	14	(34.15%)
NJ	6	(14.63%)
TJ	8	(19.51%)
TP	4	(9.76%)
FP	12	(29.27%)
FJ	17	(41.46%)
IN	7	(17.07%)
EN	13	(31.71%)
IS	8	(19.51%)
ES	13	(31.71%)
ET	8	(19.51%)
EF	18	(43.90%)
IF	11	(26.83%)
IT	4	(9.76%)

Jungian Types (E)

	n	%
E–TJ	4	9.76
E–FJ	12	29.27
ES–P	2	4.88
EN–P	8	19.51

Jungian Types (I)

	n	%
I–TP	0	0.00
I–FP	6	14.63
IS–J	8	19.51
IN–J	1	2.44

Dominant Types

	n	%
Dt. T	4	9.76
Dt. F	18	43.90
Dt. S	10	24.39
Dt. N	9	21.95

***N* = 41 + = 1% of *N* *I* = Selection Ratio Index *p<.05 **p<.01 ***p<.001**

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Table 9. Middle School Teachers.

The Sixteen Complete Types

ISTJ *n* = 7 (8.24%) + + + + + + + +	ISFJ *n* = 7 (8.24%) + + + + + + + +	INFJ *n* = 7 (8.24%) + + + + + + + +	INTJ *n* = 3 (3.53%) + + +
ISTP *n* = 3 (3.53%) + + +	ISFP *n* = 3 (3.53%) + + +	INFP *n* = 2 (2.35%) + +	INTP *n* = 2 (2.35%) + +
ESTP *n* = 0 (0.00%)	ESFP *n* = 9 (10.59%) + + + + + + + + + +	ENFP *n* = 4 (4.71%) + + + +	ENTP *n* = 0 (0.00%)
ESTJ *n* = 13 (15.29%) + + + + + + + + + + + + + + +	ESFJ *n* = 12 (14.12%) + + + + + + + + + + + + + +	ENFJ *n* = 7 (8.24%) + + + + + + + +	ENTJ *n* = 6 (7.06%) + + + + + + +

Dichotomous Preferences

E	51	(60.00%)
I	34	(40.00%)
S	54	(63.53%)
N	31	(36.47%)
T	34	(40.00%)
F	51	(60.00%)
J	62	(72.94%)
P	23	(27.06%)

Pairs and Temperaments

IJ	24	(28.24%)
IP	10	(11.76%)
EP	13	(15.29%)
EJ	38	(44.71%)
ST	23	(27.06%)
SF	31	(36.47%)
NF	20	(23.53%)
NT	11	(12.94%)
SJ	39	(45.88%)
SP	15	(17.65%)
NP	8	(9.41%)
NJ	23	(27.06%)
TJ	29	(34.12%)
TP	5	(5.88%)
FP	18	(21.18%)
FJ	33	(38.82%)
IN	14	(16.47%)
EN	17	(20.00%)
IS	20	(23.53%)
ES	34	(40.00%)
ET	19	(22.35%)
EF	32	(37.65%)
IF	19	(22.35%)
IT	15	(17.65%)

Jungian Types (E)

	n	%
E–TJ	19	22.35
E–FJ	19	22.35
ES–P	9	10.59
EN–P	4	4.71

Jungian Types (I)

	n	%
I–TP	5	5.88
I–FP	5	5.88
IS–J	14	16.47
IN–J	10	11.76

Dominant Types

	n	%
Dt. T	24	28.24
Dt. F	24	28.24
Dt. S	23	27.06
Dt. N	14	16.47

N **= 85 + = 1% of** ***N*** ***I*** **= Selection Ratio Index** ***p*<.05 *******p*<.01 ********p*<.001

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Table 10. MBTI® Comparison of Middle School v.s. Elementary School Teachers.

The Sixteen Complete Types

ISTJ *n* = 7 (8.24%) *I* = 1.13 + + + + + + + +	ISFJ *n* = 7 (8.24%) *I* = 0.68 + + + + + + + +	INFJ *n* = 7 (8.24%) *I* = 0.00 + + + + + + + +	INTJ *n* = 3 (3.53%) *I* = 1.45 + + +
ISTP *n* = 3 (3.53%) *I* = 0.00 + + +	ISFP *n* = 3 (3.53%) *I* = 0.00 + + +	INFP *n* = 2 (2.35%) *I* = 0.16 + +	INTP *n* = 2 (2.35%) *I* = 0.00 + +
ESTP *n* = 0 (0.00%) *I* = 0.00	ESFP *n* = 9 (10.59%) *I* = 0.00 + + + + + + + + + +	ENFP *n* = 4 (4.71%) *I* = 0.32 + + + +	ENTP *n* = 0 (0.00%) *I* = 0.00
ESTJ *n* = 13 (15.29%) *I* = 2.09 + + + + + + + + + + + + + + +	ESFJ *n* = 12 (14.12%) *I* = 0.72 + + + + + + + + + + + + + +	ENFJ *n* = 7 (8.24%) *I* = 0.84 + + + + + + + +	ENTJ *n* = 6 (7.06%) *I* = 2.89 + + + + + + +

Dichotomous Preferences

E	51	(60.00%)	*I* = 0.95
I	34	(40.00%)	*I* = 1.09
S	54	(63.53%)	*I* = 1.24
N	31	(36.47%)	*I* = 0.75
T	34	(40.00%)	*I* = 1.37
F	51	(60.00%)	*I* = 0.85
J	62	(72.94%)	*I* = 1.20
P	23	(27.06%)	*I* = 0.69

Pairs and Temperaments

IJ	24	(28.24%)	*I* = 1.29
IP	10	(11.76%)	*I* = 0.80
EP	13	(15.29%)	*I* = 0.63
EJ	38	(44.71%)	*I* = 1.15
ST	23	(27.06%)	*I* = 1.39
SF	31	(36.47%)	*I* = 1.15
NF	20	(23.53%)	*I* = 0.60
NT	11	(12.94%)	*I* = 1.33
SJ	39	(45.88%)	*I* = 0.99
SP	15	(17.65%)	*I* = 3.62
NP	8	(9.41%)	***I* = 0.28
NJ	23	(27.06%)	*I* = 1.85
TJ	29	(34.12%)	*I* = 1.75
TP	5	(5.88%)	*I* = 0.60
FP	18	(21.18%)	*I* = 0.72
FJ	33	(38.82%)	*I* = 0.94
IN	14	(16.47%)	*I* = 0.96
EN	17	(20.00%)	*I* = 0.63
IS	20	(23.53%)	*I* = 1.21
ES	34	(40.00%)	*I* = 1.26
ET	19	(22.35%)	*I* = 1.15
EF	32	(37.65%)	*I* = 0.86
IF	19	(22.35%)	*I* = 0.83
IT	15	(17.65%)	*I* = 1.81

Jungian Types (E)

	n	%	*Index*
E–TJ	19	22.35	2.29
E–FJ	19	22.35	0.76
ES–P	9	10.59	2.17
EN–P	4	4.71	0.24

Jungian Types (I)

	n	%	*Index*
I–TP	5	5.88	0.00
I–FP	5	5.88	0.40
IS–J	14	16.47	0.84
IN–J	10	11.76	4.82

Dominant Types

	n	%	*Index*
Dt. T	24	28.24	2.89
Dt. F	24	28.24	0.64
Dt. S	23	27.06	1.11
Dt. N	14	16.47	0.75

***N* = 126 + = 1% of *N* *I* = Selection Ratio Index *$p<.05$ **$p<.01$ ***$p<.001$**

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that students of Thinking teachers received higher grades in elementary school than middle school (d = .10), whereas Feeling teachers' students did better in middle school (d = .07), $F(1; 12{,}336) = 20.78$, $p < .001$. Students of Feeling teachers (M = -.05) had better change scores on verbal standardized tests than students of Thinking teachers (M = -.18), $F(1, 1336) = 6.95$, $p = .008$, $d = .23$, with Thinking teachers' middle schools students showing a particularly high negative change (M = -.35), manifesting as a significant interaction, $F(1, 1336) = 2.79$, $p = .04$. There was no significant teacher T–F student difference on math scores ($p = .42$), nor any significant interaction ($p = .24$).

Teacher Judging (J)–Perceiving (P). There were no significant Judging–Perceiving teacher differences, nor interactions of teacher J–P with school level, for grades, standardized math scores, or standardized verbal scores ($p \geq .24$).

Teacher type and student questionnaire responses. **Table 11** (See pages 46–47.) summarizes the results for student questionnaire responses as a function of teacher preferences and school level (elementary vs. middle).

Teacher E–I preference differences were significant (with an effect size greater than or equal to d = .10) for four student questionnaire items. Compared to Introverted teachers' students, students of Extraverted teachers reported more pressure from their teacher, $F(1, 3654) = 12.50$, $p < .001$, $d = .17$; more pressure from themselves, $F(1, 2459) = 4.99$, $p = .03$, $d = .15$; more pressure from their parents, $F(1, 2456) = 5.74$, $p = .02$, $d = .19$; and less comfort sharing ideas in class, $F(1, 3654) = 4.02$, $p = .05$, $d = .11$.

Students of Intuitive teachers reported feeling more respected by other students than did students of Sensing teachers, $F(1, 3657) = 9.81$, $p = .002$, $d = .15$, as well as more comfort sharing ideas, $F(1, 3654) = 20.02$, $p < .001$, $d = .23$. Compared to students of Thinking teachers, students taught by Feeling teachers reported that the teacher made them feel more important, $F(1, 2912) = 18.00$, $p < .001$, d = .26, and reported more self-pressure to succeed, $F(1, 2459) = 13.\ 03$, $p < .001$, $d = .15$. Students of Judging teachers differed from students of Perceiving teachers in reporting less respect from other students, $F(1, 3657) = 12.59$, $p < .001$, $d = .12$.

Analyses indicated that teachers whose Thinking–Feeling preferences were gender consistent (i.e., male Ts and female Fs, reflecting reliable population prevalence) were rated more positively by students than gender inconsistent teachers. This pattern of a significant statistical interaction between the Thinking–Feeling preference and the gender of the teacher was evident for four of five teacher ratings: "makes new information easy for me to understand," $F(1, 3660) = 13.83$, $p < .001$; "helps me to learn in new ways," $F(1, 3657) = 28.04$, $p < .001$; "helps me come up with good ideas about how to do well on tests," $F(1, 3657) = 20.97$, $p < .001$; and "makes learning interesting and fun" $F(1, 2912) = 15.84$, $p < .001$. The item "my teacher makes me feel like I'm important" showed significantly higher ratings given to Feeling teachers of either gender. Note that these results are much more descriptive of middle school, due to the shortage of male elementary school teachers. Restricting the analyses to middle school only produces similar (in fact stronger) results.

SUMMARY OF RESULTS

Type training effects. In four schools, there were significant, albeit small, positive effects upon student grades following the implementation of type training with teachers. Data from six other schools, which were suspect due to poor adherence to agreed-upon study protocols, showed neither grade improvements nor declines. There was no consistent post-training effect upon standardized test scores.

Student type preferences and academic performance. Grades for students of different type preferences interacted with school level (elementary or middle). Students with a preference for Extraversion, Intuition, Feeling, and Perceiving outperformed their opposing preferences in elementary school. In middle school, however, Introverted and Judging students earned better grades than Extraverted and Perceiving students, and the Thinking–Feeling and Sensing–Intuition elementary school differences were erased.

Students preferring Intuition and Perceiving did better on both math and verbal standardized tests than Sensing and Judging students, in both elementary and middle school. Extraverted students did better than Introverted students on math standardized tests in elementary school and worse than Introverted students in middle school. Standardized test scores for Thinking and Feeling students did not differ significantly.

Student type preferences and student questionnaire responses. Extraverted and Introverted students responded to student questionnaire items differently in elementary and middle schools. Extraverted students' ratings of teachers, confidence in their ability to succeed

Table 11. Student Questionnaire Ratings Means and Standard Deviations by School Level and Teacher Preferences.

Questionnaire Item Number and Wording	E–I Teacher Preferences				S–N Teacher Preferences				T–F Teacher Preferences				J–P Teacher Preferences				Significant Interactions Preference x School Level
	E	n	I	n	S	n	N	n	T	n	F	n	J	n	P	n	
1 I put pressure on myself to succeed in school.	2.36[a] (1.29)	1736	2.55[a] (1.18)	727	2.45 (1.43)	1160	2.38 (1.09)	1303	2.53[c] (1.47)	1012	2.34[c] (1.09)	1451	2.40 (1.36)	1561	2.45 (1.07)	902	E>I elem; I>E mid (*p* = .001) P>J elem; J>P mid (*p* = .001)
2 I feel pressure from my parents to succeed in school.	2.30[a] (1.21)	1736	2.54[a] (1.32)	724	2.32 (1.26)	1160	2.42 (1.23)	1300	2.41 (1.28)	1011	2.35 (1.22)	1449	2.32 (1.23)	1560	2.46 (1.23)	900	N>S elem; S>N mid (*p* = .001) F>T elem; T>F mid (*p* < .001) P>J elem; J > P mid (*p* < .001)
3 Some things in school are hard for me, but I've learned what to do to succeed anyway.	2.10 (.76)	1414	2.15 (.77)	547	2.14 (.78)	923	2.10 (.75)	1038	2.13 (.79)	892	2.11 (.75)	1069	2.10 (.76)	1244	2.15 (.77)	717	N>S elem more than N>S mid (*p* =.01)
4 I am comfortable with the way I learn in school, even if nobody else does it like I do.	1.77 (.76)	1737	1.84 (.81)	726	1.83 (.81)	1161	1.75 (.73)	1302	1.82 (.79)	1013	1.77 (.76)	1450	1.77 (.76)	1562	1.83 (.80)	901	S>N elem; N>S mid (*p* =.001)
5 My teacher makes new information easy for me to understand.	1.91 (.79)	2325	1.83 (.74)	1339	1.90 (.77)	1959	1.85 (.77)	1705	1.91 (.79)	1831	1.85 (.74)	1833	1.86 (.77)	2335	1.91 (.77)	1329	E>I elem; I>E mid (*p* <.001) S>N elem; N>S mid (*p* =.006)
6 My teacher helps me to learn in new ways.	1.96 (.80)	2325	1.90 (.79)	1336	1.93 (.80)	1959	196 (.82)	1702	1.93 (.79)	1831	1.95 (.80)	1830	1.92 (.78)	2335	1.98 (.82)	1326	E>I elem; I>E mid (*p* =.03)
7 My teacher helps me to come up with good ideas about how to do well on tests.	2.05 (.88)	2322	1.99 (.87)	1339	2.04 (.88)	1959	2.02 (.88)	1705	2.03 (.87)	1830	2.03 (.89)	1831	2.00 (.88)	2332	2.08 (.88)	1329	F>T elem; T>F mid (*p* = .017)
8 My teacher makes me feel like I'm important.	2.05 (.91)	1758	2.10 (.96)	1158	2.13 (.94)	1477	2.01 (.92)	1439	2.19[c] (.97)	1467	1.95[c] (.88)	1449	2.03 (.91)	1773	2.13 (.96)	1143	P>J elem; J>P mid (*p* = .035)
9 My teacher makes learning interesting and fun. *continued >>*	2.12 (.97)	1758	2.05 (.99)	1158	2.09 (1.20)	1477	2.10 (1.02)	1459	2.07 (.97)	1467	2.12 (.98)	1449	2.05 (.98)	1773	2.16 (.98)	1143	

Table 11. Student Questionnaire Ratings Means and Standard Deviations by School Level and Teacher Preferences. (*continued*)

Questionnaire Item Number and Wording	E–I Teacher Preferences				S–N Teacher Preferences				T–F Teacher Preferences				J–P Teacher Preferences				Significant Interactions Preference x School Level
	E	n	I	n	S	n	N	n	T	n	F	n	J	n	P	n	
10 I put pressure to succeed from my teacher.	2.74^c (1.20)	2322	2.94^c (1.21)	1336	2.75 (1.20)	2956	2.87 (1.22)	1702	2.77 (1.20)	1829	2.85 (1.21)	1829	2.72 (1.21)	2332	2.97 (1.19)	1326	N>S elem; S>N mid (*p*<.001) F>T elem; T>F mid (*p*<.002) P>J elem; J>P mid (*p*<.001)
11 I put pressure to succeed from other students in this class.	3.47 (1.13)	2322	3.53 (1.20)	1337	3.52 (1.21)	1955	3.45 (1.19)	1704	3.53 (1.14)	1830	3.45 (1.17)	1829	3.46 (1.28)	2331	3.54 (1.20)	1328	F>T elem more than F>T mid (*p*=.03) P>J elem; J>P mid (*p*=.02)
12 I feel respected by other students in this class.	2.09 (.96)	2325	2.10 (.99)	1336	2.16^b (1.00)	1957	2.01^b (.92)	1704	2.12 (.97)	1829	2.06 (.96)	1832	2.14^c (1.0)	2335	2.0^c2 (.91)	1326	E>I elem; I>E mid (*p*=.013) N>S mid more than N>S elem (*p*=.01) T>F elem; F>T mid (*p*<.001)
13 I feel comfortable in this class.	1.81 (.88)	2324	1.76 (.86)	1338	1.85 (.91)	1959	1.72 (.83)	1703	1.80 (.88)	1831	1.78 (.87)	1831	1.82 (.90)	2334	1.75 (.83)	1328	E>I elem; I>E mid (*p*<.001) S>N elem; N>S mid (*p*<.001) T>F elem; F>T mid (*p*<.001)
14 I feel comfortable sharing my ideas in this class.	2.27^a (1.04)	2324	2.16^a (1.01)	1334	2.34^c (1.07)	1958	2.10^c (.98)	1700	2.24 (1.05)	1831	2.22 (1.02)	1827	2.25 (1.04)	2332	2.20 (1.02)	1326	E=I elem; I>E mid (*p*=.04) N=S elem; N>S mid (*p*<.001) T>F elem; F>T mid (*p*<.001)
15 I am confident that I will succeed in this class.	1.74 (.81)	2322	1.75 (.86)	1337	1.78 (.84)	1957	1.70 (.81)	1702	1.77 (.86)	1831	1.72 (.79)	1828	1.73 (.81)	2332	1.77 (.86)	1327	S>N elem; N>S mid (*p*<.001) T>F elem; F>T mid (*p*=.01)

Note: Lower scores indicate greater agreement with the questionnaire statement.

Means for preference opposites with the same letter superscript differ significantly from each other.

Superscript a indicates $p < .05$; b indicates $p < .01$, c indicates $p < .001$.

in class, and comfort in the class were lower in middle school than elementary; Introverted students' corresponding ratings declined less and sometimes improved. Thus, the ratings of Extraverted students were generally more positive than Introverted students in elementary school, but not middle school. Elementary school Extraverted students also reported experiencing less pressure to succeed than elementary Introverted students, but more pressure to succeed in middle school.

Sensing students rated teachers significantly higher than Intuitive students on two of five teacher ratings (helping them learn in new ways and doing well on tests) and reported feeling more respected by their peers. These ratings were not affected by school level.

Thinking students reported more parental pressure than Feeling students, but less confidence in classroom success and less respect from peers, regardless of school level. Elementary Feeling students reported more comfort "with the way I learn" and "sharing ideas in this class" than Thinking students, but the pattern was reversed in middle school.

Judging students were more positive than Perceiving students in rating their teachers, their confidence in classroom success, and in reporting their past success. Their self-reported comfort with their approach to learning, their perceived respect from other students, and their reported parental pressure was higher than Perceiving students in elementary school but lower in middle school.

Teacher type preferences and academic performance. Middle school students of Introverted teachers received higher grades than middle school students of Extraverted teachers. Extraverted teachers' students also showed relatively higher year-to-year declines in math standardized test scores.

Students of Sensing teachers showed a greater decline in math scores than students of Intuitive teachers, regardless of school level.

Students of Thinking teachers received better grades than students of Feeling teachers in elementary school, but the opposite was true in middle school. Middle school students of Thinking teachers showed a higher decline in verbal standardized test scores.

Teacher type preferences and student questionnaire responses. Students of Extraverted teachers reported more pressure to succeed from parents and teachers than did students of Introverted teachers; the self-pressure ratings were higher for Introverted teachers' students in middle school but lower in elementary school. Feelings of respect and comfort and ratings of teachers were higher for students of Extraverted teachers in elementary school, but reversed in middle school (higher for students of Introverted teachers).

Students of middle school Intuitive teachers reported more comfort in class, in sharing ideas, and with their personal approach to learning; higher ratings of their teachers' ability to make information easy to understand; and more confidence in their classroom success than students of Sensing teachers. The S–N differences were either reversed or reduced in elementary school. Students of Intuitive teachers also reported less pressure from parents and teachers in middle school, but more such pressure in elementary school.

Students of Feeling teachers reported more peer respect, comfort sharing ideas in the classroom, confidence in classroom success, and less pressure to succeed from teachers, peers, and parents than students of Thinking teachers in middle school, but these differences were reversed in elementary school. Regardless of school level, students of Feeling teachers reported higher ratings for the items "my teacher makes me feel like I'm important" and "I put pressure on myself to succeed in school."

Students of Judging teachers reported more pressure to succeed from peers, self, parents, and teachers in middle school than Perceiving teachers' students did, but less than students of P teachers in elementary school. The same pattern was true for ratings of "my teacher makes me feel like I'm important." Students of Perceiving teachers in both elementary and middle schools reported greater ratings of respect from other students.

Finally, with the exception of the "makes me feel important" item (higher for male and female Feeling teachers), male Thinking and female Feeling teachers were rated more positively by students than opposite preference-gender combinations (female Thinking teachers and male Feeling teachers).

DISCUSSION

This ambitious and complex study involved multiple schools with thousands of students taught by scores of teachers in 10 different school environments, working in collaboration with local coordinators and the research team at CAPT. The study collected tens of thousands of data points at multiple times spanning the entire school year, aimed at detecting the effect of a few hours of training, usually concentrated at the beginning of the

year. Onsite coordinators, teachers or counselors or administrators primarily worked as unpaid volunteers and had little if any research experience. The project began in the fall of 2008, as the financial crisis unfolded and amplified the chronic fiscal stress that confronts most schools. With school staffs already straining to do more with less, the level of participation from teachers, administrators, and students may have been adversely impacted. In sum, the extra work load, much of it involving unfamiliar practices, contributed to implementation shortfalls at six schools. Even in the best case implementation scenarios, teachers needed to stay focused on applying type principles for the full school year as they juggled their many responsibilities. While teachers were trained to use type in their classrooms, the study did not monitor their implementation of the training.

Despite these obstacles, the study found some evidence for grade improvements in the wake of teacher training in type principles in schools where the training and study procedures were properly executed. However, aside from being limited to four of the study's ten schools, the effect was small, limited in all but one case to non-randomized, pre-post comparisons, and did not produce similar improvements in standardized test scores. Pre-post comparisons were careful to include only the same teachers teaching the same class to the same grade level, but were still susceptible to extraneous events and forces active in either of the comparison years. One of the primary historical confounds is teacher experience—hopefully teachers become better teachers from one year to the next, which would explain improved grades as well. While trained teachers' grades improved relative to similar pre-post comparisons for untrained teachers, most of the untrained teachers elected not to receive type training. Such self-selection limits confidence in attributing differences in grades to improved teaching following type training.

Ideally future research will employ more random assignment of teachers to trained/untrained experimental conditions. Rather than providing teachers only with a framework (type theory) for understanding different approaches to information gathering, researchers should also provide specific lesson guidance, or even lesson construction, that clearly utilizes type in the classroom. Again, using random assignment and a sufficient number of teachers, classes, and students, the results of such a carefully prepared lesson could be compared against the results from teaching the same material using more standard instruction. Restricting the data collection to shorter time periods than the entire school year would also allow teachers to keep focused and for any potential type effect to predominate over extraneous influences.

The results indicating relationships of different student types and preferences to student performance and attitudes are more robust. A unique and important contribution of this research is the scope and comprehensiveness of data collected across multiple grade levels. These data suggest a developmental component to the relationship of type and education. Elementary and middle school environments differ, with the former associated with higher grades for students with preferences for Extraversion, Intuition, Feeling, and Perceiving. By middle school, those differences disappear for the Sensing–Intuition and Thinking–Feeling domains and are reversed for Extraversion–Introversion and Judging–Perceiving. On standardized tests, Intuitive and Perceiving students perform better than Sensing and Judging students, regardless of school level. Past research (see Myers & McCaulley, 1985) has similarly shown superior standardized test performance by Perceiving and, especially, Intuitive college students. Despite the apparent aptitude advantage of Perceiving students, Judging college students generally earn better grades. Data from the current study suggest that Judging students earn lower grades than Perceiving students during elementary school, but by middle school (and beyond) Judging students catch up and surpass them, possibly through better adherence to deadlines and better organizational and time management skills. In fact, post hoc analyses of our data confirmed that, compared to Perceiving types, Judging students' grades were higher relative to their standardized test scores for both math, $t(1937) = 3.37$, $p < .001$, $d = .16$, and verbal scores, $t(1807) = 4.51$, $p < .001$, $d = .22$. If standardized test scores are more indicative of aptitude, these results suggest that Judging students learn to overachieve, relative to aptitude. Another possible explanation is that the classroom environment in middle school is more J-friendly, emphasizing organization and timely completion of assignments.

Extraverted elementary school students also earned better standardized math test scores than Introverted students, but the reverse was true in middle school. Teacher ratings, higher for Extraverted students than Introverted students in grades 3, 4, and 5, but lower for middle school grades, showed the same Extraversion–Introversion switch pattern. Thus, several indicators converge to suggest that Extraverted students begin

school with an advantage over Introverts, but that advantage disappears and eventually reverses as Introverts go through school. This interpretation adds a longitudinal aspect to the short-term conception of Extraverts as more confident and active than Introverts, who take longer to process information. Our post-hoc analysis of grades vs. standardized tests also showed Introverts earning higher relative grades compared to standardized test scores than Extraverts, $t(1937) = 2.36$, $p = .02$, $d = .10$ for math and $t(1807) = 2.64$, $p < .01$, $d = .13$ for verbal scores.

The Thinking–Feeling domain also appears to be developmentally influenced. Elementary school Feeling students earned better grades than Thinking students, but the difference disappeared by middle school. One consistent finding of interest, replicating other work in which adults were rated by observers (Thorne & Gough, 1991), was that gender role consistent (male-Thinking and female-Feeling) teachers were rated more positively by students. An absence of male Feeling teachers in elementary school precluded examination of potential developmental effects on such student ratings of teachers.

Post-hoc analyses suggest that the Thinking–Feeling domain behaves very differently compared to other type domains regarding academic performance changes from elementary to middle school. For Extraversion–Introversion, Sensing–Intuition, and Judging–Perceiving, students whose continuous scores were in the middle of the scales (known as "low preference clarity" in type theory) showed changes in performance somewhere between more polarized scoring students (e.g., clear Extraverts or clear Introverts). For Thinking–Feeling, however, students with scores in the *middle* of the Thinking–Feeling scale improved their grades in middle school, while both *clear* Thinking types' and *clear* Feeling types' scores declined. This pattern repeated itself in student questionnaire responses, with middle school students with low Thinking or Feeling clarities rating both their teachers and their experience of the school environment (feeling respected, confident, and comfortable) more positively than clear Thinking or Feeling students. These consistent yet unexpected findings suggest that a student with a balance of Thinking and Feeling may have more judgment options to help negotiate the changing social-emotional climate, teacher expectations (more teachers are T in middle than in elementary school), and classroom demands of middle school. With middle school students entering puberty at different ages, gender roles may be widely divergent as students mature. Future research would be required to see if midzone T–F scores are associated with performance benefits with adults or younger children.

Judging–Perceiving differences are also developmentally intriguing. Past research with older students has shown an advantage for Perceiving students on aptitude tests (like the SAT) and an advantage for Judging students on grades (e.g., Myers & McCaulley, 1985). Our data show a similar pattern in middle school: Perceiving students did better on standardized tests and Judging students got better grades. In elementary school, however, Perceiving students not only did better on standardized tests, but also get better grades. This is new information about type development and may reflect one (or both) of two processes at work. First, it may be that elementary school rewards Perceiving behavior (exploration), whereas middle school rewards Judging behavior (getting the work done on time in an orderly fashion). Or, it may be the case that Judging students take a while to develop their Judging skills and apply them to school, compensating for the head start that Perceiving students seem to enjoy.

Even in elementary school, Judging students were more positive about their teachers, the school environment, and themselves. The only questionnaire item response pattern that deviated from Judging students being more positive than Perceiving students from elementary to middle school was perceived parent pressure—Judging students reported more in elementary school, but Perceiving students reported more in middle school. Judging students reported more pressure from teachers and from themselves at all grades. Judging students not only liked school more, but also approached it with more responsibility.

Not only did student performance and attitudes change as they mature, but the results of type measurement also differed, with a change from elementary to middle school associated with an increasing frequency of E, T, and P. Whether such changes are maturational and universal, or a response to changes in the school environment, or some kind of measurement artifact remains an open question, begging more research.

Of course, the learning environment includes teachers as well as students. Teachers in elementary schools in the present study were over three times more likely to prefer both N and P than both S and J. Shifts in the school environments are likely to reflect teacher and administrator type differences. Unfortunately, the interesting and important question of whether teacher

type consistently influences student academic performance or attitudes towards school cannot be definitively answered without a more comprehensive study. Characteristics of individual teachers apart from psychological type may influence results in unknown ways. So, while the current data suggest that students of Introverted and Feeling preference teachers receive better grades than students of Extraverted and Thinking teachers, the results may be measuring, for example, greater leniency in Feeling teachers. With the relatively small numbers of teachers spread across many schools, these results may also be attributable to cultural differences at the schools or different socio-economic statuses of the communities where the schools are located. Thus, all results should be interpreted with caution until such time as enough data are collected from many more teachers and schools.

The study found no evidence of any significant effect on student academic performance for complementary vs. similar type preferences of pupil and teacher. DiTiberio (1996, 1998), in a review of the literature on this subject, reported inconclusive results. Perhaps efforts to study teacher and student type combinations would be better focused on lesson style and student combinations. Good teachers presumably have developed their own methods of transcending their own styles to reach a diversity of students. To the extent that they succeed in doing so, their type should not limit their effectiveness. We, therefore, suggest a more focused and controlled series of studies exploring various combinations of lesson style and learner preferences. Designing two differently styled lessons—for example, one using Sensing strategies and one using an Intuitive-friendly approach—and videotaping them would allow a high degree of control and refinement of content and delivery. Learning could be assessed at the end of the session to determine whether the meshing of lesson and learner preferences facilitates content mastery.

One final comment concerns the decline of grades and standardized test scores as students progress from one grade level to the next, which was observed in the study's data. Often the biggest decline occurred from fifth to sixth grades, the transition from elementary to middle school. Extensive, large scale studies of middle schools have called such institutions "the Bermuda triangle of education" (Rand Corporation, 2004, p. xv), where differences between achievers and non-achievers increase, minorities fall further behind, and increasing student disengagement sows the seeds that culminate in dropping out of high school. Given that "a volatile mismatch exists between the organization and curriculum of middle grades schools and the intellectual, emotional, and interpersonal needs of young adolescents" (Carnegie, 1989, p. 32) and that "*failed opportunities to engage youths in middle school may have lifelong consequences*" (Rand Corporation, 2004, p. 49, italics in original), future research involving psychological type and education may serve society best by a focus on the critical years of middle school.

FOOTNOTES

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[2] Such studies rarely employ rigorous sampling methods, instead often relying on convenience samples compromised by self-selection. True representative randomized samples are rare in general and non-existent for groups other than adult age. Thus, results for comparing one student group to another should be interpreted very cautiously. Melear & Alcock (1999), for example, compared 204 black high school students from rural high schools in North Carolina to a much larger sample (N = 3053) of mostly white high school students from urban Philadelphia, probably taken at least two decades earlier. These two (presumably convenience) samples differed in many ways other than race, even if they were representative.

[3] Student analyses used indicated type, not verified. Some schools did not conduct a verification process with students, and there were wide differences in the agreement rates of indicated and verified types among the schools which did.

[4] Efforts to obtain this information, either online or by request from state departments of education, were successful in Colorado, Florida, and Texas, but not New York. New York state ignored repeated requests for standard deviation data but does publish means for different tests in different years. Statewide standard deviations for New York schools were estimated based on available data published online and from the current studies. The private school in the current research used Stanford Achievement Tests with existing published norms (means and standard deviations) for appropriate grades.

[5] Z-score conversion does not allow clear conclusions

about absolute improvement or decline, as the average score is set to zero. All students in the state could average higher or lower from one year or subject to another.

[6] An alternative estimate of effect size is partial eta squared, which can be calculated for interactions as well as main effects. Cohen's *d* was used as it is more descriptive of the magnitude of mean differences.

[7] Not only did these five schools use a directly comparable grading system, but four of them came from the same school district. This was the best comparison by far for grades prior to conversion to *z*-scores, which set the mean grades within each school to zero, prohibiting meaningful comparisons between schools teaching different grades.

[8] However, if standardized test scores drop in higher grades, then the state average should drop as well. This suggests there is something unique about schools in this study. Perhaps schools with bigger challenges were drawn to participate in research for its potential benefit.

[9] This pattern of results is consistent with the interpretation that the untrained teachers had better students, that overall student test scores declined, but the decline was tempered by type-trained teachers. But other explanations may also account for the pattern.

[10] Ideally, membership in these two groups is determined randomly. In the present research, our untrained group of teachers was not given the opportunity for type training, whereas the trained teachers actively volunteered. Thus, there are unknown self-selection effects coloring the results.

[11] Results for this school have previously been reported in greater detail (McPeek, Urquhart, Breiner, Holland, & Cavalleri, 2011). The prior report used raw scores (grades on a 100-point scale, state scores for standardized tests) rather than *z*-score grade conversions.

[12] These analyses used indicated type, due to unknown differences in the quality of determining students' best fit types.

[13] More detail: Introverts outperformed Extraverts in English, math, and social studies and generally in middle school in all subjects. Intuitive types outperformed Sensing types in math and reading, primarily in elementary school. Feeling types outperformed Thinking types overall in English and reading. Judging–Perceiving grade performance differences were small for all subjects.

[14] We are not reporting changes over the course of multiple administrations of the student questionnaires because these results are difficult to interpret. Students generally were least positive at the first administration, early in the school year, and more positive at mid or end year. While this pattern is consistent with a positive result of type training as the school year unfolded, another compelling explanation would be an increase in student comfort as the classroom and school environments become more familiar. Analyses using a two or three time repeated measure ANOVA rather than an average of the multiple administrations generally produced results similar to those reported.

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