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University-School Partnership: A Lens for School Type Differences in Fractional Knowledge

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INTRODUCTION

International large-scale assessments generally show that private school students **outperform** public school students in mathematics, science, and reading (Organisation for Economic Co-operation and Development [OECD], 2009).

- A strong theoretical impetus in the **superiority** of private schools,
- After **controlling** for student and home background factors there appears to be **little to no** statistically significant **school type differences** in standardized test scores (OECD, 2013).
- **Turkey** had the largest variance internationally between schools in student performance: The overall **achievement gap** between the lower and higher achievers was large (OECD, 2007), and that this discrepancy was attributable to the **between-school variation** while controlling for family background and demographic characteristics (Alacacı & Erbaş, 2010).

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INTRODUCTION

The study of **school type disparity** in performances based on student assessments has assumed an increasing importance (e.g., Lubienski & Lubienski, 2006).

- It has many **implications for equity in mathematics education** that can be defined as "being unable to predict mathematics achievement and participation based solely upon student characteristics such as race, class, ethnicity, sex, beliefs, and proficiency of language" (Gutiérrez, 2002, p. 9).
- **Equity in mathematics education** has a relevant influence (see *Journal for Research in Mathematics Education* for the March 2013 special issue) on the student achievement outcomes, treatment of students, and students' access to educational resources (National Council of Teachers of Mathematics [NCTM], 2008).

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THE PRESENT STUDY

Achieving equity in the schools is very **difficult** for particularly in **Turkish mathematics classrooms**.

- Although the mathematics curriculum itself does not vary, there are differences in the way mathematics is implemented.

- Owing to the greater resources of private schools in financial and physical terms, mathematics education in private schools is much more effective, which is evidenced by a number of studies (e.g., Cinoglu, 2006).

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THE PRESENT STUDY

PRIVATE > PUBLIC

International studies documented that **private schools** affected **better mathematical outcomes** than did public schools (e.g., Coleman, Kilgore, & Hoffer, 1981).

PUBLIC > PRIVATE

More recent studies showed that **mathematics achievement** in **public schools** was slightly higher than that in private schools (e.g., Braun, Jenkins, & Gregg, 2006).

- Although most research strongly suggests that there are **school type differences** in mathematics achievement, there has been **little progress** in explaining these differences with respect to skills acquired through association with a particular content such as **fractional knowledge**.

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THE PRESENT STUDY

Few studies (Hallett, Nunes, & Bryant, 2010; Hallett, Nunes, Bryant, & Thorpe, 2012) attempted to explain grade level differences in conceptual and procedural knowledge while learning fractions.

- the existence of such differences could result from **students' school experiences** which reflect **differences across teaching practices**, and in turn, knowledge of fractions.

The **purpose** of the present study was to explore school type differences in students' fractional knowledge by using data from a **university-school partnership**, *University within School*.

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RESEARCH QUESTION

Is there a statistically significant difference between the mean scores of fifth-grade students attending public and private schools in fractional knowledge?

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METHOD

The present study was conducted within a **university-school partnership** during 2014-2015 academic year.

The *University within School Partnership* (Özcan, 2013), involved collaborative efforts of the **MEF University** and two school districts to develop an overlapping network of partnering, experiencing, and mentoring relationships across middle grade levels (Grades 5-8)

For details of that partnership please see Aydın, Tunç-Pekkan, Taylan, Birgili, & Özcan (in press); Aydın, Tunç-Pekkan, Taylan, Birgili, & Özcan (2016); Taylan, Tunç-Pekkan, Aydın, Birgili, & Özcan (2016); and Tunç-Pekkan, Taylan, Birgili, Aydın, & Özcan (2016).

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METHOD

Participants

Ten Grade 5 classes from one public (n = 5; School A) and one private (n = 5; School B) middle school located in two school districts of İstanbul, Turkey.

- Schools were **nonrandomly** selected based on the criteria that the school administrations were **willing** to participate in the partnership.

Public School A: 108 students (57 females and 51 males)

Private School B: 95 students (43 females and 52 males)

- **Average age** = 11.5 years old

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METHOD *Participants (Contd.)*

In Turkey, *4 + 4 + 4 Education System* has been implemented since 2012-2013 academic year. Along the 12 years of schooling, students attend to primary (Grades 1-4), middle (Grades 5-8), and high (Grades 9-12) school. There are **no requirements** (i.e., national exams) for the transition from primary to middle school.

Transition from primary to middle school:

students make a school choice between public and private schools.

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METHOD *Participants (Contd.)*

Public schools:

- accept students with regard to their **place of residence**.
- parents of students in public schools **cannot choose or exert influence** over which schools their children attend.
- students are required **neither to take level determination exams nor to pay tuition.**

Private schools:

- provide an alternative for parents who 1) are dissatisfied with the conditions of public schools, 2) can afford the tuition charged, and 3) receive financial aid.
- some are selective in their admissions, while others are not.
- various foundation schools accept students according to the results of standardized exams conducted by their measurement and evaluation departments.

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METHOD *Participants (Contd.)*

The **same educational curriculum** (MoNE, 2013) is implemented for each subject (e.g., Mathematics) in both public (*n*= 15858) and private (*n*= 1111) schools.

There are some **differences** concerning the **school policies** and **classroom practices**.

- In **public** schools classroom size is large and students are exposed to the traditional method of instruction. This teacher-centered instruction stressed drill-and-practice on the board and review of the topic.
- In **private** schools the methods of instruction is implemented in small size classrooms. This allows for making sense of information, questioning, thoughtful investigating, and/or individual development of understanding.

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METHOD

Instrument

The **Fractions Test (FT)** was developed by the **teacher-researchers** to measure students' fractional knowledge.

- **32 four-distractor multiple-choice items**; each item was scored either 0 (incorrect) or 1 (correct)
- The total testing time was one-class period long **(40 min)**

- **Pilot study:** 34 fifth-grade students in a public middle school. The **KR-20** reliability coefficient was **.80**.
- **Main study:** The **same test** was used for both experimental and control groups before and after the intervention. The **KR-20** reliability coefficients were **.85 and .89**, on the pretest and posttest, respectively.

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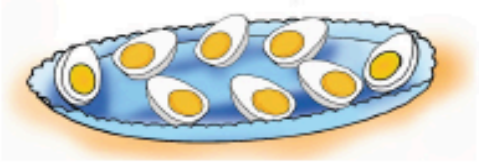
METHOD *Instrument (Contd.)*

- **Test content:** unit, proper, improper, and equivalent fractions; ordering, addition, and subtraction of fractions; locating fractions and "1" on number line; benchmarking.

Item 3: How many wholes can be made with the half eggs in the plate?

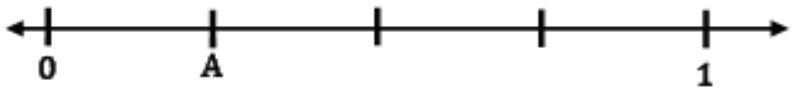


a) 2 b) 4 c) 6 d) 8

Item 11: Which of the following fractions is closest to $\frac{1}{2}$?

a) $\frac{1}{6}$ b) $\frac{4}{6}$ c) $\frac{5}{6}$ d) $\frac{6}{6}$

Item 24: Given the number line below, what is the fraction represented with the point A?



a) $\frac{1}{4}$ b) $\frac{2}{4}$ c) $\frac{1}{3}$ d) $\frac{2}{3}$

Figure 1. **Sample items of the FT**

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METHOD

Data Sources

- test scores for the FT

Data Analysis

- *Step 1*: Date cleaning – Information about the groups was checked.
- *Step 2*: Preliminary analysis – Basic assumptions were tested (i.e., Levene's Test for Equality of Variances).
- *Step 3*: Independent samples t-test – Grouping variable: school type
- *Step 4*: Power analysis – Effect size (eta squared, μ^2) was calculated (i.e., the magnitude of the differences between public and private school students)

Statistical analyses were performed with IBM SPSS 21.0.

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RESULTS

STEP 1:

Results revealed that **private** school students (*M*= 25.02, *SD*= 5.26) **outperformed public** school students (*M*= 15.73, *SD*= 6.21) in fractional knowledge (see Table 1).

- The mean score of students in the private school was 9.2 points above the mean score of students in the public school.

- This implied that private school students were more able to build a relationship between the halves and the whole (see Item 3 in Figure 1), compare fractions using the half as a benchmark (see Item 11 in Figure 1), and/or identify fractions represented by a point on the number line (see Item 24 in Figure 1).

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RESULTS

TABLE 1. Means and Standard Deviations of FT Scores for the Public School and Private School Students

Group	Public School (N = 108)		Private School (N = 95)	
	M	*SD*	*M*	*SD*
Fractional Knowledge	15.73	6.21	25.02	5.26

Note. Total scores = 32.

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RESULTS

STEP 2:

Before analyzing the Independent Samples t-test for public and private school students, a preliminary assumptions check was done to investigate **whether the variation of FT scores for both groups is the same**.

Results of the Levene's Test yielded a significance value of .06 ($p > .05$) indicating that the variances of FT scores were the same across the two groups and that the assumption was not violated (see Table 2).

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RESULTS

STEP 3:

Regarding *Step 2*, equal variances were assumed leading us to investigate the differences between public and private schools.

Results of the t-test for Equality of Means showed that there was a statistically significant difference in the mean FT scores of the public school and private school students, $t(201) = 11.41$, $p = .00$ (two-tailed), with private school students receiving higher scores than public school students.

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RESULTS

TABLE 2. Independent Samples t-Test

	Levene's Test for Equality of Variances		t-Test for Equality of Means			
	F	*p*	*t*	*df*	*p*	*Mean Difference*
Fractional Knowledge	3.33	.069	11.41	201	.00*	9.29

Note. Total scores = 32.
*$p < .05$.

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RESULTS

STEP 4:

To check the magnitude of the mean difference, eta squared was calculated (Cohen, 1988).

Results revealed that the magnitude of the differences in the mean FT scores (M= 9.2) was very large (μ^2**= .39**).

- This implied that 39% of the variance in fifth-grade students' fractional knowledge can be explained by school type differences.

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DISCUSSION

All findings of this work lead to the conclusion that, in the beginning of the middle school, **an achievement gap in fractional knowledge exists**: Fifth grade students enrolled in private school were more able to, for instance, locate fractions on the number line, identify equivalent fractions, and solve fraction word problems.

With respect to differences by content domain, several studies illustrated that **mathematics shows the most relevant differences in favor of private schools** (e.g., Coleman & Hoffer, 1997).

- The current analysis of Turkish data supported these findings, which are particularly important in relation to the fact that private schools have more resources to implement different instructional methods (e.g., computer assisted learning) and perspectives (e.g., better discipline).

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DISCUSSION

The use of fruitful approaches → academic achievement → private school students would do better in mathematics than public school students.

Parents of private school students → sufficient financial affordance and value their children's schooling → bring about higher scores for private than for public school students.

Implications

To reduce the disparity between schools, educational policy makers can improve mathematics curriculum that provides every student with the opportunity to acquire core mathematical skills within appropriate time regardless of school type.

Future Research

Future researchers could conduct longitudinal studies to understand the reasons that led to the disparity between different types of schools.

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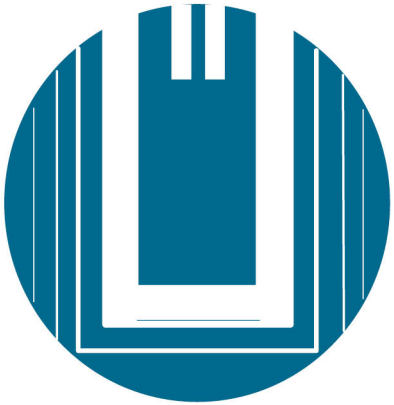
THANK YOU!...



OKULDA ÜNİVERSİTE

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