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*Full Length Research Paper*

# Debate participation and academic achievement among high school students in the Houston Independent School District: 2012 - 2015

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**Competitive debate programs exist across the globe, and participation in debate has been linked to improved critical thinking skills and academic performance. However, few evaluations have been able to adequately address self-selection into the activity when examining its impact on achievement. This study evaluated the relationship between participating in a debate program and academic performance among high school students (N=35,788; 1,145 debaters and 34,643 non-debaters) using linked debate participation and academic record data from the Houston Independent School District. Academic performance was indicated by cumulative GPA and performance on the SAT college entrance exam. Selection into debate was addressed using propensity score methods informed by sociodemographic characteristics and 8th grade standardized test scores to account for pre-debate achievement. Debate participation was associated with 0.66 points (95% Confidence Interval (CI): 0.64, 0.68) higher GPA, 52.43 points (95%CI: 50.47, 54.38) higher SAT Math, and 57.05 points (95% CI: 55.14, 58.96) higher SAT Reading/Writing scores. Findings suggest that competitive debate is associated with better academic outcomes for students.**

**Key words:** Achievement, program evaluation, testing, observational research, after school/co-curricular.

## INTRODUCTION

There are persistent gaps in academic achievement and college-readiness in urban, public school districts, especially among lower income and minority students (Banerjee, 2016). Policy makers and educators have advanced extracurricular learning to address these achievement disparities (Marsh and Kleitman, 2002). However, there is limited quantitative evidence supporting

the effectiveness of extracurricular programs at improving academic outcomes for lower income and/or minority secondary school students, especially regarding college-readiness. Research is particularly needed in districts that predominantly serve Latino/Hispanic students, the fastest growing group in K-12 schools (US Department of Education, 2020). De facto segregation by race and

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ethnicity remains in the US public school system. According to the US Department of Education, 95% of Hispanic and 96% of Black students attend a school that is at least 25% racial/ethnic minority; in comparison, only 52% of non-Hispanic white students attend a school that is at least 25% racial/ethnic minority (US Department of Education, 2020).

Competitive debate is a co-curricular activity centered on the communication of evidence-based argumentation. Pairs of students work together to debate both sides of policy-relevant topics (e.g., government support for renewable energy), and in the process practice academic skills including reading and interpreting complex non-fiction text, developing and responding to arguments orally and in writing, collaborative and cooperative learning, and time management (Mitchell, 1998). Debate leagues continue to grow worldwide, with international tournaments drawing debaters from up to 60 countries (English-Speaking Union, 2020). In addition, there is a large body of qualitative evidence supporting the positive impact of debate on critical thinking skills, school engagement, and personal development (Louden, 2010).

There are major challenges to isolating and quantifying the impact of extracurricular activities on academic performance. While there is an extensive literature, both quantitative and qualitative, describing the salience of a wide range of extracurricular activities (e.g., music, sports, theater) for adolescent development (Eccles et al., 2003; Eccles and Barber, 1999; Gibbs et al., 2015; Marsh and Kleitman, 2002), the causal evidence that *specific* activities enhance academic performance is limited. This stems from two methodologic issues that are challenging to address: First, the identification of an appropriate comparison group (Marsh and Kleitman, 2002); this is difficult because program evaluators often only have data on students who participate in the activity. Second, an adequate means to account for self-selection into the activity (Hunt, 2005); programs often only have data on students once they have begun participating, meaning that they cannot account for pre-activity academic performance when evaluating the impact of the program. Large academic administrative data systems, which can be linked to information regarding participation in extracurricular activities, provide an opportunity for addressing both of these limitations (Mezuk et al., 2011).

Using such large administrative data systems, a handful of studies have quantitatively evaluated the relationship between participating in a policy debate league and academic achievement in urban school districts. Mezuk et al. (2011) found that Chicago high school students who participated in debate were more likely to graduate from high school, performed better on the ACT college entrance exam, and gained more in GPA over the course of high school than comparable students who did not participate (Mezuk et al., 2011). A more recent report found that debate was associated with gains in standardized test scores and lower likelihood of

absenteeism among middle school students in Baltimore (Shackelford, 2019). Both the Mezuk et al. (2011) and Shackelford (2019) studies used propensity score methods to account for the non-random assignment (that is, self-selection) of students into debate programs; both identified that better-achieving students were more likely to self-select into debate, but that debate participation was still associated with academic outcomes even after accounting for this self-selection. In addition, other quantitative reports have examined the relationship between debate participation and indicators of psychosocial development (e.g., self-efficacy, civic engagement, etc.) and have reported positive correlations (Anderson and Mezuk, 2015; Kalesnikava et al., 2019). In sum, quantitative studies of debate participation in urban school districts show that while there is differential self-selection into debate, consistent with all extra-curricular activities (Hunt, 2005), debate participation is still associated with better academic performance after accounting for this self-selection.

The present study aims to extend this work by assessing the relationship between debate participation and indicators of academic achievement and college-readiness among a large sample of high school students from a district that serves a predominantly Hispanic/Latino student population. Data come from the Houston Urban Debate League (HUDL) and the Houston Independent School District (HISD), the largest school district in Texas, with records spanning 2012 to 2015. We use quasi-experimental propensity score methods to account for the non-random assortment of students into debate to attempt to isolate the influence of participation in this activity on academic achievement.

## METHODS

### Data sources

Two sources of de-identified data on three 9<sup>th</sup> grade cohorts (2012/13 through 2014/15) of students were merged to form the sample: 1) academic records from HISD and 2) debate participation records from HUDL. The analytic sample consisted of all HUDL participants ("debaters") during this period as indicated by debate tournament participation records. The comparison sample of non-debaters was created via a 30% random sample of 9<sup>th</sup> grade students who did not debate from each academic year (2012/13 to 2014/15), which equated to approximately 11,000 students from each 9<sup>th</sup> grade cohort. The resulting total sample for this analysis was 35,788 students, which consisted of 1,145 debaters (that is, students who participated in at least one debate tournament) and 34,643 non-debaters.

All demographic and academic performance variables were derived from HISD administrative records. Sociodemographic characteristics included sex, age in 9<sup>th</sup> grade, race (coded as Hispanic/Latino, Black, non-Hispanic white, Asian, Native American, and other for analysis), cohort year (2012/13, 2013/14 and 2014/15), and whether the student qualified for free/reduced cost lunch, which served as a proxy of economic disadvantage. Finally, to account for differential self-selection of students into debate as a function of academic performance, we indexed pre-debate (that is, 8<sup>th</sup> grade) achievement by performance on the Reading and Math

sections of the State of Texas Assessments of Academic Readiness (STAAR) test, a state-wide standardized exam (Texas Education Agency, 2021). While the exact percentiles on the STAAR sections vary year to year, for 8<sup>th</sup> grade, scores between 1700 – 1759 on the Reading and scores between 1700 – 1828 on the Math section are indicative that the student “Meets” academic readiness thresholds for those subjects; higher values indicate that the student “Masters” those subjects (Texas Education Agency, 2020).

### Outcome assessment

We examined two academic outcomes: cumulative GPA (that is, last recorded GPA for each student, modeled as a continuous variable) and performance on the Math and Evidence-based Reading/Writing sections of the SAT college entrance exam. For individuals who took the SAT multiple times only the highest score was used. The format of the SAT changed during the study period (The College Board, 2015); from 2005 to 2016 the SAT was scored out of a total of 2400 points with three sections (Math, Critical Reading, and Writing) each worth 800 points. We converted these to the current (2016 – present) SAT format, which includes two sections (Math and Reading/Writing Sections) which are each worth 800 points (for a total possible score of 1600 points), according to College Board concordance guidelines (The College Board, 2016). The SAT has identified benchmarks that represent “college-readiness” (that is, a 75% likelihood of attaining at least a “C” in first semester college course related to each section); these are scores of  $\geq 480$  for the Reading/Writing section and  $\geq 530$  for the Math section (The College Board, 2016). SAT performance was examined as both a continuous outcome (that is, average expected score on each section) and as a binary outcome (that is, met college readiness benchmark for the section).

### Treatment of missing data

Data in this study all come from administrative sources (e.g., debate tournament records and administrative school records) and as such, for some variables there is substantial missing data. As these data are unlikely to be missing completely at random, including only cases with complete data on all covariates ( $n=16,704$ ) in our analysis would have resulted in a biased sample (Leyrat et al., 2019). To address this missing data problem, we used Multiple Imputation with Chained Equations (MICE) (van Buuren and Groothuis-Oudshoorn, 2011). We imputed 10 complete datasets from the original data, with a maximum of 10 iterations per imputation, using the R MICE package (Version 3.6.0). We verified the plausibility of the imputed values (e.g., ensuring there were no cases of implausible age in 9<sup>th</sup> grade) using diagnostic plots comparing marginal distributions of observed and imputed data.

### Analysis

First, we compared the sociodemographic characteristics of debaters and non-debaters using Chi-squared tests for categorical variables and t-tests for continuous variables. This comparison clarifies to what degree debaters differed from students who did not debate, including differential self-selection into the activity, and provides a metric to assess the reach of the program (that is, which types of students are engaging in the debate league, and which are not).

Next, we used inverse probability of treatment weighting (IPTW) (Austin and Stuart, 2015) to account for selection bias in our estimates of the relationship between debate participation and the two outcome indicators of academic achievement (SAT

performance and GPA). IPTW addresses selection bias by weighting each observation in the dataset by the inverse of the probability (that is, propensity) they debated (e.g., students who are very likely to have debated, and did in fact debate, are down-weighted and students who are very unlikely to have debated, but did in fact debate, are up-weighted). This weighting creates a “pseudo-population” in which debaters and non-debaters are balanced based on their observed characteristics. In this manner, IPTW generates estimates of the debate-achievement relationship that are less biased than those that would be generated from standard multivariable regression (Austin and Stuart, 2015).

To generate the propensity score (that is, probability that a student debated), we used a two-step process: First, we fit a logistic regression model predicting debate participation (1=yes, 0=no) from observed socio-demographic characteristics (that is, sex, age in 9<sup>th</sup> grade, race, 9<sup>th</sup> grade cohort/year, and free/reduced lunch) and pre-debate achievement (that is, 8<sup>th</sup> grade STAAR reading and math scores) within each of the 10 imputed datasets. Next, from this logistic regression model, we estimated the predicted probability (that is, propensity, possible range: 0 (very unlikely to debate) to 1 (very likely to debate)) for each student in the sample. We generated the IPT weight for each student by taking the inverse of this probability (1/predicted probability of debate participation).

We then used this IPTW to fit regression models of debate predicting academic achievement (that is, GPA and SAT performance) using a two-step procedure: We fit a generalized linear model for each of the 10 imputed datasets estimating the effect of debate participation on each outcome (that is, GPA, SAT Math Score, and SAT Reading/Writing Score), using IPTW and adjusting for sex, age in 9<sup>th</sup> grade, race, ninth grade cohort, free/reduced lunch status, and 8<sup>th</sup> grade STAAR reading and math scores. Three alternative specifications of this model were considered: (1) unadjusted for all covariates while using IPTW, (2) unadjusted for all covariates using IPTW with the propensity score function including all interaction terms, and (3) adjusted for all covariates using IPTW with the propensity score function including all interaction terms. However, model fit was poor for the alternative models and the  $R^2$  was consistently highest for the fully adjusted model using IPTW with no interaction terms in the propensity score function. Finally, parameter estimates (beta coefficients) and standard errors were then pooled across the 10 imputed datasets into a single set of values for each indicator of achievement.

All data analysis was conducted in R Studio (3.5.2) and all p-values refer to two-tailed tests. This study was reviewed and deemed exempt from human subjects regulation by the Institutional Review Board at the University of Michigan. It was approved by the Office of Research and Accountability at HISD.

## RESULTS

As shown in Table 1, nearly two-thirds of the sample was Hispanic/Latino and three-quarters qualified for free/reduced lunch, a proxy indicator of socioeconomic disadvantage. This is consistent with the overall demographics of the HISD (Houston Independent School District, 2021), indicating that our sample was representative of the district as a whole. Debaters were slightly younger in 9<sup>th</sup> grade and were more likely to be female and Asian or non-Hispanic White compared to non-debaters; there was no difference in free/reduced lunch status. While 8<sup>th</sup> grade STAAR test scores were significantly higher for debaters, consistent with differential self-selection of higher-achieving students into the activity, even among debaters these higher scores

**Table 1.** Characteristics of Houston Independent School District High School students by debate participation.

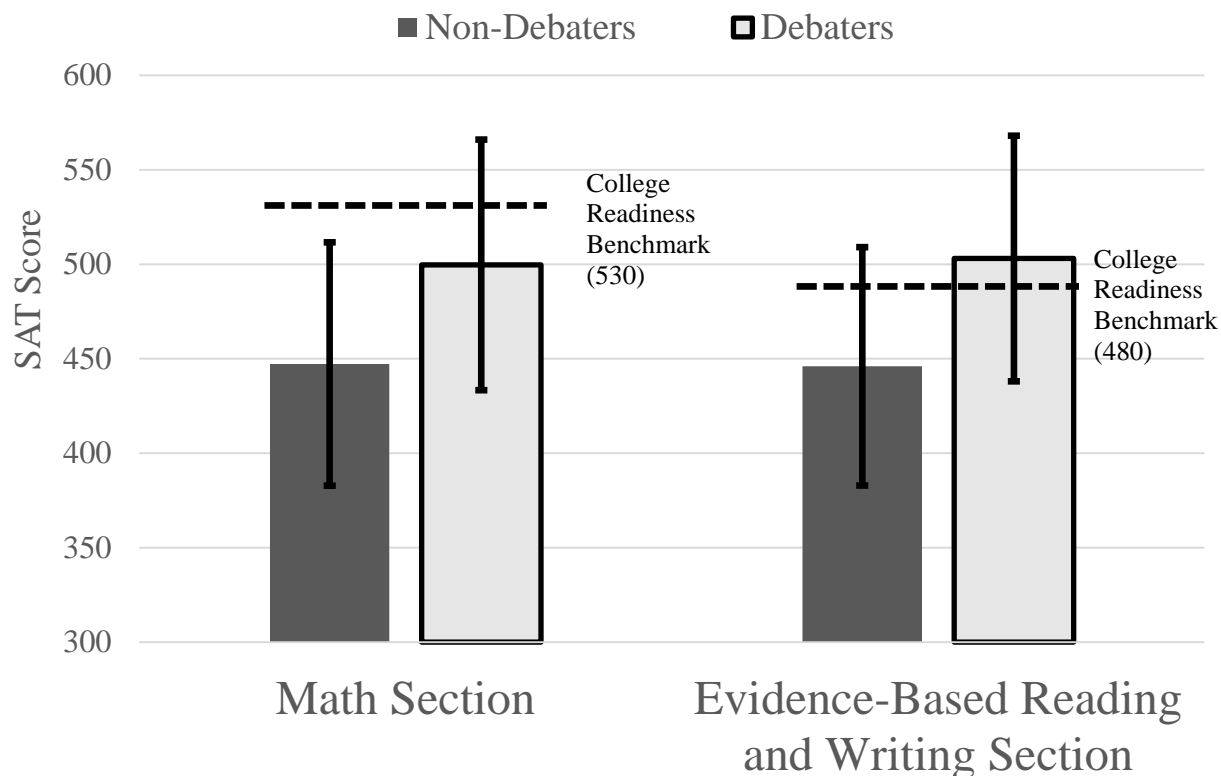
Parameter	Overall (n=35,788)	Debaters (n=1,145)	Non-debaters (n=34,643)	Test statistic	df	p
<b>Sex</b>						
Female	17255 (48.2%)	639 (55.8%)	16616 (48.0%)	27.0	1	<.0001
Male	18533 (51.8%)	506 (44.2%)	18027 (52.0%)			
<b>Age in 9th Grade</b>						
Mean (SD)	14.5 (0.836)	14.1 (0.480)	14.5 (0.841)	26.0	1203	<.0001
Missing	131 (0.4%)	131 (11.4%)	0 (0%)			
<b>Race</b>						
Asian	1275 (3.6%)	109 (9.5%)	1166 (3.4%)	137.8	4	<.0001
Black	9089 (25.4%)	303 (26.5%)	8786 (25.4%)			
Hispanic/Latino	22982 (64.2%)	637 (55.6%)	22345 (64.5%)			
Other	334 (0.9%)	17 (1.5%)	317 (0.9%)			
Non-Hispanic white	2108 (5.9%)	79 (6.9%)	2029 (5.9%)			
<b>Ninth grade cohort</b>						
2012-2013	11407 (31.9%)	395 (34.5%)	11012 (31.8%)	4.1	2	0.13
2013-2014	12099 (33.8%)	380 (33.2%)	11719 (33.8%)			
2014-2015	12282 (34.3%)	370 (32.3%)	11912 (34.4%)			
<b>Free/reduced lunch status</b>						
No	9252 (25.9%)	310 (27.1%)	8942 (25.8%)	0.9	1	0.35
Yes	26536 (74.1%)	835 (72.9%)	25701 (74.2%)			
<b>STAAR reading score</b>						
Mean (SD)	1740 (312)	1770 (196)	1730 (315)	5.6	1004	<.0001
Missing	8500 (23.8%)	289 (25.2%)	8211 (23.7%)			
<b>STAAR Math score</b>						
Mean (SD)	1730 (322)	1750 (237)	1730 (325)	2.0	774.8	0.05
Missing	10709 (29.9%)	446 (39.0%)	10263 (29.6%)			
<b>SAT Math section score</b>						
Mean (SD)	471 (108)	525 (112)	469 (108)	15.9	1135	<.0001
Missing	14140 (39.5%)	108 (9.4%)	14032 (40.5%)			
<b>SAT reading/writing section score</b>						
Mean (SD)	470 (107)	534 (109)	467 (106)	19.4	1137	<.0001
Missing	14140 (39.5%)	108 (9.4%)	14032 (40.5%)			
<b>GPA</b>						
Mean (SD)	2.61 (0.958)	3.38 (0.800)	2.58 (0.951)	32.8	1264	<.0001
Missing	5668 (15.8%)	9 (0.8%)	5659 (16.3%)			

P-value refers to comparison between debaters and non-debaters. Test statistic refers to a Chi2 for categorical variables and t-test for continuous variables.

were still only in the “meets” academic readiness category.

Using IPTW to account for self-selection into debate, the average cumulative GPA for debaters was 0.66 points (95% Confidence Interval (CI): 0.64, 0.68) higher

than comparison students. Similarly, debate participation was associated with 52.43 points (95% CI: 50.47, 54.38) higher score on the Math and 57.05 points (95% CI: 55.14, 58.96) higher score on the reading/writing section of the SAT. As shown in Figure 1, debate participants



**Figure 1.** Average SAT performance by debate status among high school students in the Houston Independent School District, 2012/13 to 2014/15. IPTW adjusted average SAT performance by debate participation status. Estimates are pooled from imputed data. IPTW estimated using sociodemographic characteristics and 8<sup>th</sup> grade standardized test scores. Error bars indicate 95% confidence intervals. College-readiness benchmarks are those scores provided by the SAT to indicate a 75% likelihood of attaining at least a C in first semester courses related to the section (e.g., a quantitative-oriented course for the Math SAT).

**Table 2.** Sensitivity analyses examining the relationship between debate participation and GPA and SAT performance under three analytic scenarios

Outcome	Complete case linear regression analysis (n=16,704)	95% confidence interval	Multiple imputation linear regression analysis (n=35,788)	95% confidence interval	Multiple imputation IPTW analysis (n=35,788)	95% confidence interval
	Beta		Beta		Beta	
Cumulative GPA	0.57	[0.51, 0.63]	0.60	[0.55, 0.65]	0.66	[0.64, 0.68]
SAT Math Score	40.65	[33.82, 47.47]	52.86	[47.29, 58.45]	52.43	[50.47, 54.38]
SAT Reading/Writing score	47.70	[41.02, 54.39]	61.02	[55.57, 6.65]	57.05	[55.14, 58.96]

Three analytic scenarios: (1) Complete case analysis (no imputation, standard linear regression modeling), (2) Multiple imputation (pooled across 10 imputed datasets, standard linear regression modeling) and (3) Inverse probability of treatment weighting (with multiple imputation).

were significantly more likely to meet the college-readiness benchmark on the Reading/Writing (Odds ratio: 1.18, 95% CI: 1.13, 1.23) section, but not the Math section, of the SAT.

The substantive impact of our analytic decision to use IPTW on our inferences is shown in Table 2. This table illustrates the estimates from 1) Complete case analysis

(that is, not using MICE) using standard generalized linear models (that is, not using IPTW), 2) Imputed data using standard linear models (that is, not using IPTW), and 3) Imputed data analyze using IPTW models. Across all three of these modeling approaches, debate participation was significantly associated with both GPA and SAT outcomes; the results of the IPTW show that the

relationship between debate and academic achievement was robust to differential self-selection based on observed sociodemographic characteristics and 8<sup>th</sup> grade (pre-debate) achievement as indicated by the STAAR standardized test performance.

## DISCUSSION

Competitive academic debate programs exist in thousands of communities around the globe, including recent growth in urban school districts in the United States (International Debate Education Association, 2017). Prior research has described the benefits of debate participation for outcomes such as critical thinking skills (Green and Klug, 1990; Kennedy, 2007), as well as self-efficacy and various indicators of social/emotional development (Anderson and Mezuk, 2015; Fine, 2004; Kalesnikava et al., 2019), that are in turn correlated with school engagement (Bellon, 2000). The present study, which is one of the largest quantitative evaluations of debate participation and achievement among high school students conducted to date, extends this work by providing robust evidence of the benefits of debate on academic performance and college readiness. These findings are consistent with those of prior studies in Chicago (Mezuk, 2009; Mezuk et al., 2011), which found that debate participants were more likely to reach college-readiness benchmarks on the ACT college entrance exam; this study, which is the first to examine the relationship between debate participation and performance on the SAT college entrance exam, similarly found stronger effects on the Reading/Writing versus Math sections of the test. Findings are also consistent with research among middle school students in Baltimore (Shackelford, 2019), which found positive impacts of debate on school engagement and standardized test scores entering into high school. In sum, this study adds to the growing literature showing that debate participation is associated with improved academic outcomes for adolescents in large urban districts.

Findings should be interpreted considering study strengths and limitations. Consistent with prior work on debate, and extra-curricular activities in general, there was differential self-selection of students with stronger academic performance in middle school into this high school debate program (Hunt, 2005; Mezuk et al., 2011). While this study used propensity score weighting to account for this self-selection when estimating the relationship between debate participation and achievement, the validity of IPTW methods to mimic an experimental design requires strong, and generally untestable, assumptions about unmeasured confounders and measurement error. Therefore, while our approach reduces the bias that such threats to validity introduced to our inferences, we cannot exclude the possibility of residual confounding due to unmeasured factors (e.g., participation in other extra-curricular activities in high

school, parental/familial characteristics, non-cognitive skills such as grit (Heckman et al., 2006; Im et al., 2016; Shelly, 2011)). Strengths include the large sample with a diverse racial/ethnic study body, longitudinal design, and indicators of pre-debate achievement to minimize the bias introduced by self-selection into debate through IPTW methods.

The Hispanic/Latino population is the largest ethnic minority group in the United States, currently representing approximately 27% of K-12 public school students (US Department of Education, 2020). This is one of the first quantitative studies to examine the relationship between debate participation and academic outcomes in a predominantly Latino/Hispanic school district, and these findings are consistent with prior work examining co-curricular activities and school engagement among Latino/Hispanic students. For example, Diaz (2005) reported that Latino high school students who engaged in more extracurricular activities reported higher levels of school engagement, although this was a general phenomenon and not specific to any particular activity (Diaz, 2005). Similarly, LeCroy and Krysik (2008) reported that having a higher number of pro-academic peers were associated with both higher GPA and more school engagement among Latino middle school students (LeCroy and Krysik, 2008). As the number of Hispanic/Latino students grows, debate leagues have worked to ensure their programming is accessible to these students; for example, several leagues offer Spanish language debate competitions (e.g., leagues in Minnesota (Minnesota Urban Debate League, 2021) and New York (Zimmerman, 2019)).

In sum, the present study adds to the literature illustrating the role of time-intensive, academically-oriented extra-curricular activities like debate for supporting school achievement for students in urban districts (Mariana et al., 2006). It demonstrates the potential of large administrative data systems to support rigorous evaluations of the impact of such programs on student achievement at scale (Mezuk et al., 2011). When viewed in combination with the large body of qualitative and ethnographic work that has explored the various ways that competitive debate relates to adolescent development (Asad and Bell, 2014; Branham, 1995; Fine, 2004), these findings emphasize the salience of this activity for student engagement with learning both inside and outside the classroom (Louden, 2010).

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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## REFERECES

- Anderson S, Mezuk B (2015). Positive Youth Development and Participation in an Urban Debate League: Results from Chicago Public Schools, 1997-2007. *The Journal of Negro Education* 44(3):362-378.
- Asad AL, Bell MC (2014). Winning to Learn, Learning to Win: Evaluative Frames and Practices in Urban Debate. *Qualitative Sociology* 37(1):1-26.
- Austin PC, Stuart EA (2015). Moving towards best practice when using inverse probability of treatment weighting (IPTW) using the propensity score to estimate causal treatment effects in observational studies. *Statistics in Medicine* 34(28):3661-3679.
- Banerjee PA (2016). A systematic review of factors linked to poor academic performance of disadvantaged students in science and maths in schools. *Cogent Education* 3(1):1178441.
- Bellon J (2000). A Research-Based Justification for Debate Across the Curriculum. *Argumentation and Advocacy* 36(3):161-175.
- Branham RJ (1995). "I Was Gone on Debating": Malcolm X's Prison Debates and Public Confrontations. *Argumentation and Advocacy* 31(3):117-137.
- Diaz JD (2005). School Attachment Among Latino Youth in Rural Minnesota. *Hispanic Journal of Behavioral Sciences* 27(3):300-318.
- Eccles JS, Barber BL (1999). Student Council, Volunteering, Basketball, or Marching Band: What Kind of Extracurricular Involvement Matters? *Journal of Adolescent Research* 14(1):10-43.
- Eccles JS, Barber BL, Stone M, Hunt J (2003). Extracurricular Activities and Adolescent Development. *Journal of Social Issues* 59(4):865-889.
- English-Speaking Union (2020). World Schools Debating Championships. ESU. <https://www.esu.org/competitions/wscd/>
- Fine GA (2004). Adolescence as Cultural Toolkit: High School Debate and the Repertoires of Childhood and Adulthood. *The Sociological Quarterly* 45(1):1-20.
- Gibbs BG, Erickson LD, Dufur MJ, Miles A (2015). Extracurricular associations and college enrollment. *Social Science Research* 50:367-381.
- Green CS, Klug HG (1990). Teaching Critical Thinking and Writing through Debates: An Experimental Evaluation. *Teaching Sociology* 18(4):462-471.
- Heckman JJ, Stixrud J, Urzua S (2006). The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior. *Journal of Labor Economics* 24(3):411-482.
- Houston Independent School District (2021). General Information / Facts and Figures. <https://www.houstonisd.org/Page/41879>
- Hunt HD (2005). The Effect of Extracurricular Activities in the Educational Process: Influence on Academic Outcomes? *Sociological Spectrum* 25(4):417-445.
- Im MH, Hughes JN, Cao Q, Kwok O (2016). Effects of Extracurricular Participation During Middle School on Academic Motivation and Achievement at Grade 9. *American Educational Research Journal* 53(5):1343-1375.
- International Debate Education Association (2017). About IDEA. Retrieved from <https://idebate.org/about-idea-nw/>
- Kalesnikava VA, Ekey GP, Ko TM, Shackelford D, Mezuk B (2019). Grit, growth mindset and participation in competitive policy debate: Evidence from the Chicago Debate League. *Educational Research and Reviews* 14(10):358-371. <https://doi.org/10.5897/ERR2019-3707>
- Kennedy R (2007). In-Class Debates: Fertile Ground for Active Learning and the Cultivation of Critical Thinking and Oral Communication Skills. *International Journal of Teaching and Learning in Higher Education* 19(2):183-190.
- LeCroy CW, Krysik J (2008). Predictors of Academic Achievement and School Attachment among Hispanic Adolescents. *Children and Schools* 30(4):197-209. <https://doi.org/10.1093/cs/30.4.197>
- Leyrat C, Seaman SR, White IR, Douglas I, Smeeth L, Kim J, Resche-Rigon M, Carpenter JR, Williamson EJ (2019). Propensity score analysis with partially observed covariates: How should multiple imputation be used? *Statistical Methods in Medical Research* 28(1):3-19.
- Louden AD (2010). Navigating Opportunity: Policy Debate in the 21st Century. International Debate Education Association.
- Marsh HW, Kleitman S (2002). Extracurricular school activities: The good, the bad, and the nonlinear. *Harvard Educational Review* 72(4):464-514.
- Mezuk B (2009). Urban Debate and High School Educational Outcomes for African American Males: The Case of the Chicago Debate League. *The Journal of Negro Education* 78(3):290-304.
- Mezuk B, Bondarenko I, Smith S, Tucker E (2011). Impact of participating in a policy debate program on academic achievement: Evidence from the Chicago Urban Debate League. *Educational Research and Reviews* 6(9):622-635.
- Minnesota Urban Debate League (2021). Spanish Debate—Community Topic. Minnesota Urban Debate League. <https://www.augsburg.edu/urbandebateleague/sdl/>
- Mitchell GR (1998). Pedagogical Possibilities for Argumentative Agency in Academic Debate. *Argumentation and Advocacy* 35(2):41-60.
- Moriana JA, Alós F, Alcalá R, Pino MJ, Herruzo J, Ruiz R (2006). Extracurricular activities and academic performance in secondary students. *Electronic Journal of Research in Educational Psychology* 4(8):12.
- Shackelford D (2019). The BUDL Effect: Examining Academic Achievement and Engagement Outcomes of Preadolescent Baltimore Urban Debate League Participants. *Educational Researcher* 48(3):145-157.
- Shelly B (2011). Bonding, Bridging, and Boundary Breaking: The Civic Lessons of High School Student Activities. *Journal of Political Science Education* 7(3):295-311.
- Texas Education Agency (2020). 2017–2018 STAAR Raw Score Conversion Tables. Texas Education Agency. <https://tea.texas.gov/texas-schools/accountability/academic-accountability/performance-reporting/2017-2018-staar-raw-score-conversion-tables>
- Texas Education Agency TE (2021, January 8). Testing. Texas Education Agency. <https://tea.texas.gov/student-assessment/testing>
- The College Board (2015). Compare SAT Specifications. SAT Suite of Assessments. <https://collegereadiness.collegeboard.org/sat/inside-the-test/compare-old-new-specifications>
- The College Board (2016). The College and Career Readiness Benchmarks for the SAT Suite of Assessments. SAT Suite of Assessments. <https://collegereadiness.collegeboard.org/about/scores/benchmarks>
- US Department of Education (2020). The Condition of Education—Preprimary, Elementary, and Secondary Education—Elementary and Secondary Enrollment—Racial/Ethnic Enrollment in Public Schools. [https://nces-ed-gov.proxy.lib.umich.edu/programs/coe/indicator\\_cge.asp](https://nces-ed-gov.proxy.lib.umich.edu/programs/coe/indicator_cge.asp)
- US Department of Education (2020). Bar Chart Races: Changing Demographics in K–12 Public School Enrollment | White House Hispanic Prosperity Initiative. <https://sites.ed.gov/hispanic-initiative/2020/07/bar-chart-races-changing-demographics-in-k-12-public-school-enrollment/>
- van Buuren S, Groothuis-Oudshoorn K (2011). Mice: Multivariate Imputation by Chained Equations in R. *Journal of Statistical Software* 45(1):1-67.
- Zimmerman A (2019). This bilingual debate team in NYC is fighting 'English-only norms' at national competitions. Chalkbeat New York. <https://ny.chalkbeat.org/2019/9/19/21121785/this-bilingual-debate-team-in-nyc-is-fighting-english-only-norms-at-national-competitions>



*Full Length Research Paper*

# Mathematics anxiety, attitude and performance among secondary school students in Kenya

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**Mathematics anxiety and attitude have a great influence on mathematics performance. This article presents an analysis of the relationship between Mathematics anxiety, attitude and performance. The study adopted a correlational research design. The analysis is based on the responses of 367 students who were randomly selected from 55 secondary schools. An adapted Mathematics Anxiety Scale (MAS) and Attitude towards Mathematics Inventory (ATMI) were used. The performance grades for the students were also gathered from the teachers whereby the list that contained the students' marks also contained the admission numbers of the students for easier linkage with the individual student questionnaire. The data were analyzed using the scatter plot diagram to give the outline of the relationship and Spearman's correlation coefficient to find out whether there is a significant relationship between Mathematics anxiety, Mathematics attitude and performance. There was a positive significant linear relationship between Mathematics anxiety and Mathematics attitude ( $r = 0.538$ ,  $p < 0.05$ ). There was a negative significant linear relationship between Mathematics performance and Mathematics anxiety ( $r = -0.723$ ,  $p < 0.05$ ). This shows that Mathematics attitude correlates with Mathematics anxiety which later correlates with Mathematics performance of the students, hence the two variables should be given appropriate attention to produce better and positive results in terms of performance.**

**Key words:** Mathematics anxiety, Mathematics attitude, Mathematics performance.

## INTRODUCTION

Mathematics is a fundamental part of school curriculum as a subject and acts as a tool for the development of other sciences. Mathematics is essential in every facet of life as numeracy skills become a requirement to function effectively in daily life (Gafoor and Kurukkan, 2015). Mathematics stimulates involvement and success in many careers especially those in the fields of Science, Technology, Engineering, and Mathematics (STEM)

(Ferguson et al., 2015). Following research findings that mathematics as a subject is poorly performed the following factors are attributed to the same; inadequacy of resources and teaching personnel, anxiety and fear of Mathematics, poor teaching methods, overcrowded classrooms and mathematics attitude of students (Sa'ad et al., 2014).

Scarpello (2007) reports that seventy-five percent of

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Americans stop the study of Mathematics and avoid many careers that related to mathematics. Mathematics anxiety is one of the main reasons for these avoidance behaviours (Gafoor and Kurukkan, 2015). Ashcraft (2002) reported that students show a severe negative emotional response in situations that involve numerical and mathematical activities, a situation referred to as Math anxiety (Ruff and Boes, 2014). Mathematics anxiety is a feeling of fear and tension towards mathematics which can result to an individual's inability to do mathematics. It is therefore vital to detect math anxiety in children to prevent them from developing an avoidance of mathematics which might bring about lasting effects (Aarnos and Perkkilä, 2012). The levels of anxiety can either be of high, moderate or low. Low/moderate levels result in students focusing on mathematics computations and problem solving, while high levels result in much tension which prevents the students from participating in the mathematical task ahead.

Haladyna et al. (1983) termed mathematics attitude as either a positive or negative feeling or expression towards mathematics. Zan and Martino (2009) identify three dimensions within attitude towards mathematics: emotional disposition, vision of mathematics, and perceived competence. This implies that Mathematics attitude is a feeling of like or dislike for mathematics (Zan and Martino, 2009; Haladyna et al., 1983). Mathematics attitude can either be positive or negative. Positive mathematics attitude enables the students to be focused on mathematics computations and problem solving; negative attitude diverts the students' mind from concentrating on mathematics computation and solving problems. They look at mathematics as challenging. Studies show a relationship between mathematics anxiety and attitude and the two variables influence mathematics performances.

Students' performance in mathematics is influenced by Mathematics anxiety, Mathematics attitude, inadequate learning and teaching resources, strategies and the teaching and learning environments (Oyugi, 2018; Ndinda, 2016; Githaiga, 2019). Mathematics anxiety and Mathematics attitude are caused by environmental factors (Shaikh, 2013). Environmental factors are associated with the surrounding where students learn mathematics. Environment can influence students' attitude towards mathematics or cause anxiety. Students need conducive environment to learn mathematics.

Instructional methodologies that are used for teaching embrace a key role in children's ambitions to pursuing future career choices related to mathematics. The old teaching practices such as expectations on correct answers, fear of making errors, and rote calculations and memorizations are said to be the contributing factors to students' anxiety and attitude towards mathematics in basic classrooms (Hacıömeroğlu, 2017). According to Yeo et al. (2015), teachers can influence Mathematics attitude and anxieties in students when they embarrass

them in front of others, assign many complex assignments and when they delay in helping students solve problem after consultation. The teacher's mode of introducing a concept to students plays a great role in a students' performance. If a teacher uses difficult terms to teach the students, this may disengage the students causing Mathematics anxiety. Teachers should avoid increasing the anxiety levels of Mathematics in students.

The students' attitude towards mathematics and anxiety can be promoted by their own family background factors in connection to Mathematics. A study carried out in India by Soni and Kumari (2017) asserts that parental Mathematics anxiety and attitude may lead to mathematics anxiety and influence students' attitude towards mathematics. When parents' anxiety is high that of their children increases especially if they help them to do their homework. This is because parents express to their own children their own dislike and frustration with Mathematics. According to Maloney et al. (2015), attitude can be transmitted socially to students during early learning.

### **Relationship between mathematics anxiety and mathematics attitude**

Mathematics anxiety may influence mathematics attitude towards mathematics problems directly or indirectly (Kargar et al., 2010), where students develop avoidance behaviors towards mathematics. First, mathematics anxious students may avoid mathematics courses or subjects dealing with mathematical tasks and this may mean that these students do not gain competence or mastery of mathematics operations. Second, mathematics anxiety may influence mathematics attitude. Math's anxious students may attempt to evade particular classes and their anxiety may directly affect their ability to successfully complete math's problems (Plaisance, 2009).

Students who achieve a positive mathematics attitude can solve all mathematics problems provided that they have low level of mathematics anxiety. Akin and Kurbanoglu (2011) postulated that there is a negative link between math anxiety and positive attitudes. Math anxiety is related to insights of one's own mathematical abilities in relation to skills in other subject areas and with negative math attitudes. Simply, negative attitudes have negative results in mathematics thus generating math anxiety (Vinson, 2001). Also, when one takes math anxiety as a state of uneasiness which occurs in response to situations involving mathematical tasks which can often create a negative attitude toward the subject (Zettle and Raines, 2002), the relationships between math anxiety and math attitudes are easily understandable. That means that negative math attitudes promoted mathematics anxiety to be high while positive attitude decreased mathematics anxiety (Akin and

Kurbanoglu, 2011). Chaman and Callingham (2013) posited that there is a relationship between mathematics anxiety and mathematics attitude.

Research in Kenya has shown that students had negative attitude towards mathematics (Githaiga, 2019). This is further supported by Ndinda (2016) who posited that poor attitudes towards mathematics lead to poor performance (Oyugi, 2018). Further, consistent failure in Mathematics is attributed to students' attitudes towards Mathematics as a subject (Manoah et al., 2011; Nui and Wahome, 2006). There existed a correlation between anxiety levels and academic achievement; high anxiety resulted in poor academic results while moderate levels of anxiety resulted in high academic results recorded in Mathematics by the students (Syokwaa et al., 2014). This shows that both Mathematics anxiety and attitude affect the performances in Mathematics, though attitude is directly proportional to achievement while anxiety is indirectly proportional (Mweni, 2015).

### **Relationship between mathematics anxiety and performance**

Mathematics anxiety has been found to make students avoid Mathematics lessons resulting in poor performance in mathematics (Buckley et al., 2016). Individual and environment factors contribute to Mathematics anxiety leading to poor performance (Chang and Beilock, 2016). Individual factors may be the memory coordination while solving mathematical problems and again how one is motivated to undertake the problem at hand. Environmental factors that stimulate Mathematics anxiety include students' perception about the classroom environment, parental support and also teachers' classroom activities. The reasons for avoidance are often associated with fears and worries about their abilities to pass Mathematics (Maloney and Beilock, 2015). These fears result in difficulties in basic numerical processing and low performance in courses related to numerical reasoning (Núñez-Peña et al., 2013; Maloney et al., 2011). These difficulties brought by avoidance of Mathematics therefore may result in Mathematics anxiety together with poor performance in Mathematics.

Radišić et al. (2015) provide an evidence that students displaying high Mathematics anxiety symptoms score low marks; the lower level of Mathematics anxiety has been associated with the achievement and interest in Mathematics, and high Mathematics self-concept. This is because high anxiety results in less achievement in the performance of mathematical related problems (Ifamuyima and Rosanwo, 2016). They further argue that when the students have moderate anxiety they settle down and face the task at hand; and this results in better outcome in mathematics content and performance.

Moderate level of Mathematics anxiety is linked to achievement and interest in Mathematics, high Mathematics self-concept, and conducive school and

classroom atmosphere. Again the atmosphere in which the learning takes place is essential for students' Mathematics anxiety determination. Similarly, a study carried out in the Netherlands by Macher et al. (2012) postulates that Mathematics anxiety holds a crucial role in Mathematics performance. When students become anxious Mathematics performances becomes low compared to students with moderate levels of anxiety. Mathematics anxious students feel stressed and worried about carrying out simple mathematics tasks and they usually perform poorly in Mathematics (Bekdemir, 2010).

The relationship between mathematics anxiety and performance can be linked to arousal performance theory by Yerkes and Dodson (1908). In their theory, they posits that; 'if arousal increases, performance will also increase but if arousal becomes too great and continuous then performance would deteriorate'. The theory has two assumptions namely; increase in arousal results in decrease in performance and moderate arousal results in optimal performance. During the onset of arousal, a student is confident to have the ability to control the arousal pressure and this may increase his performance. Once the arousal becomes so great the student would start to become less confident on the ability to control the pressure and the performance would drop. For good performance, there is a need for little arousal. The arousal can be linked to a task that can influence anxiety levels. If there is no arousal then there is no anxiety which allows respondents to be relaxed and not engage in any Mathematics task resulting to poor performance. When the anxiety is mild or moderate the respondents enjoy the ability to control it and work towards the Mathematics task. This results in high performance; when the anxiety is very high then the respondents' performance is threatened since they cannot deal with the high anxiety together with the task.

There is a relationship between mathematic anxiety and mathematical performance (Syokwaa et al., 2014). Further, there exists a correlation between anxiety levels and academic achievement; high anxiety leads to poor academic results while moderate levels of anxiety lead to high academic results. High anxiety affects students' ability to perform effectively in Mathematics.

## **METHODOLOGY**

### **Research design**

The study adopted a correlational research design. The design allows one to know if there exists any relationship between the study's two variables. The design used the survey method of data collection which provided the respondents' tools to gauge their opinions they had experienced on variables (Mathematics anxiety and mathematics attitude) after which the relationships were established.

### **Participants**

A total of 367 students from 55 public secondary schools were

**Table 1.** KCSE grading system.

Score range (Mathematics)	Points	Grade
70-100	12	A
65-69	11	A-
60-64	10	B+
55-59	9	B
49-54	8	B-
43-48	7	C+
37-42	6	C
31-36	5	C-
25-30	4	D+
19-24	3	D
12-18	2	D-
0-11	1	E

selected to take part in the study. The sample consisted of 170 (46.3%) male and 197 (53.7%) female students. The participants were 13-20 years old.

## Research instruments

### *Mathematics Anxiety Scale (MAS)*

Math anxiety was measured using an adapted 14 item Mathematics Anxiety Scale (Mahmood and Khatoon, 2011). There are 7 negatively worded items and 7 items positively worded used to measure students' Mathematics anxiety. The Mathematics Anxiety Scale (MAS) is 5- point Likert scale that were scored as 1- never, 2- rarely, 3- sometimes, 4-often and 5- always for the negative items and the scoring was reversed for the positive items in MAS. The scores ranged from 14-70 with high score indicating higher levels of math anxiety. The respondents who scored 14-32 were classified as low level of anxiety, 33-51 were classified as moderate in anxiety, while those who scored between 52-70 were high in anxiety. The MAS showed an acceptable consistency with a Cronbach's alpha of 0.719 which is within Cronbach alpha of 0.87 reported by Mahmood and Khatoon (2011).

### *Attitude towards Mathematics Inventory (ATMI)*

Mathematics attitude was measured using an adapted 40 item Attitude towards Mathematics Inventory (Tapia and Marsh, 2004). The ATMI is a 4- point Likert scale that was scored as 1,2,3 and 4 to represent strongly agree, agree, disagree and strongly disagree respectively. The scores ranged from 40-160 with high score indicating negative attitude. The students' attitude was either positive or negative whereby the scores 40-86 had positive attitude and 87-160 had negative attitude towards Mathematics. The ATMI showed a good reliability with a Cronbach's alpha of 0.744 which is within Cronbach alpha of 0.93 reported by Tapia and Marsh (2004).

### *Students' performance*

The opener mathematics scores were obtained from the respective teachers. The opener exam is an exam that is done at the beginning of a new term once students resume from holidays. The students' score ranges from 0 to 100% with their respective grade

ranging from E to A. The higher score (41-100%) was regarded as high performance and the lower scores (0-40%) were regarded as low performance. The scores for the participants were obtained easily since the students were requested to write their admission numbers on the questionnaires for easy identification with what the teachers provided. The grading system as per Kenya Certificate of Secondary Education (KCSE) year 2019 is shown in Table 1.

## Data collection procedure

An introductory letter received from the university of Embu enabled the researcher to acquire a research permit from the National Commission for Science, Technology, and innovations (NACOSTI). The researcher also obtained a consent letter from the County Director of Education, Meru County before seeking permission from the school principals in preparation for data collection. Thereafter, the researcher visited the schools in person and assured the study participants of total confidentiality with the information. Form three and form four students between 13 and 20 years old were randomly selected to participate in the study. The students from all the schools were presented with the scale during Mathematics class time in a regular school term. The participants were guided on how to fill the questionnaire by the researcher. The participants were asked to respond to questions independently. The questionnaire took 20 min to complete.

## Data analysis

The edited data were coded and the analysis made by means of the statistics package for social sciences (SPSS). The students' demographic information was analyzed using descriptive statistics tables to get the percentages, means and standard deviations. The scatter plot diagram was used as it could give an outline about the relationship between mathematics anxiety, attitude and performance before the correlations were done. Spearman rho correlation coefficient was done so as to show whether there existed a relationship between mathematics anxiety, mathematics attitude and performance. The two tests were used to determine whether there was a significance relationship between mathematics anxiety, mathematics attitude and performance.

## RESULTS

### Students' demographic information

The results in Table 2 show that out of a total of 367 students, 53.7% were females and 46.3% were males. From the total, majority (82%) of the students were between 16-20 years old (Mean =1.546, S.D = 0.3354), 14.7% between 13-15 years (mean = 0.278, S.D = 0.0602), while (3.3%) were above 20 years (Mean= .062, S. D = 0.0134).

The results in Table 3 show that 33% of the students had low anxiety, 32.7%, moderate, and 34.3%, high anxiety. Further, females and males with low anxiety were 17.2 and 15.8%, respectively. In addition, moderately low anxiety was reported among the male students who scored 15% compared to females who scored 17.7%. The scores on high levels of anxiety further show that females scored 15% with males, 18.8%.

This implies that the three levels of anxiety were

**Table 2.** Students' demographic information.

Students' demographic information		Frequency	Percentage
Gender	Female	197	53.7
	Male	170	46.3
Age	13-15	54	82
	16-20	301	14.7
	Above 20	12	3.3

**Table 3.** Students' anxiety levels.

Scores	Levels	Total	Gender	No.	Mean	SD
14-32	Low	121(33%)	Male	58 (15.8%)	0.1580	0.2257
			Female	63(17.2%)	0.1717	0.2451
33-51	Moderate	120(32.7%)	Male	55(15%)	0.2997	0.4306
			Female	65(17.7%)	0.3543	0.5089
52-70	High	126(34.3%)	Male	57(15.5%)	0.4659	0.6453
			Female	69(18.8%)	0.5640	0.7811

**Table 4.** Students' attitude towards mathematics.

Scores	Levels	Total	Gender	No.	Mean	SD
40-86	Positive	193(52.6%)	Male	94 (25.6%)	22.3	3.1
			Female	99(27.0%)	23.5	3.3
87-160	Negative	174(47.4%)	Male	76(20.7%)	18.0	2.5
			Female	98(26.7%)	23.3	3.4

**Table 5.** Students' mathematics performance .

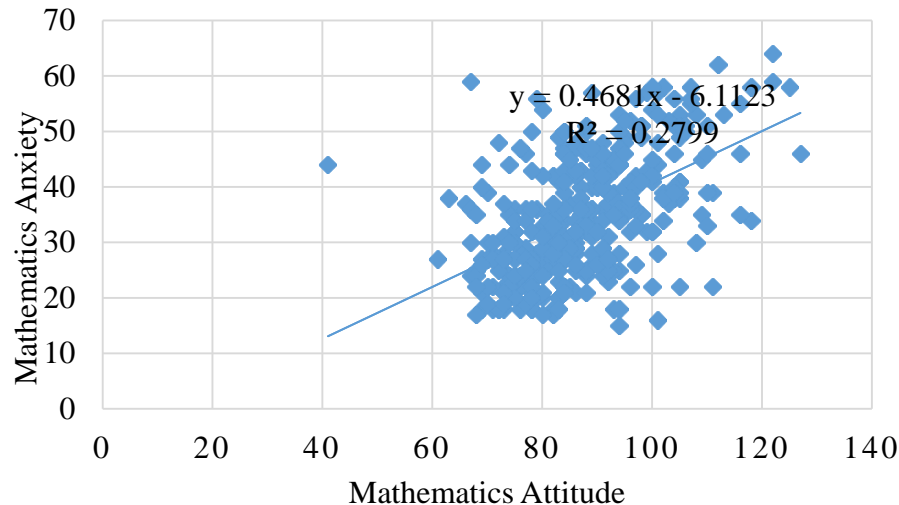
Scores	Levels	Total	Gender	No.	Mean	SD
0-40	Low	186(50.7%)	Male	93 (25.35%)	10.2	4.4
			Female	93(25.35%)	10.2	4.4
41-100	High	181(49.3%)	Male	77(21%)	8.5	3.6
			Female	101(28.3%)	11.4	4.9

prevalent.

The results in Table 4 show that 52.6% of the students had positive attitude and 47.4%, negative attitude. Further, females and males who scored positive attitude were 27 and 25.6%, respectively. In addition, negative attitude was reported among the male students who scored 20.7% compared to females who scored 26.7%. This implies that the two types of attitude were prevalent.

Though female students showed slightly higher scores than male students in all the types of attitude, this might have been random since there were more female students in the study.

The results in Table 5 show that 50.7% of the students had low performance and 49.3%, high performance. Females and males who scored low in performance were 25.4 and 25.4%, respectively. High performance was



**Figure 1.** Scatter plot diagram showing the relationship between mathematics attitude and mathematics anxiety

**Table 6.** Spearman's rho correlation between mathematics attitude and mathematics anxiety

		Mathematics attitude
Mathematics anxiety	Spearman's Correlation coefficient	0.538
	Sig. (2-tailed)	0.000
	N	367

reported among the male students who scored 21% compared to females who scored 28.3%. Though female students showed slightly higher scores than male students in high performance level, this might have been random since there were more female students in the study.

### Statistical analysis

#### Relationship between mathematics anxiety and mathematics attitude

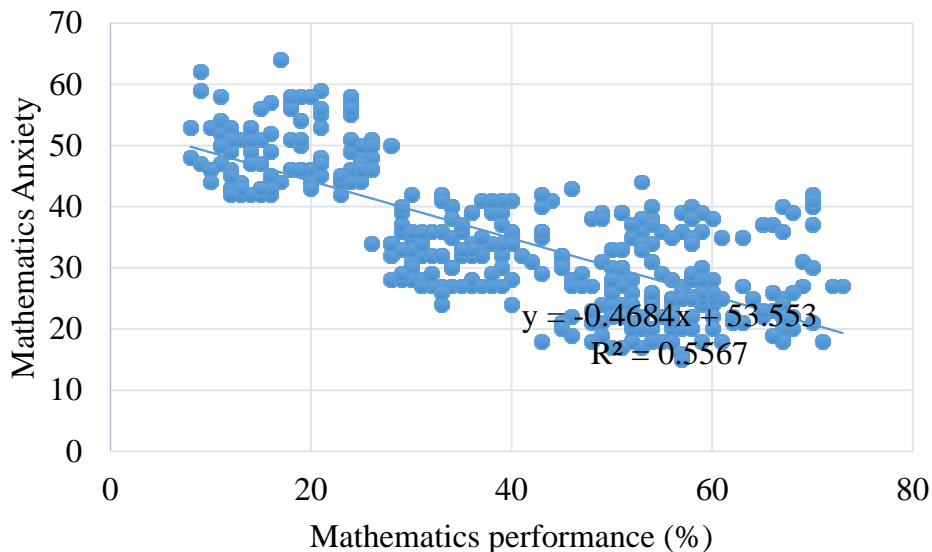
The results in Figure 1 indicate a monotonic relationship between mathematics anxiety and mathematics attitude.

The results in the figure 1 reveal that,  $R^2$  linear = .280, which means that a variation of 28% of Mathematics anxiety is influenced by Mathematics attitudes with other factors influencing Mathematics anxiety with 72%. The linear regression equation implies that a unit increase in Mathematics attitude results in a 0.47 increase in Mathematics anxiety. This implies that when Mathematics attitude is high (negative attitude) the level of Mathematics anxiety is also high (Hacıömeroğlu, 2017). This means there is a monotonic relationship between Mathematics anxiety and attitude towards Mathematics.

The results in Table 6 reveals that there is a significant relationship between mathematics anxiety and mathematics attitude ( $r = .538$ ,  $p < 0.05$ ). The relationship between mathematics anxiety and mathematics attitude was positive and statically significant, suggesting that the more the students are anxious (high anxiety level) the high the mathematics attitude (negative mathematics attitude) and the lower the anxiety of students the lower the attitudes towards mathematics (positive attitude). Since the lower the scores for Mathematics attitude the positive the attitude and the higher the scores for Mathematics anxiety the high the anxiety level, then it implies that as the Mathematics attitude increases, the Mathematics attitude tends to be more negative.

#### Relationship between Mathematics anxiety and performance

A scatter plot diagram was used to test for relationship between Mathematics anxiety and performance. The results were as below. The results in Figure 2 revealed that  $R^2$  linear = .557. This means that a variation of 56% of Mathematics performance is influenced by Mathematics anxiety with the remaining percentage (44%) of other factors influencing Mathematics performance. The linear



**Figure 2.** Scatter plot diagram showing relationship between mathematics anxiety and mathematics performance.

**Table 7.** Spearman’s rho correlation between mathematics anxiety and mathematics performance.

		Mathematics performance
Mathematics anxiety	Spearman’s rho Correlation coefficient	-0.723
	Sig. (2-tailed)	0.000
	N	367

regression equation implies that a unit increase in Mathematics anxiety results in reduction of Mathematics performance by 0.47. This implies that higher Mathematics anxiety level leads to poor performance in Mathematics (Reali et al., 2016). This means there is a monotonic relationship between Mathematics anxiety and performance in Mathematics.

The results in Table 7 revealed that mathematics anxiety was negatively correlated with mathematics performance, which means that the relationship was statistically significance ( $r = -.723, p < .05$ ). This shows that the more the students are anxious (high anxiety level) the lower would be their Mathematics performance (low Mathematics performance), and as the anxiety goes down to moderate level the performance shift to high (Justicia-Galiano et al., 2017).

**DISCUSSION**

The objective of the study was to examine the relation between Mathematics anxiety, Mathematics attitude and performance among secondary school students. Results have revealed significant relationship between Mathematics anxiety and Mathematics attitude. Students

who happened to be more anxious towards mathematics had negative attitude towards Mathematics while low anxious students had positive attitude towards Mathematics. The study results are consistent with previous research (Chaman and Callingham, 2013; Akin and Kurbanoglu, 2011; Haciömeroğlu, 2017; Sahri et al., 2017). There was a positive correlation between Mathematics anxiety and Mathematics attitude. For instance, students with positive attitude towards Mathematics will be so strongly committed to their Mathematics class as compared to those with negative attitude (Kargar et al., 2010). Mathematics attitudes of high school students were linked to their Mathematics anxiety (Haciömeroğlu, 2017). The results of the analysis revealed that secondary school students with positive attitude towards Mathematics had lower level of Mathematics anxiety.

Past research showed that students with positive attitude towards Mathematics were likely to be less anxious with Mathematics (Briley, 2012; Swars et al., 2007; Swars et al., 2009). This means that both the students’ anxiety and attitude can affect their ability to learn mathematics. Students with low anxiety are more confidence to carry out mathematical task. In addition, this current study showed the significant correlations

between anxiety and attitude towards Mathematics. This means that anxiety and attitude towards Mathematics can predict educational outcomes related to achievement in Mathematics.

Examining Mathematics anxiety and Mathematics performance among secondary school students, the results revealed that there was a negative association between Mathematics anxiety and Mathematics performance. The findings were consistent with past individual studies (Miller and Bichsel, 2004; Rodarte-Luna and Sherry, 2008; Reali et al., 2016; Justicia-Galiano et al., 2017; Lauer et al., 2018; Namkung et al., 2019) and a meta-analysis that consisted of 49 studies which showed an effect size ( $r = -0.32$ ) (Zhang et al., 2019). For instance, Reali et al. (2016) studied the relationship between Mathematics anxiety and math performance among Colombian students and obtained a negative correlation ( $r = -0.27$ ) (Justicia-Galiano et al., 2017). Thus, the findings in the current study implied a negative math anxiety-performance relation.

Namkung et al., (2019) posited that there was a significant negative relationship between Mathematics anxiety and Mathematics performance. This is supported by Gunderson et al. (2018) who found out that students' math anxiety was negatively correlated to their mathematics performance. Past studies have documented a negative association between math anxiety and math achievement in students (Ganley and McGraw, 2016; Ramirez et al., 2013). Negative relation between mathematics anxiety and achievement can be developed in childhood and transferred to adulthood (Cargnelutti et al., 2017; Vukovic et al., 2013; Krinzinger et al., 2009).

For good and high performance in Mathematics, there is need to give attention to the high anxiety levels or negative attitudes and try to bring them to moderate or the required levels. These anxieties and attitudes can be stabilized by students, teachers and parents by use of strategies such as encouraging group work, active learning, use of a variety of assessment and also dispelling harmful misconception about Mathematics in societies during socialization activities (Blazer, 2011). This implies that teachers should play a greater role in reducing high anxieties to moderate levels and again alleviating negative attitude of students towards Mathematics to be positive.

The results showing correlations between Mathematics anxiety, attitude and performance are supported by Kenyan scholars' findings that there exists a correlation between Mathematics anxiety, Mathematics attitude and Mathematics performance (Githaiga, 2019; Ndinda 2016; Njaggah, 2003; Oyugi, 2018; Syokwaa et al., 2014). Syokwaa et al. (2014) agreed that high Mathematics anxiety had a negative effect on the academic achievement of students in Mathematics. Students with positive attitude towards Mathematics performed well in Mathematics (Langat, 2015; Mutai, 2011). Students' attitude towards Mathematics had effects on their Mathematics performances in Kenya Certificate of

Secondary Education (KCSE) (Githaiga, 2019; Oyugi, 2018). Negative attitude towards Mathematics had negative impact on achievement in Mathematics geometry (Ndinda, 2016).

## Conclusion

This study has revealed that there is a relationship between Mathematics anxiety and Mathematics attitude of secondary school students. Mathematics anxiety can be in three levels: low, moderate, and high anxiety while Mathematics attitude can either be positive or negative towards Mathematics. The Spearman's correlation coefficient results revealed that there was a significant relationship between Mathematics anxiety and Mathematics attitude of the students in secondary schools. Specifically, negative attitude towards Mathematics is associated with high Mathematics anxiety while positive attitude towards Mathematics is associated with moderate or low Mathematics anxiety. There was a relationship between Mathematics anxiety and performance. Specifically, high Mathematics anxiety results in low performance in Mathematics and moderate Mathematics anxiety results in high performance in Mathematics. The two variables (anxiety and attitude towards Mathematics) need attention since they can predict students' performance and learning of Mathematics. Since this study does not examine the influence of test anxiety, it recommends a comprehensive study to examine the relationship between math tests, attitude and anxiety among secondary school students.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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## REFERENCES

- Aarnos E, Perkkilä P (2012). Early signs of Mathematics anxiety. *Procedia-Social and Behavioral Sciences* 46:1495-1499. <https://doi.org/10.1016/j.sbspro.2012.05.328>
- Akin A, Kurbanoglu IN (2011). The relationships between math anxiety, math attitudes, and self-efficacy: A structural equation model. *Studia Psychologica* 53(3):263.
- Ashcraft MH (2002). Math anxiety: Personal, educational, and cognitive consequences. *Current Directions in Psychological Science* 11(5):181-185.
- Bekdemir M (2010). The pre-service teachers' Mathematics anxiety related to depth of negative experiences in Mathematics classroom while they were students. *Educational Studies in Mathematics*



- 75(3):311-328. <https://doi.org/10.1007/s10649-010-9260-7>
- Blazer C (2011). Strategies for Reducing Math Anxiety. Information Capsule. 1102. Research Services, Miami-Dade County Public Schools.
- Briley JS (2012). The relationships among mathematics teaching efficacy, mathematics self-efficacy, and mathematical beliefs for elementary pre-service teachers. *Issues in the Undergraduate Mathematics Preparation of School Teachers: The Journal 5*.
- Buckley S, Reid K, Goos M, Lipp OV, Thomson S (2016). Understanding and addressing mathematics anxiety using perspectives from education, psychology and neuroscience. *Australian Journal of Education 60(2):157-170*. <https://doi.org/10.1177/0004944116653000>
- Cargnelutti E, Tomasetto C, Passolunghi MC (2017). How is anxiety related to math performance in young students? A longitudinal study of Grade 2 to Grade 3 children. *Cognition and Emotion 31:755-764*. <http://dx.doi.org/10.1080/02699931.2016.1147421>
- Chang H, Beilock SL (2016). The math anxiety-math performance link and its relation to individual and environmental factors: A review of current behavioral and psychophysiological research. *Current Opinion in Behavioral Sciences 10:33-38*. <https://doi.org/10.1016/j.cobeha.2016.04.011>
- Chaman M, Callingham R (2013). Relationship between Mathematics Anxiety and Attitude towards Mathematics among Indian Students. Mathematics Education Research Group of Australasia.
- Ferguson AM, Maloney EA, Fugelsang J, Risko EF (2015). On the relation between math and spatial ability: The case of math anxiety. *Learning and Individual Differences 39:1-12*. <https://doi.org/10.1016/j.lindif.2015.02.007>
- Gafoor KA, kurakkan A (2015) why high school students feel mathematics difficult? An exploration of affective beliefs. Online submission.
- Ganley CM, McGraw AL (2016). The development and validation of a revised version of the math anxiety scale for young children. *Frontiers in Psychology 7(1181)*. <http://dx.doi.org/10.3389/fpsyg.2016.01181>
- Githaiga EW (2019). Factors influencing Mathematics performance in KCSE among learners in public secondary schools in Kilifi Sub-county (Doctoral dissertation, KeMU).
- Gunderson EA, Park D, Maloney EA, Beilock SL, Levine SC (2018). Reciprocal relations among motivational frameworks, math anxiety, and math achievement in early elementary school. *Journal of Cognition and Development 19(1):21-46*. <https://doi.org/10.1080/15248372.2017.1421538>
- Hacıömeroğlu G (2017). Reciprocal relationships between mathematics anxiety and attitude towards mathematics in elementary students. *Research gate*. <https://doi.org/10.24193/adn.10.3.6>
- Haladyna T, Shaughnessy J, Shaughnessy JM (1983). A causal analysis of attitude toward mathematics. *Journal for Research in Mathematics Education 19-29*. <https://doi.org/10.2307/748794>
- Ifamuyima SA, Rosanwo EI (2016). Improving Mathematics achievement of junior secondary school students using mastery learning instructional strategy. *International Journal of Innovation in Science and Mathematics 4(2)*.
- Justicia-Galiano MJ, Martín-Puga ME, Linares R, Pelegrina S (2017). Math anxiety and math performance in children: The mediating roles of working memory and math self-concept. *British Journal of Educational Psychology 87(4):573-589*. <https://doi.org/10.1111/bjep.12165>
- Kargar M, Tarmizi RA, Bayat S (2010). Relationship between mathematical thinking, mathematics anxiety and mathematics attitudes among university students. *Procedia-Social and Behavioral Sciences 8:537-542*. <https://doi.org/10.1016/j.sbspro.2010.12.074>
- Krinzinger H, Kaufmann L, Willmes K (2009). Math anxiety and math ability in early primary school years. *Journal of Psychoeducational Assessment 27(3):206-225*. <http://dx.doi.org/10.1177/0734282908330583>
- Langat AC (2015). Students' attitudes and their effects on learning and achievement in Mathematics: A Case study of public secondary schools in Kiambu County, Kenya. Unpublished Reserch Project, submitted in partial fulfilment of the requirements for the Degree of Master of Education of Kenyatta University. Available online also at: <https://ir-library.ku.ac.bitstream/handle/123456789/10911/Students>.
- Lauer JE, Esposito AG, Bauer PJ (2018). Domain-Specific Anxiety Relates to Children's Math and Spatial Performance. *Developmental Psychology. Advance Online Publication*. <http://dx.doi.org/10.1037/dev0000605>
- Macher D, Paechter M, Papousek I, Ruggeri K (2012). Statistics anxiety, trait anxiety, learning behavior, and academic performance. *European Journal of Psychology Of Education 27(4):483-498*. <https://doi.org/10.1007/s10212-011-0090-5>
- Mahmood S, Khatoon T (2011). Development and validation of the mathematics anxiety scale for secondary and senior secondary school students. *British Journal of Arts and Social Sciences 2(2):169-179*.
- Maloney EA, Beilock SL (2015). Math anxiety: A factor in math achievement not to be ignored. *Policy Insights from the Behavioral and Brain Sciences 2(1):4-12*. <https://doi.org/10.1177/2372732215601438>
- Maloney EA, Ansari D, Fugelsang JA (2011). Rapid communication: The effect of mathematics anxiety on the processing of numerical magnitude. *Quarterly Journal of Experimental Psychology 64(1):10-16*. <https://doi.org/10.1080/17470218.2010.533278>
- Maloney EA, Ramirez G, Gunderson EA, Levine SC, Beilock SL (2015). Intergenerational effects of parents' math anxiety on children's math achievement and anxiety. *Psychological Science 26(9):1480-1488*. <https://doi.org/10.1177/0956797615592630>
- Manoah SA, Indoshi FC, Othun LO (2011). Influence of Attitude on Performance in Mathematics. *International Research Journal 2(3):965-981*.
- Miller H, Bichsel J (2004). Anxiety, working memory, gender, and math performance. *Personality and Individual Differences 37(3):591-606*. <http://dx.doi.org/10.1016/j.paid.2003.09.029>
- Mutai JK (2011). Attitudes towards learning and performance in mathematics among students in selected secondary schools in Bureti district, Kenya. Unpublished Masters Dissertation.
- Mweni NT (2015). Relationship between affective factors and achievement in Mathematics among secondary school students in Ganze District, Kilifi County Kenya (doctoral dissertation, Kenyatta University).
- Namkung JM, Peng P, Lin X (2019). The Relation Between Mathematics Anxiety and Mathematics Performance Among School-Aged Students: A Meta-Analysis. *Review of Educational Research*. <https://doi.org/10.3102/0034654319843494>
- Ndinda MD (2016). An analysis of the factors influencing achievement in mathematics geometry among secondary school students in Makadara Sub-County, Nairobi County.
- Njaggah MN (2003). Factors influencing the performance of mathematics among public secondary school students in Nairobi province (Doctoral dissertation, University of Nairobi).
- Nui WN, Wahome NA (2006). SMASSE PROJECT. *Tsukuba Journal of Educational Study in Mathematics P 25*.
- Núñez-Peña MI, Suárez-Pellicioni M, Bono R (2013). Effects of math anxiety on student success in higher education. *International Journal of Educational Research 58:36-43*.
- Oyugi KJ (2018). Factors Affecting Students' Performance in Mathematics at KCSE Level in Selected Mixed Secondary Schools in Njiru Sub county; Nairobi (Doctoral dissertation, University of Nairobi).
- Plaisance DV (2009). A Teachers' Quick Guide to Understanding Mathematics Anxiety. *Louisiana Association of Teachers of Mathematics Journal 6(1):1-8*.
- Radišić J, Videnović M, Baucal A (2015). Math anxiety—contributing school and individual level factors. *European Journal of Psychology of Education 30(1):1-20*. <https://doi.org/10.1007/s10212-014-0224-7>
- Ramirez G, Gunderson EA, Levine SC, Beilock SL (2013). Math anxiety, working memory, and math achievement in early elementary school. *Journal of Cognition and Development 14(2):187-202*. <http://dx.doi.org/10.1080/15248372.2012.664593>
- Realí F, Jiménez-Leal W, Maldonado-Carreño C, Devine A, Szücs D (2016). Examining the link between math anxiety and math performance in Colombian students. *Revista Colombiana de Psicología 25(2):369-379*. <https://doi.org/10.15446/rcp.v25n2.54532>
- Rodarte-Luna B, Sherry A (2008). Sex differences in the relation between statistics anxiety and cognitive/learning strategies.

- Contemporary educational psychology 33(2): 327-344. <https://doi.org/10.1016/j.cedpsych.2007.03.002>
- Ruff SE, Boes SR (2014). The Sum of All Fears: The Effects of Math Anxiety on Math Achievement in Fifth Grade Students and the Implications for School Counselors. *Georgia School Counselors Association Journal* 21(1).
- Sa'ad TU, Adamu A, Sadiq AM (2014). The causes of poor performance in mathematics among public senior secondary school students in Azare metropolis of Bauchi State, Nigeria. *Journal of Research and Method in Education* 4(6):32. <https://doi.org/10.9790/7388-04633240>
- Sahri NA, Kamaruzaman WNF, Jamil JM, Shaharane INM (2017). Exploring mathematics anxiety and attitude: Mathematics students' experiences in AIP Conference Proceedings 1905(1).
- Scarpello G (2007). Helping students get past math anxiety. *Techniques: Connecting Education and Careers (J1)* 82(6):34-35.
- Shaikh SN (2013). Mathematics anxiety factors and their influence on performance in mathematics in selected international schools in Bangkok. *Journal of Education and Vocational Research* 4(3):77-85.
- Soni A, Kumari S (2017). The role of parental math anxiety and math attitude in their children's math achievement. *International Journal of Science and Mathematics Education* 15(2):331-347. <https://doi.org/10.1007/s10763-015-9687-5>.
- Swars S, Hart LC, Smith SZ, Smith ME, Tolar T (2007). A longitudinal study of elementary pre-service teachers' mathematics beliefs and content knowledge. *School Science and Mathematics* 107(8):325-335. <https://doi.org/10.1111/j.1949-8594.2007.tb17797.x>
- Swars SL, Smith SZ, Smith ME, Hart LC (2009). A longitudinal study of effects of a developmental teacher preparation program on elementary prospective teachers' mathematical beliefs. *Journal of Mathematics Teacher Education* 12(1):47-66. <https://doi.org/10.1007/s10857-008-9092-x>
- Syokwaa KA, Aloka PJ, Ndunge SNF. (2014). The Relationship between anxiety levels and academic achievement among students in selected secondary schools in Lang'ata District, Kenya. *Journal of Educational and Social Research* 4(3):403-403.
- Tapia M, Marsh GE (2004). An instrument to measure mathematics attitudes. *Academic Exchange Quarterly* 8(2):16-22.
- Vinson BM (2001). A comparison of preservice teachers' mathematics anxiety before and after a methods class emphasizing manipulatives. *Early Childhood Education Journal* 29(2):89-94. <http://dx.doi.org/10.1023/A:1012568711257>
- Vukovic RK, Kieffer MJ, Bailey SP, Harari RR (2013). Mathematics anxiety in young children: Concurrent and longitudinal associations with mathematical performance. *Contemporary Educational Psychology* 38(1):1-10. <https://doi.org/10.1016/j.cedpsych.2012.09.001>
- Yeo LW, Tan KC, Lew LS (2015). Mathematics anxiety among male and female respondents. *International journal of social, behavioral, educational, economics, business, and industrial engineering* 9(8).
- Yerkes RM, Dodson JD (1908). The relation of strength of stimulus to rapidity of habit-formation. *Journal of comparative neurology and psychology* 18:459-482.
- Zan R, Di Martino P (2009). Different profiles of attitude towards mathematics: The case of learned helplessness. *Proceedings of psychology of mathematics education* 33(5):417-424.
- Zettle R, Raines S (2002). The relationship of trait and test anxiety with mathematics anxiety. *College Student Journal* 34(2):246-258.

*Full Length Research Paper*

# **The effectiveness of response to intervention (RTI) diagnostic program in diagnosing and improving the difficulties of reading and writing in a Jordanian sample**

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The study aims to investigate the impact of an educational program that was developed based on the response to intervention model for diagnosing and improving the difficulties of learning to read and write among a sample of students in Jordan. The number of the study participants was 60 male and female students, with learning difficulties in fourth, fifth, and sixth grades in government schools affiliated with the Jordanian Ministry of Education. For the purpose of the study, a program was prepared based on the strategies and methods of the response to intervention model in three stages, measured the effectiveness of the program in diagnosing reading and writing difficulties was prepared and measured the extent of their improvement. The researcher prepared achievement reading and writing tests to be applied in the pre and post measurement for each stage of the response to intervention model. The program was implemented for two consecutive months at three meetings per week, each of which lasted for 45 minutes. The study data collected were analyzed and the study reached (1) the effectiveness of the response to intervention model in detecting students' reading and writing difficulties were demonstrated by the decrease in the number of students who need intensive interventions according to each stage of the model and (2) there are statistically significant differences in the achievement tests performance for reading and writing and for post-measurement in all stages of the response to intervention model and grades.

**Key words:** Response to intervention (RTI), reading and writing difficulties.

## **INTRODUCTION**

The difficulties of reading and writing are the most prevalent patterns of learning disabilities, as they constitute more than 80% of the categories of learning difficulties. Also, they are a major obstacle to school success in all subjects because the inability to read and

write results in multiple mental incapacities and multiple learning problems (Lerner, 2000).

Previously, it was prevalent to identify students with reading and writing difficulties by testing the divergence between intelligence and academic achievement in

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reading and writing. Here, students are required to obtain average or above in official intelligence tests and achievement test in reading and writing (Al-Zayat, 2007). However, the test of divergence was criticized because it contains several contradictory and illogical factors in estimating the intelligence and achievement of students with learning difficulties. This led to lack of agreement on the diagnosis and evaluation of people with learning disabilities (Gresham, 2002).

As a result, the response to intervention model came as one of the most prominent models that address the weaknesses in the process of diagnosing and treating learning disabilities. This model constitutes a general framework for diagnosing students with learning difficulties, assessing their achievement and determining the extent of their deviation from the average achievement of their peers. It presents the serial therapeutic intervention according to specific stages based on the capabilities and needs of the students and also determines the educational services they need (Al-Ansari, 2009).

### **The study problem**

Recent research and studies in the field of special education have revealed the weakness and limitations experienced by the divergence test in diagnosing learning disabilities. This led to a decrease in its credibility in identifying students with learning difficulties (Rashid, 2016). Therefore, the Education for People with Disabilities Law (IDEA, 2004) introduced the response to intervention model (RTI) to determine the services of the youngest children while providing their own individual education, where RTI strategy is a methodology based on accurate data and a way to give academic solutions that suit the children's situation (Wallace, 2014).

Hence, the problem of the study reveals the effectiveness of a therapeutic diagnostic program based on the response to intervention model (RTI) in diagnosing and improving reading and writing skills among a sample of students with learning difficulties. The following sub-questions emerge from the main question:

- (1) How effective is the RTI in diagnosing students with literacy difficulties in a Jordanian sample in grades four, five, and six primary schools?
- (2) Are there statistically significant differences between the averages of the students' scores in the post-test reading skills due to the educational program?
- (3) Are there statistically significant differences between the averages of students' scores in the post test of writing skills due to the educational program?

### **Objectives of the study**

- (1) Building a diagnostic and assessment tool for reading

and writing difficulties based on the response to intervention model with psychometric properties.

- (2) Building a therapeutic diagnostic program to improve reading and writing difficulties for a sample of students.

### **Importance of the study**

(1) Presenting the response to intervention model as an alternative to the standard divergence between mental ability, and academic achievement, as a tool for diagnosing and assessing learning disabilities

(2) Providing special education field with a structured program for diagnosing and treating reading and writing difficulties based on frequent measurement and accurate data and providing therapeutic methods and services that are appropriate to the capabilities and needs of students according to their progress as a strategy for early intervention to save their time and effort.

### **Terms of the study**

#### ***Response to intervention model***

It is a model that provides intense and direct intervention to students before performing the diagnostic process to identify students who need special educational services (Sheldon, 2005).

It is procedurally defined as: a teaching strategy based on direct and intensive teaching interventions that are carried out individually or within small groups with the aim of identifying and revealing students with reading and writing difficulties, and then providing therapeutic services to students who have proven to have reading and writing difficulties.

#### ***The therapeutic diagnostic program based on the response to intervention model***

It is a set of strategies, methods, means and activities that have been prepared for use by the teacher in order to treat students' reading and writing difficulties.

#### ***Difficulties in reading and writing***

It is the inability to read and write, difficulty in reading and writing letters and syllables, linking between their forms and sounds, the inability to form words and sentences, and write clearly.

It is procedurally defined as the score that students obtain in the reading and writing achievement test.

Students with reading and writing difficulties in this study are fourth, fifth and sixth grade students who were referred to the Learning Difficulty Resources rooms; those who are proficient in reading and writing alphabet but have difficulties in reading and writing syllables,

words, sentences and paragraphs in schools in Amman region based.

### **Study limitations**

- (1) The sample of the study was limited to public schools in Amman Governorate.
- (2) The study sample was restricted to students with learning difficulties in the fourth, fifth and sixth grades at the basic stages.
- (3) The study application was limited to the first semester of the year 2018/2019.
- (4) The degree of accuracy of resource room teachers' diagnosis for students with learning disabilities.
- (5) The level of cooperation and seriousness of the study sample members in answering the study tool.

## **THEORETICAL FRAMEWORK**

### **Dyslexia**

Reading is a complex process that includes a set of mental processes represented in perception, remembering, deduction, and connection. It is an intellectual activity that includes the following processes: letters and words correctly known and spoken, understanding, analyzing, criticizing, and interacting with the reader, solving problems and psychological pleasure (Mercer and Mercer, 2006).

Dyslexia is represented in the inability to acquire the basic skills of learning to read or read very slowly, or mixing letters and words with repetition of the reciter and not adhering to numbering and deleting a number of letters. It is also the students' inability to understand everything they read in the detail, so these students face a problem in understanding the questions that are posed to them directly after reading (Al-Waqfi, 2016).

### **Dysgraphia**

Writing is positively associated with the skill of reading, so teaching and learning writing is an essential element in the educational process as it is an educated skill that can be given to students as a mental activity based on thinking. Difficulties appear in the writing process in the form of: reversing writing letters, mixing directions, arranging letters, incorrect word or syllables when writing, mixing similar letters, enlarging or shrinking letters too much, difficulty in holding writing tools, poor calligraphy, and lack of line (Hilalhan et al., 2006).

### **Learning disabilities diagnosis**

The American Department of Education has developed a set of procedural systems that can be taken as criteria for

diagnosing learning disabilities.

### ***Discrepancy criterion***

This means there is a difference or discrepancy between the students' actual achievement, abilities, and mental ability in one or more of the following areas: oral expression, auditory comprehension, basic reading skills, reading comprehension, written expression, mathematical operations, or mathematical reasoning; it is the difference within the individuals, that is the students' achievement is not low in all subjects; their achievement may be low in reading but high in mathematics or written expression, or their performance might be high in completing optical distinction but low in distinguishing auditory distinction, which is called intra-individual difference.

### ***Exclusion criterion***

It means excluding the cause of the educational difficulty experienced by the students; it is the result of a specific disability (visual or auditory, motor or mental or emotional disability) caused by environmental, cultural or economic factors.

### ***Special education criterion***

It means that the educational difficulties and problems faced by the student are so large and complex that they cannot be treated in the regular class using traditional methods and require special education programs and methods (Hilahan et al., 2006).

Many criticisms have been made regarding the variation in the diagnosis of learning disabilities for the following reasons:

- (1) There is no agreement among specialists on a cut-off point at which the difference in distance between mental ability and academic achievement is determined.
- (2) Criticism of the measures used to assess the level of contrast between mental abilities and achievement is that it lacks the required psychometric properties.
- (3) The exclusion test does not help predict students' academic performance and academic achievement.
- (4) The test of spacing does not help to determine appropriate methods and strategies for a student with learning disabilities.
- (5) The criterion of variation perpetuates the phenomenon of "waiting for failure", which means postponing the assessment and diagnosis of the student to the third grade to start the evaluation process, and this contradicts the philosophy of early intervention.

As a result of these and other criticisms, response to intervention model or treatment response model has

been suggested, which is defined as: “a system that integrates assessment and intervention within a multi-level prevention system to maximize students’ achievement and reduce behavioral problems; it also identifies students at risk of poor learning outcomes, monitors students’ progress, provides evidence-based interventions, controls the intensity and nature of these interventions, depending on the students’ response, and identifies students with learning disabilities or other disabilities” (Skelding-dills, 2013).

It is defined by the United States National Joint Committee for Learning Disabilities as a set of forms of therapeutic interventions that can help to provide accurate information about students with learning disabilities and determine their need for special education services and associated therapeutic services and interventions at various stages (NJCLD, 2005).

### **Levels of response to intervention model**

It consists of three levels as mentioned in Miller (2016).

(1) The first level: General or comprehensive intervention, which is the stage of general education, in which therapeutic interventions and educational activities are offered to all students in the class. Emphasis is placed on academic skills, and in the intermediate and secondary levels, focus is placed on a broader range of skills and behaviors; progress is observed in individual student’s performance and adjusting the procedures and interventions according to their progress. 80% or more students must pass this stage.

(2) The second level: targeted intervention: It is the stage of intensive and special therapeutic interventions for students who have not passed the first stage; strategies and curricula are designed to assist the general curriculum and not replace it. They are provided individually or in the form of small groups, and the progress of students in achieving their goals is monitored. This stage must be passed by 15-20% or more students.

(3) The third level: The intensive specialized intervention phase: In this stage, specialized and individual therapeutic interventions are offered to students who have failed in the first and second stages, and intensive interventions are provided to improve their academic performance and follow up their performance. Students who have not passed this level are evaluated as needing special education services and are named as students with learning difficulties. This stage must be passed by 5% or less students.

### **Rationale for applying the teaching response model (Thebes, 2007)**

(1) The response to intervention model attributes the

students’ academic weakness in their inability to benefit from and use well the educational methods and strategies. This leads to a decline in their academic level, and not necessarily because of their learning difficulties.

(2) The response to intervention model helps to distinguish between actual learning difficulties and the weakness and lack of educational services provided to the students.

(3) The response to intervention model provides a wide range of specialized educational services to the largest number of students who have academic weakness and who only need a change in teaching methods.

(4) Implementation of the response to intervention model requires a specialized team in the general education and special education field, which supports the joint responsibility of the team members.

(5) The response to intervention model helps to identify students who are exposed to learning difficulties in early stages and provide them with early intervention services. This reduces the "waiting for failure" phenomenon, and also the number of students transferred to special education services.

(6) The response to intervention model helps to reduce teachers’ diagnostic errors, and helps to collect data related to their tutorial.

### **LITERATURE REVIEW**

Bryant et al. (2008) conducted a study aimed at knowing the effect of therapeutic interventions in the second level of the response to intervention model on the performance of first grade students who have learning difficulties; they numbered 161 students who received therapeutic interventions for a period of 23 weeks. The study found that 119 students have improved their performance as a result of therapeutic interventions and did not need to move to the third level, while 42 students did not benefit from intervention treatments at the second level. This means that they need other intensive interventions.

Callender (2007) conducted a study aimed at providing students with reading difficulties with intervention strategies to solve specific problems within the response to intervention model and assessing special education before and after its application. Data were collected from 1999-2004 and the study sample consisted of 1400 students in grade 3 chosen from 150 schools. They were divided into two groups; the first group applied a reading program plan based on the response to intervention model, and the second group applied a reading program based on the school curriculum. The study found that the result of the first group in the reading achievement test is better than the results of the second group. The researcher also noted that the number of students increased in the period (2002-2005) by 3% in general education schools and by 1% in special education programs.

Peterson et al. (2007) conducted a study aimed at measuring the effectiveness of the response to intervention model based on a collaborative consulting system to solve problems. The program was applied to 556 students in eighth grade from 1999 to 2003. The study results show that the level of students improved in reading skills. This indicates the effectiveness of the program and the level of improvement was constant at a rate of 1% during the years of application. Also, 98% of the teachers that participated in the study indicated that the response to intervention model provided a suitable learning environment for students. All team members showed their cooperation and satisfaction with the program and its effectiveness in improving students' performance; also parents play an effective role in 90% success of the program.

Al-Zayat (2006) conducted a study aimed at knowing the predictive value of identifying and diagnosing learning difficulties by the quantitative and qualitative analysis model. The sample of the study consisted of 504 students from the third and fourth basic grades in four schools in the Republic of Egypt. The following measures were applied to them: Raven's measure of mental abilities, a behavioral traits scale for people with learning difficulties, a behavioral traits measure for people with low achievement. It was found that: the criterion of divergence based on quantitative analysis does not distinguish between people with learning difficulties and those with low achievement; it contributes to diagnosing 40-50% of students with low achievement as having learning difficulties due to errors in identification and diagnosis, which affects the nature of the programs they receive. The study also found that 60% of students who were diagnosed with learning disabilities respond to intensive early intervention services in the first stage of the response to intervention model and therefore remain in the regular classes. The results also showed that the predictive value of the qualitative analysis models is more accurate and more reliable compared to the quantity analysis models based on test spacing.

Fuchs and Fuchs (2005) conducted a study aimed at revealing the effectiveness of the response to intervention model in identifying and diagnosing learning difficulties; the study was applied to 100 first grade students at Tennessee Elementary School. To identify students with learning difficulties, a CBM-WIF measure was applied which measures the ability to read correctly. The students are considered successful on the scale if they can read 50 words out of 100 words chosen randomly, and they are to fail on the scale if they only read 15 words. The study results show a group of students obtained an average of 22.5, exceeding the failure point criterion (15); therefore, they are not grouped in the category of people with learning difficulties; another group of students got an average of 10.5 on the scale and therefore failed to pass the cut-off point of the scale. Thus, they were transferred to benefit from the services

of the response to intervention model in the first level for a period of 8 weeks. Then, their reading abilities were re-evaluated on the same scale, and the group got a level of improvement of 1.8. Thus, their performance improved and they were excluded from the category of learning difficulties. A third group obtained an average of 5.5, failing to pass the cut-off point of the scale. They were included to benefit from the response to intervention model procedures. At the first level for a period of 8 weeks, their reading abilities were reassessed on the same scale, and they obtained an improvement level of 0.4. Consequently, they were transferred to benefit from the services of the response to intervention model in the second level for a period of 8 weeks, after which they were re-evaluated. The group obtained an improvement level of 1.7; thus the group succeeded and their performance improved. Then they were excluded from the category of learning difficulties. A fourth group obtained an average of 5.5, and therefore failed to pass the cut-off point of the scale. They were transferred to benefit from the procedures of the response to intervention model in the first level for a period of 8 weeks, after which their reading abilities were reassessed on the same scale. The group got an improvement level of 0.2 and thus they were transferred to benefit from the services of the response to intervention model in the second level for a period of 8 weeks. Then they were re-evaluated and the group got an improvement level of 0.5, which is less than the required value. Therefore, this group was taken out of the category of learning difficulties and was transferred to benefit from special education services.

Al-Ansari (2009) conducted a study to know the effectiveness of the response to intervention model in developing the skill of word recognition in terms of diagnosis and treatment and finding an alternative model for the test of spacing to detect learning difficulties. The fourth and fifth primary schools were randomly selected, and the study obtained the following results.

The response to intervention model reduces the percentage of students with learning difficulties by 66.66%, and the performance of 20 students improved. This shows their response to therapeutic interventions in the intervention response model, which indicates a high predictive value of the response to intervention model based on qualitative analysis. After applying the dimensional scale in the follow-up phase shows, the percentage of persistence in the performance of students in the response to intervention model reached 95.95%. This indicates the effectiveness of the strategies of the response to intervention model.

Vaughn et al. (2003) conducted a study to evaluate the effectiveness of the response to intervention model in detecting and identifying students with learning difficulties. The study sample consisted of 45 students from the second grade of primary school with a high probability of emerging learning difficulties based on the

appreciation of their teachers. The response to intervention model was applied to them in three stages and for a period of three months. The study found that 66% of the students responded to the teaching interventions and improved their performance. 34% of the students did not respond to the teaching interventions and were transferred to special education services to obtain intensive interventions.

Vaughn et al. (2003) conducted a study to identify the effectiveness of the response to intervention model as a method for detecting students with learning difficulties who were not disclosed through the criterion of divergence. The study sample consisted of 45 students from the second grade who face difficulties in reading in three schools; a program based on the response to the intervention model was applied to them for a period of 10 weeks. The study obtained the following results: 10 students responded to the program based on the response to intervention model at the second level, 14 students responded to the program based on response to intervention at the third level, 10 students responded to the program based on the response to intervention model at the fourth level, and 11 students did not respond to the program based on the response to intervention model. That is, 75% of the students responded to the program based on the response to intervention model by applying the four levels.

It is clear from a review of previous studies that the response to intervention model supports early detection of the strengths and weaknesses of the students through intensive and appropriate teaching interventions that meet the needs of different students. This does not aggravate the students' learning problem and its complexity, and thus reducing the number of students who are described as having learning difficulties.

## METHODOLOGY

The researcher used the semi-experimental curriculum.

### Study population and its sample

The study population included all students with learning disabilities between the ages of 9 and 12 years in the fourth, fifth, and sixth grades; they were enrolled in government schools affiliated to the Jordanian Ministry of Education in the first semester of the academic year 2018/2019. The primary study sample was chosen using the simple random method from the second Amman District Directorate, in which resource rooms and students with learning difficulties are available. The sample consisted of 100 students with learning difficulties representing the fourth (35), fifth (33) and sixth (32) classes. The criteria for selecting the study sample include the sample of students with reading and writing difficulties chosen according to the criterion of divergence based on the following:

- (1) The students must obtain an average IQ of 90 or above on the Raven scale of successive matrices rationing (Alian and Al-Smadi, 1988).
- (2) The performance of students should be less than the mark of success in the achievement test in reading and writing prepared by

the researcher (26 or less).

(3) The students must not have any mental or sensory handicap or environmental or emotional deprivation. This was ensured by reviewing and studying their personal and school files.

(4) They must be diagnosed by the teachers of the Learning Disabilities Chambers, to confirm they have difficulties in reading and writing according to the tests approved in the Ministry of Education (Princess Tharwat College Tests for Learning Disabilities and informal tests designed by the teachers of the Learning Disabilities Resources Rooms).

(5) The academic record of the students must be reviewed and their grades in Arabic language subject must be monitored during the previous school years.

(6) After applying the previous criteria to the primary sample of the study, the study sample reached 60 students representing the fourth (25), fifth (23) and sixth (12) grades students.

### Study tools

The researcher collected the study data using the following tools.

#### ***First: Raven's test of the successive matrices rated on Jordanian environment***

It is a test that aims to measure intelligence based on the students' ability to do abstract thinking in realizing the relationships between symbols and geometric shapes such as similarity or difference or the relationship existing between the part and the whole or the relationships of succession. Alian and Al-Smadi (1988) legalized it on the Jordanian environment and found its psychometric properties by applying it to a sample of (2543) people whose ages ranged between 11 and 40 years. On the scale, the result showed the emergence of five factors, including one factor that explains approximately three quarters (1.74%) of variation of performance, which is the general factor. The stability factor was extracted using a retest method and reached 90%. Likewise, the criteria represented in the transferred degrees and the percentages corresponding to each grade of raw grades in each age group were extracted.

#### ***Second: Achievement test in reading and writing prepared by the researcher***

The researcher built the test paragraphs based on the study objectives to measure students' achievement in both reading and writing before and after applying the educational program. This test may be of three equal forms to suit the three stages of the program. Each model consists of eighteen questions: nine questions in reading and nine questions in writing. It was divided into four levels: the syllable level, the word level, the sentence level, and the paragraph level, in a graded manner in terms of difficulty level. Each student was asked to answer all the questions given in the test, and the grades were distributed according to the number of correct responses for the student.

**Validity of the test:** The validity of the content was verified by presenting the list of educational objectives of the program and the test paragraphs to a committee of arbitrators from professors of special education and psychology. Paragraphs that were agreed upon by the arbitrators were 90% or more; and the paragraphs that did not reach this percentage were deleted.

**Reliability of the test:** To ensure the consistency of the achievement test that was used in the current study, the ten-day repeating method was used on 30 male and female students with



**Table 1.** Correlation coefficients between the marks of the study sample by repetition method

Type of test	Correlation coefficient
Achievement reading test	0.91
Writing achievement test	0.93

\*Statistically significant at the significance level of 01.0.

learning difficulties who were not from the fourth, fifth and sixth grades; both reading and writing tests were given to them. Then the correlation coefficients and their significance level were extracted for the two tests. Table 1 shows the correlation coefficients for both the reading test and the writing test.

**Correction of the test:** After the test was divided into four levels (syllable, word, sentence, paragraph) and the grades were distributed by 15, 15, 10, and 10 grades for each level, an overall mark was extracted from the general total of 50 for each student, both in pre and posttest.

### ***Third: The educational program based on the treatment response model prepared by the researcher***

The program included a set of different strategies and activities for each student according to his needs and weaknesses in reading and writing obtained from the achievement test results and from reviewing his work and performance records at school and from the teachers' notes.

The overall objective of the program is to use the response to intervention model to identify students who have actual reading and writing difficulties and those who have been misdiagnosed to have reading and writing difficulties; this limits students who actually deserve special education services.

The program was built on the following foundations:

(1) Selecting intervention activities based on the specific difficulties that the study sample has been identified with through the achievement test prepared by the researcher and from the analysis of students' work and records.

(2) The theoretical basis for the intervention response model, which is based on the presentation of the intervention in three phases or levels; the duration of each stage is two weeks at three sessions per week and the duration of each session is one (45) minute class:

(a) The first level: providing intensive and varied educational activities for all students in the study sample and in the regular class, and then assessing their progress and measuring the extent of improvement of their weaknesses.

(b) The second level: to provide intensive and varied educational activities in the form of small groups and individually to students whose performance at the first level has not improved in parallel with the regular curriculum and in the regular class.

(c) The third level: inventory of students whose performance did not improve in the second level and referred them to the resource rooms to provide focused and in-depth educational programs to treat their difficulties.

(3) Activities were presented at each level according to the needs of each student; teaching methods and teaching strategies that proved effective in many studies were applied to suit the needs of students and their preferred learning styles. These teaching methods include: VAKT method, Fernald method, Orton Gillingham

method, Macro, Micro, Gameplay, and computer learning. In addition to using home enrichment activities, there was continuous feedback and immediate reinforcement.

(4) Pre-measurement is carried out by applying the achievement test in reading and writing to students before applying teaching strategies at each level. Then post-measurement was done to determine the extent of improvement and progress in the students' performance. Based on the results of the evaluation, an appropriate decision is taken with regard to the students, so the student who improves his performance in Post-measurement is excluded from the program and focus is placed on it in the regular class. For the student who fails, to attain the next level he is to be followed up, focused on, and given specific teaching.

(5) The training includes a set of worksheets that are regular, sequential, and interrelated in a gradient that suits the capabilities of the students.

(6) Combining reading and writing exercises within a single task, and mutually allowing the students - in the educational situation - to deal with reading and writing skills together.

(7) The various program activities are included from easy to difficult until the student reaches the level of proficiency and if the student fails to reach the degree of proficiency, he moves to the next level.

(8) Enhancing students' correct responses, through material and symbolic rewards, in order to increase their motivation and thus ensure their continuation and interaction with the activities of the program sessions.

(9) The application of the activities of the program by two teachers (one teacher and one female teacher) after their pre-training and preparation by introducing them to the model, its methods and strategies, how to implement the program and writing individual educational and educational plans.

### **Curative interventions in the program**

In the first stage, general teaching strategies were presented in reading and writing using the method: VAKT method, Fernald method, Orton Gillingham method, and the use of appropriate exercises and activities for it. The students' progress and the extent to which he achieved the goals are monitored by making a file for each student. Interference here was through general education and in the regular class.

In the second stage, teaching strategies were presented based on the specific needs of each student, intensifying educational activities and modifying or changing teaching methods according to the needs of the student. The intervention here was an aid to general education and not compensation for it; students remained in their classes and intensive strategies were presented to them; there was diversification in teaching methods and giving tasks to household and enrichment activities.

In the third stage, here the intervention was presented to students who failed in the second level; they were referred to the Learning Disabilities Resource Rooms because they can have learning difficulties in reading and writing. An individual educational program was designed for them based on the weaknesses that they

**Table 2.** The numbers of students enrolled in each stage of the response to intervention model, according to their improved performance.

Class	Overall number	The number of students who pass the first level of the response to intervention model	The number of students who pass the second level of the response to intervention model	The number of students who pass the third level of the response to intervention model
4th grade	25	10	11	4
5th grade	23	8	10	5
6th grade	12	3	6	3
Overall N	60	21	27	12

failed to improve on. During the interventions of the previous stages, special education services are provided to them at this stage.

### Program evaluation and testing

After building the educational program, it was presented to a group of arbitrators specialized and interested in the subject of special education, psychological measurement, counseling, psychology and a number of resource room teachers to evaluate the following aspects:

- (1) The extent to which the tutorial is based on the response to intervention model and components.
- (2) The suitability, clarity and organization of the sequence in the program.
- (3) The extent to which the program matches the desired educational goals.
- (4) The suitability of the time period for the application of the program and its distribution in sessions.

### Exploratory pilot application of the proposed educational program

After presenting the program to the jury committee and making the appropriate amendments, a sample of 13 male and female students was selected from students with learning difficulties from outside the study sample; some sessions of the program were applied to them to verify:

- (1) Possible difficulties when applying the educational program to the study sample to correct it.
- (2) The extent of students' interaction with educational activities and methods.
- (3) Modifying and developing the program in light of the feedback of this experiment.

This exploratory experiment helped to organize the educational sessions, starting with preparing the students and explaining the educational strategies intended to be used.

The program was finalized after arbitration, exploratory experimentation and appropriate amendments, as it became ready for final application.

### Study procedures

- (1) Meeting with Arabic language teachers and teachers of sources of learning difficulties in each school to clarify the objectives of the study, taking approvals on the application of the program and study tools and arranging the application dates and the number of lessons the researcher needs.

- (2) Obtaining data related to students such as: grade, difficulty type, degree in Arabic language (reading and writing).

- (3) Review students' academic files related to their achievement in general, their family circumstances, and their health and emotional state.

- (4) Apply the Raven scale for successive matrices on the individuals of the initial sample consisting of 100 students, and determine the degree of intelligence for each student.

- (5) The achievement of the achievement test in reading and writing on the individuals of the primary sample.

- (6) Reviewing the students' academic record and monitoring his grades in Arabic language during the previous school year.

- (7) Identifying students with learning difficulties by applying the criterion of divergence, and excluding students who do not meet the criterion of divergence between intelligence and academic achievement in reading and writing. Accordingly, the study sample reached 60 students representing the fourth (25), fifth (23) and sixth (12) grades students.

- (8) The application of the therapeutic program for a period of six weeks (by two weeks for each stage), by three sessions per week and the duration of each session one (45) minutes of study. The program is divided into three stages and the student who improves his performance after the end of the first stage is excluded from the umbrella of learning difficulties. If he does not respond, he is moved to the second stage.

## RESULTS AND DISCUSSION

Results related to the first question states: What is the effectiveness of the response to intervention model (RTI) in diagnosing students with learning and reading difficulties in grades four, five and six?

To answer this question, the researcher applied the achievement test in reading and writing to the members of the study sample of 60 male and female students: fourth (25), fifth (23) and sixth (12) before and after each stage of the response to intervention model; then the test was corrected. The number of students who achieved the test pass mark of 26 and above is 50; the results are given in Table 2.

It appears from Table 2 that the study sample responds to the response to intervention model at all stages; general and diverse teaching methods and strategies were applied to all the study sample of 60 male and female students in their regular classes and with their colleagues. 21 students succeeded in passing the stage. The first of the intervention are students whose marks were on the post-test for the achievement test (26) or more. This means that the general methods and

**Table 3.** Arithmetic averages and standard deviations for the post achievement reading test for each stage of the response to intervention model.

Class	The first stage of the response to intervention model					The second stage of the response to intervention model					The third stage of the response to intervention model			
	Pretest		Posttest			Pretest		Posttest			Pretest		Posttest	
	Mean	SD	Mean	SD		Mean	SD	Mean	SD		Mean	SD	Mean	SD
Fourth grade n = 25	26.90	2.81	40.10	2.88	The remaining number n = 15	30.89	0.24	32.95	0.44	The remaining number n = 4	22.53	2.57	36.13	2.19
Fifth grade n = 23	29.63	0.47	31.04	0.47	The remaining number n = 15	32.80	0.92	37.11	0.98	The remaining number n = 5	24.54	2.77	27.15	2.99
Sixth grade n = 12	27.82	1.07	33.01	0.47	The remaining number n = 9	30.79	0.87	34.98	1.45	The remaining number n = 3	21.53	2.23	25.93	2.76

strategies presented at the first level of the intervention have improved the performance of the students and consequently withdraw from the program because they are not with learning difficulties. The remaining number of (39) male and female students moved to the second stage of the response to intervention model, which includes providing intensive strategies and individual and group teaching. Then the post-test was applied to them, and it shows the success of (27) male and female students on the post-test; thus they withdraw from the program because they are not with learning difficulties. The remaining number of students and 12 (male and female) students were subjected to the third level of the response to intervention model services and strategies; they were referred to the resource room for the possibility that they have learning difficulties to receive special education services.

It was noted here that the response to intervention model has reduced the number of students who were diagnosed by the test of divergence as having learning difficulties from 60 to 12 students; 48 responded to the strategies and methods of the response to intervention model, and this is an indication of the effectiveness of the response model. The program includes a set of teaching strategies that have been proven effective with studies and scientific research such as the multi-sensory learning method, the Fernald

and Gillingham method, computer education and educational games. The model takes into account multiple learning patterns. The students used the methods that commensurate with their abilities, and speed of reinforcement was used continuously to increase the students' motivation for learning and achievement.

This study is consistent with Bryant et al. (2008), Peterson et al. (2007), Al-Zayat (2006), Doug and Lynn (2006), Al-Ansari (2009), Vaughn et al. (2003) and Vaughn et al. (2003).

Results related to the second question: Are there statistically significant differences between the averages of students' scores on the post test of reading skills attributed to the educational program?

The standard mean and deviations for the post test scores were extracted for each stage of the response model and for all grades. Table 3 shows the results.

It is clear from Table 3 that all members of the study sample and in all classes have improved their performance according to the stages of the response to intervention model as follows:

(1) In the fourth grade, 10 responded to the intervention in the first stage, and the arithmetic mean for them before the intervention was 26.90 and after the intervention it rose to 40.10. In the second stage 11 responded to the intervention.

The mean before the intervention was 30.89 and after the intervention it rose to 32.95; in the third stage, 4 responded to the model; the mean of them before the intervention was 22.53 and after the intervention, it rose to 36.13 by 16%.

(2) In the fifth grade, 8 responded to the intervention in the first stage, and the arithmetic mean for them before the intervention was 29.63 and after the intervention it rose to 31.04; in the second stage 10 responded to the intervention. The mean for them before the intervention was 32.80 and after the intervention it rose to 37.11; in the third stage 5 responded to the intervention; the arithmetic mean for them before the intervention was 24.54 and after the intervention it rose to 27.15 by 21.7%.

(3) In the sixth grade, 3 responded to the intervention in the first stage, and the arithmetic mean for them before the intervention was 28.27 and after the intervention it rose to 33.01. In the second stage 6 responded to the intervention, and the mean for them before the intervention was 30.79, and after the intervention it rose to 34.98. In the third stage, 3 responded to the intervention; the arithmetic mean for them before the intervention was 21.53 and after the intervention it rose to 25.93 by 25%.

Results related to the second question: Are there statistically significant differences between the

**Table 4.** Arithmetic averages and standard deviations for the post achievement test in writing for each stage of the response to intervention model.

Class	The first stage of the response to intervention model					The second stage of the response to intervention model					The third stage of the intervention response model			
	Pretest		Posttest			Pretest		Posttest			Pretest		Posttest	
	Mean	SD	Mean	SD		Mean	SD	Mean	SD		Mean	SD	Mean	SD
Fourth grade n = 25	21.43	2.01	26.03	2.79	The remaining number n = 15	28.53	0.47	30.94	0.50	The remaining number n = 4	22.43	0.62	27.31	0.59
Fifth grade n = 23	33.73	0.51	35.57	0.62	The remaining number n = 15	33.60	1.82	36.59	1.84	The remaining number n = 5	25.18	3.10	30.47	2.23
Sixth grade n = 12	20.24	0.50	25.57	0.48	The remaining number n = 9	31.67	0.51	34.23	0.48	The remaining number n = 3	27.30	1.76	30.07	2.40

averages of students' scores on the post test of writing skills attributed to the educational program?

The standard mean and deviations for the post test scores were extracted for each stage of the response model and for all grades. Table 4 shows the results.

It is clear from Table 4 that all members of the study sample and in all classes have improved their performance according to the stages of the response to intervention model, as follows:

(1) In the fourth grade, 10 responded to the intervention in the first stage, and the arithmetic mean for them before the intervention was 21.43 and after the intervention it rose to 26.03, in the second stage 11 responded to the intervention. The mean for them before the intervention was 328.5 and after the intervention it rose to 30.94; in the third stage 4 responded to the intervention, and the arithmetic mean for them before the intervention was 22.43 and after the intervention it rose to 27.31.

(2) In the sixth grade, 3 responded to the intervention in the first stage, and the arithmetic mean for them before the intervention was 20.24 and after the intervention it rose to 25.57; in the second stage 6 responded to the intervention. The mean for them before the intervention was 31.67 and after the intervention it rose to 34.23; in the third stage, 3 responded to the intervention, and

the arithmetic mean for them before the intervention was 27.30 and after the intervention it rose to 30.07.

(3) We can say that the response to intervention model is effective in detecting and identifying students with learning difficulties as well as effective in improving and treating academic weakness of the students. The researcher attributes this result to the fact that the response to intervention model is based on three therapeutic stages that depend on the continuous measurement of the level of students' progress and the provision of educational strategies and teaching methods. Scientific research and multiple studies have proven its efficiency and effectiveness; it commensurate with the students' abilities and educational needs within a comfortable educational environment, that is free from threat and psychological pressure. The use of reinforcement daily and the provision of enrichment activities and household duties that involve parents in the follow-up program had a significant role in the progress of the students and increased their motivation for the program. The results of the current study are consistent with all previous studies.

The study attempts to reconsider the issue of diagnosing students with learning disabilities in terms of components, procedures and drivers used; it adopts the response to intervention model

as a strategic and proven method that is effective in diagnosing and evaluating people with learning disabilities.

### Recommendations

In light of the results of the study, the researcher recommends the following:

- (1) Changing the routine evaluation pattern currently used in schools to detect students with learning difficulties and rely on the methods and strategies of the response to intervention model.
- (2) That special education programs for people with learning disabilities be modified so that their teaching methods are based on the response to intervention model within its different stages, and the strategies should be generalized to all schools.
- (3) Doing a re-study on large samples that include other types of learning difficulties, and comparing the effectiveness of the program with each of these types; and also studying the effect of the program on other dependent variables among these students.

### CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

## REFERENCES

- Al-Ansari M (2009). The effectiveness of the response model to interfere in the development of a speech-knowing skill for people with learning difficulties from secondary school pupils in the State of Kuwait. Unpublished Master Thesis, Arab Gulf University, Kuwait.
- Alian A, Al-Smadi J (1988). Mental Performance Standards for Jordanian Individuals More Than 11 Years of Advanced Raven Matrices, *Journal of Educational Studies*, University of Jordan, Volume Fifteenth Issue No. 8.
- Al-Waqfi R (2016). Learning difficulties: theoretical and practical. Dar Al-Masirah, Amman: Jordan.
- Al-Zayat F (2007). Learning difficulties: teaching strategies and therapeutic approaches. University Publishing House, Cairo: Egypt
- Al-Zayat M (2006). The predictive value of identifying and diagnosing learning difficulties between quantitative and qualitative analysis models. International Conference on Learning Difficulties. 11/26/2006, Riyadh: Saudi Arabia.
- Bryant DP, Bryant BR, Gersten RM, Scammacca NF, CWinter A, Shih M, Pool C (2008). The Effects of TierII Intervention on the Mathematics Performance of FirstGrade Students Who are at Risk for MathematicsDifficulties. *Learning Disability Quarterly* 31(2):47–65.
- Callender WA (2007). The Idaho Results Based Model: Implementing Response to Intervention Statewide. *Response to Intervention: The Science and Practice of Assessment and Intervention* pp. 331-342. New York. Springer.
- Fuchs L, Fuchs D (2005). Response to Intervention (RTI) as a method of LD identification, paper presented at the national research center on learning disability. United State.
- Gresham FM (2002). Responsiveness to Intervention: AnAlternative Approach to the Identification of LearningDisabilities. In: R. Bradley, L. Danielson, & D.L. Hallahan (Eds.), *Identification of Learning Disabilities: Research to Practice*. 467-519. New Jersey: Lawrence Erlbaum Association.
- Hilahan D, Kaufman J, Lloyd J, Wes M, Elizabeth M (2006). Learning difficulties: its concept - nature - therapeutic learning, (translation: Adel Abdullah Muhammad), Amman: Dar Al Fikr Distribution and Publishing. (Original publication date 2005).
- Individuals with Disabilities Education Act (IDEA) (2004), National Center for Learning Disabilities.
- Lerner J (2000). *Learning Disabilities; Theories Diagnosis and Teaching Strategies* (8th ed.). Boston, New YorkHoughton Mifflin Company.
- Mercer C, Mercer N (2006). Teaching students with learning problems, (translation: Ibrahim Zureikat and Reda Al-Gammal), Amman: Dar Al-Fikr Distribution and Publishing. (Original publication date 2005).
- Miller L (2016). Response to intervention: a mixed-methods longitudinal study of the differences in reading achievement within a school district. Doctor of Education. Muncie, Indiana: Ball State University.
- National Joint Committee on Learning Disabilities (NJCLD) (2005). *Responsiveness to Intervention and Learning Disabilities: A Report Prepared by the National Joint Committee on Learning Disabilities Representing ElevenNational and International Organizations*.<http://www.NJCLD.org>. Retrive.
- Peterson DW, Prasse DP, Shinn MR, Swerdlik ME (2007). The Illinois Flexible Service Delivery Model: AProblem-Solving Model Initiative. In S. R. Jimerson, M. K.Burns, & A. M. VanDerHeyden (Eds.), *Handbook of Response to Intervention: The Science and Practice of Assessment and Intervention*. 300–318. New York: Springer.
- Rashid Z (2016). Intervention Response Model for People with Learning Disabilities: Mechanisms for Identification and Diagnosis, *Journal of Human and Social Sciences Generation for Learning Disabilities* pp. 17-18.
- Sheldon H (2005). Research Roundup: Response to Intervention- APrimer, Director of Professional Services, <http://www.NJCLD.org>. Retrive.
- Skelding-Dills K (2013). Response to Intervention (RTI) in a High School: A Case Study of Implementation. Doctor of Education. Blacksburg, Virginia: Virginia Polytechnic Institute and State University.
- Vaughn S, Linan-Thompson S, Hickman P (2003). Response to Instruction as a Means of Identifying Students with Reading/Learning Disabilities. *Exceptional Children* 69(4):391-409.
- Wallace S (2014). Response to intervention: examining teacher perceived self-efficacy when prescribing and implementing academic and behavior interventions. Doctor of Education. Drexel University.

*Full Length Research Paper*

# **Students' metaphoric perceptions regarding the concept of distance education during the pandemic**

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**The aim of this study is to examine the views of students at different education levels on the concept of distance education through metaphors. In this study, the phenomenological design was used in accordance with the nature of qualitative research. The participants of the study, for whom the ethical rules were taken into account, consisted of 63 gifted students in total studying at primary and secondary school levels. In the collection of data, each participant was asked to fill in the form containing an open-ended item for the concept of distance education. The data obtained from the students were later analysed using the content analysis technique. When the relevant metaphors were examined, a total of 63 different categories were revealed. Depending on these categories, it has been observed that the concept of distance education is represented through different metaphors. According to the findings, it was determined that primary and secondary school students simulated the concept of distance education to different metaphors such as speaking class, longing for friends and intelligence cube.**

**Key words:** Metaphor, perception, phenomenology design, distance education, students.

## **INTRODUCTION**

Technological developments have not only transformed the way people live, receive information and provide services, but have also affected the way they receive education. In this period, which is also called the information society, various Information and Communication Technologies (ICTs) are used by people to follow the latest developments (Arthur-Nyarko et al., 2020). Technological developments have facilitated

access to information across the world and made the world a global village with access to information (Buluk and Esitti, 2020). However, the coronavirus disease 2019 (COVID-19), which emerged as a negative development in late 2019, spread rapidly all over the world and has been declared a pandemic by the World Health Organisation.

It has been stated that as of 17 April, 2020, schools

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were closed in 191 countries around the world and 1,724,657,870 students were affected by this process, due to the 'COVID-19' pandemic that spread rapidly and caused various crises in a global context (UNESCO, 2020a). This process has directly affected the education system in Turkey and other countries. In order for students not to stay away from education during this period, distance education in primary, secondary and high school levels by the National Ministry of Education system has been started.

The Education Information Network which was established in 2012, for distance education was initiated due to the pandemic and started to be used actively, enabling students and teachers to be in contact. For all students to have easy access during the pandemic process, the infrastructure of the system has been developed. The Education Information Network TV, with three different channels, namely Primary School, Secondary School and High School, started broadcasting for distance education. On these channels, lesson hours from 1st grade to 12th grade are 20–25 min each and repetitions continue throughout the day. There is an 'activity zone' in between lectures to provide students with educational and entertaining activities.

When the literature is examined, it is seen that there are different definitions of distance education. In the most general sense, distance education is defined as a teaching method that operates based on the active use of information technologies in order to teach lessons and to facilitate learning, as instructors and students are located in different times and places (Valentine, 2002). According to another definition, distance education is described as a form of education in which the learner and the teacher are separated and are distant from each other in most of the teaching and learning process, and materials and documents suitable for the course content are frequently used (Usun, 2006).

With the decision to transition to distance education, online media and TV broadcasts started to be used actively in this process in many countries (Stojanovic et al., 2020). Lessons were conducted as synchronic (synchronous) and asynchronic (asynchronous) within the scope of distance education. In synchronic education, students and teachers meet at a predetermined time (usually online) and conduct live lectures (Fidalgo et al., 2020). In this process, a more active environment is created for teachers and learners and to provide an environment similar to face-to-face education, such as in-class interaction and discussion, instantly asking questions and expressing incomprehensible parts. In asynchronous education, on the other hand, it is the type of education where teachers and students cannot have the opportunity to work simultaneously and students can access the course content (presentation, video, audio recording, etc.) over the Internet whenever they want or need it. Communication between participants takes place mainly through e-mail and online forums and is often

managed by trainers (Watts, 2016).

When the literature on distance education is examined during the pandemic, it is possible to come across many studies. Accordingly, Ozdogan and Berkant (2020) examined stakeholder views on distance education during the pandemic period in their research. The data within the scope of the research were obtained from 137 stakeholders using semi-structured interview forms. The solution suggestions of the stakeholders are mostly in the form of measuring and evaluating the process, establishing equal opportunities, increasing participation and interaction in the course, strengthening the infrastructure, making lessons with their own teachers, and reducing the number of lessons.

Gencoglu and Ciftci (2020) examined the education system during the epidemic in their research. In the study, the difficulties encountered in the world and Turkey in terms of education during the COVID-19 pandemic process, the measures taken, and the solutions produced were discussed. As a result, it has been observed that the problem areas faced by countries commonly focus on 'access to distance education, determination of student achievement, compensatory education planning, psychosocial support services and (disadvantaged) students requiring special policies'.

Chatterjee and Chakraborty (2020) examined students' views on online education during the COVID-19 process in their research. They prepared a questionnaire with 20 statements related to online education during the COVID-19 pandemic. As a result, the students appreciated the software and online study materials being used to support online education. In addition, the students felt that online education is stressful and is affecting their health and social life.

Bozkurt (2020) conducted a study that determines the metaphorical perceptions of primary school students towards distance education during the pandemic process. As a result, facilitators in the positive metaphor group in the study, lifelong themes of learning, instructional presence, structured learning, sense of community, autonomy, time, space and independence, intrinsic motivation and accessibility emerged. In the negative metaphors group, themes of loneliness, artificiality, socialisation, extrinsic motivation, isolation, lack of communication, psychological distance, quality, inequality, transience and affective closeness emerged.

### **Purpose of the study**

The aim of this research is to analyze the metaphors developed by gifted students regarding the concept of distance education. In this context, answers to the following questions were requested:

1. What are the metaphors gifted students have about the concept of distance education during the pandemic?

2. Under which conceptual categories are the specified metaphors in terms of common features?

### Importance of the study

The COVID-19 (Yip and Chau, 2020), which is still increasing and effective today, is a highly contagious disease and there is no vaccine or definitive treatment against this virus that causes the disease (Guragai, 2020). This situation has brought important difficulties and changes in daily life. One of the most important areas affected by the coronavirus, which has affected the world in a short time, is the education sector. In this direction, after the first cases seen in Turkey on March 11, 2020, education was suspended for a short time at preschool, primary school, secondary school, high school and higher education levels. In this context, countries have changed to distance education instead of the traditional face-to-face education (Al Lily et al., 2020). Socio-psychological variables such as students' perspectives and attitudes towards distance education are important for the effectiveness and efficiency of this transition process. In this context, in this study, the perspective of gifted students towards distance education was presented with a metaphor study. It is clear that the findings of the study, especially the metaphors that students use to conceptualise distance education, can give certain clues to educators about this process. In addition, in this study, the positive and negative aspects of distance education will be evaluated through the eyes of the students and in this sense, future research will be enlightened. With this study, it is aimed to examine the perceptions and perspectives of students who continue their education in an institution where all education and training activities are carried out with the procedures and principles of distance education through metaphor analysis and contribute to the field.

### METHODS

This study, which examines the metaphorical images and perceptions of gifted students towards distance education, was designed as a qualitative phenomenology study. Phenomenology focuses on the phenomena that we are aware of but does not have a detailed and deep understanding (Yildirim and Simsek, 2016).

The reason why metaphor analysis is preferred in this study is the thought that meaningful data cannot be collected from primary school students with traditional data collection tools. In addition, with this method, the meanings that students attribute to distance education with their experiences and perspectives during the pandemic process were revealed. Beyond being linguistic tools (Moser, 2000), metaphors also offer important opportunities to understand human unknowns and new situations, which are one of the important assumptions of the constructivist approach (Parsons et al., 2004; Saban, 2006).

### Study group

In this study, Turkey's Science and Arts Centre reached 63 primary

school students in the field of education. The 63 gifted primary school students participating in the study were 10 years old. 41 of them were boys and 22 of them were girls. The classes in which the participants were educated were the 3rd grade, 4th grade and 5th grades of primary education. The ages of the students are between the ages of 9-10-11.

### Data collection tool, data collection and analysis of data

Distance education students, during the COVID-19 pandemic considering their experiences, were asked to fill in the sentence, 'Distance education is like... because...' in the form using a metaphor. The collected data were analysed by the researcher through content analysis. The metaphors that emerged in this context were coded and divided into categories. Quantitative descriptive analyses using frequencies and percentages were used in reporting the data. Content analysis is first conceptualizing the collected data and then organizing them in a logical way according to the emerging concepts and determining the theme that explains the data at the end of these processes (Buyukozturk, 2018). In this study, content analysis method was used in the analysis of the data. In this context, the data collected first are conceptualized, then, the obtained concepts were themed and interpreted. Also F (female) and M (male) letters are used while coding. The reason for this coding is to observe the gender difference. Thus, while reading the comments, metaphors can be evaluated according to the gender factor.

### Research reliability/validity and reliability studies

One of the ways to increase the credibility of research in qualitative studies is the researcher's experience in the relevant field (Bashir et al., 2008). In this context, the researcher completed her doctorate in the field of distance education, carried out theoretical and practical studies and took part in many national and international projects. In order to ensure the content validity of the questions used in the interview form, a faculty member who has experience in qualitative education researches opinion had been received. In order to ensure internal validity, an adequate participation strategy was adopted (Merriam and Tisdell, 2015), and data were collected from 63 students in total, and it was aimed to achieve satisfaction in the answers given in this way. In addition, in order to support the emerging themes and increase the credibility of the research findings, the sample responses of the participants were used as direct citations under the relevant categories and themes. The first author independently coded the emerging themes, and then the same procedure was repeated by the faculty member who gave an opinion for content validity.

### Strengths and limitations of the study

This study is one of the preliminary studies that examine the images and perceptions of gifted primary school students towards distance education, which do not exist in national and international literature. In this context, the study will form a basis for future studies. In addition to its expressed strengths, this study has some limitations as well. The biggest limitation in this context is that the distance education experiences of students are limited to distance education content provided by the Education Information Network (EBA) and simultaneous and asynchronous activities.

### FINDINGS

In the study, firstly, metaphors were coded and divided



**Table 1.** Frequency and percentage values of positive metaphors according to categories and themes.

Categories theme	Positive metaphor	F	%
Entertainment motivation	Talking robots	5	6.6
Entertainment motivation	Talking screen	3	4.0
Entertainment motivation	Talking head	2	2.6
Assistant facilitator	Home asistant	4	5.3
Assistant facilitator	Google assistant teaching state	1	1.3
Education sense of community	School	7	9.3
Education sense of community	Class	5	6.6
Education sense of community	Cluster	3	4.0
Education sense of community	Group	3	4.0
Education sense of community	Team	2	2.6
Technology virtual environment	Virtual classroom	6	8.0
Technology virtual environment	Virtual reality	1	1.3
Technology virtual environment	Virtual lab	1	1.3
Technology accessibility	Conference	5	6.6
Technology accessibility	Video call	5	6.6
Technology accessibility	Commander	3	4.0
Technology accessibility	E-book	1	1.3
Follow-up visuality	Sunglasses	2	2.6
Follow-up visuality	Camera	2	2.6
Follow-up visuality	Lifeless picture-image	1	1.3
Freedom independence	Colour pencil	2	2.6
Freedom independence	Break time	1	1.3
Comfort easiness	Armchair/chair	3	4.0
Flexibility planning	My room	1	1.3
Flexibility planning	Alarm clock	1	1.3
Speed time saving	Superman	1	1.3
Flexibility backing time	Time machine	1	1.3
Wideness unlimited	Ocean	2	2.6
Trip discover	Virtual museum	1	1.3
<b>Total</b>		<b>75</b>	<b>100</b>

into categories, and these categories' themes can be associated with the distance education literature. In this section, where positive and negative metaphors are discussed separately, the resulting categories and findings are presented. Direct quotations are included in order for the reader to add their own comments and to increase the reliability of the study. After presenting the emerging themes, the context of the relevant literature is discussed.

### Positive metaphors

Positive metaphors consist of a total of 13 categories and a total of 13 themes under these categories (Table 1). A total of 30 positive metaphors were determined, as shown in Table 1.

According to Table 1, positive metaphors are separated within the answers given by the students to the relevant

question. The positive metaphors are examined in detail according to their categories in the following sections. In terms of frequency and percentage, it is seen that the most slice is on the education category and "the school metaphor", which is under the theme of sense of community.

### Entertainment categories

The theme that emerges under this category and is the most dominant among all themes is the 'motivation' theme. With the closure of schools as a result of the pandemic, it can be said that the applications within the scope of emergency distance education are beneficial in this sense. For example, one of the participants used the metaphor: '*Distance education is like a talking robot because it did not deprive us of our lessons during the pandemic process*' (F7). In this context, the role of

distance education applications is attributed to the continuity of education to the metaphor of talking robot.

### Assistant categories

The theme that emerges under this category and is the most dominant among all themes is the 'facilitator' theme. The metaphors that students use in the assistant category in distance education are in a facilitating direction. For example, one of the participants used the metaphor: '*Distance education is like a home assistant because allows me to watch the lessons without getting tired*' (M2). Therefore, the facilitating role of distance education applications is attributed to the metaphor of home assistant.

### Education categories

The theme that emerges under this category and is the most dominant among all themes is the 'sense of community' theme. In the education category, students defined distance education as participating in a community and feeling a sense of community. For example, one of the participants used the metaphor: '*Distance education is like a team because in every lesson I feel like the footballer of that lesson*' (M51). Considering this metaphor, the student likened himself to a football player in distance education environments and thus experienced the feeling of belonging to a community.

### Technology categories

The themes that emerge under this category and are the most dominant among all themes are the 'virtual environment' and 'accessibility' themes. When metaphors were examined primarily as a virtual environment theme, one of the participants used the metaphor: '*Distance education is like virtual lab because we experiment at home and show it to our teacher for science lesson*' (F26). One of the participants used the metaphor: '*Distance education is like commander because the moment you open it, you reach it*' (M30). With these metaphors, students drew attention to the virtual environment and accessibility features offered by distance education.

### Follow-up categories

The theme that emerges under this category and is the most dominant among all themes is the 'visuality' themes. The metaphors that students use in the follow-up category in distance education are in a visuality direction. For example, one of the participants used the metaphor:

*'Distance education is like sunglasses because allows us to see people far away at the computer'* (F46). With this metaphor, students drew attention to the visuality features offered by distance education.

### Freedom categories

The theme that emerges under this category and is the most dominant among all themes is the 'independence' themes. The metaphors that students use in the freedom category in distance education are in an independence direction. For example, one of the participants used the metaphor: '*Distance education is like colour pencil because I have the opportunity to study as I want in distance education*' (M19). With this metaphor, the students underlined that they are free in distance education and that they are in control of the course with distance learning.

### Comfort categories

The theme that emerges under this category and is the most dominant among all themes is the 'easiness' theme. For example, one of the participants used the metaphor: '*Distance education is like armchair because I can reach everything with just one click from where I sit*' (F11). The student drew attention to the comfort of distance education with the metaphor used in this expression.

### Flexibility categories

The themes that emerge under this category and are the most dominant among all themes are the 'planning' and 'backing time' themes. When metaphors were examined primarily as a planning theme, one of the participants used the metaphor: '*Distance education is like my room because I can plan as I want*' (F40). One of the participants used the metaphor: '*Distance education is like time machine because I can bring back time with the records I take*' (M10). With these metaphors, the student likened distance education to a time machine that takes one back in time.

### Speed categories

The theme that emerges under this category and is the most dominant among all themes is the 'time-saving' theme. For example, one of the participants used the metaphor: '*Distance education is like Superman because when the teacher asks a question, I quickly scan the question from the search engine, I save time*' (M06). With this view, the student emphasised that they can access information with a single click through the wide Internet network and this situation saves time in the lesson.

**Table 2.** Frequency and percentage values of negative metaphors according to categories and themes.

Category	Theme	Negative metaphor	F	%
Captivity	Isolation	Bird in a cage	2	4.1
Captivity	Isolation	Prison	2	4.1
Captivity	Isolation	Lantern	3	6.2
Captivity	Isolation	Crime	2	4.1
Captivity	Isolation	Court	1	2.0
Distance	Communication	Astronaut	1	2.0
Distance	Communication	Cleaning robot	1	2.0
Distance	Communication	Voice assistant	2	4.1
Fault	Disconnection	Punk	1	2.0
Fault	Disconnection	Broken radio	1	2.0
Fault	Disconnection	Broken television	1	2.0
Fault	Disconnection	Heart	1	2.0
Loneliness	Friendship	Sunshade	2	4.1
Loneliness	Friendship	Curtain	1	2.0
Loneliness	Friendship	Empty room	2	4.1
Loneliness	Friendship	Black cat	1	2.0
Tasteless	Sapless	Eating less salt	1	2.0
Tasteless	Sapless	Spinach	2	4.1
Tasteless	Sapless	Unsweetened tea	1	2.0
Confusion	Fear	Trap	1	2.0
Confusion	Fear	Accident	1	2.0
Confusion	Fear	Ghost	1	2.0
Confusion	Fear	Quarantine people	2	4.1
Obligation	Necessity	Test subject	2	4.1
Obligation	Necessity	Elevator	2	4.1
Obligation	Necessity	Drug	2	4.1
Obligation	Necessity	Homework	2	4.1
Far away	Can't touch	Whistle	1	2.0
Far away	Can't touch	Drum	1	2.0
Far away	Can't touch	Pipe	1	2.0
Difficulty	Impossibility	Mask	1	2.0
Difficulty	Impossibility	Snowy weather	1	2.0
Difficulty	Impossibility	Petrol free car	1	2.0
Total			48	100

### Wideness categories

The theme that emerges under this category and is the most dominant among all themes is the 'unlimited' theme. For example, one of the participants used the metaphor: '*Distance education is like ocean because I'm lost in the sea of knowledge*' (F54). With this metaphor, attention was drawn to the wideness and accessible information environment offered by distance education.

### Trip categories

The theme that emerges under this category and is the most dominant among all themes is the 'discover' theme.

For example, one of the participants used the metaphor: '*Distance education is like virtual museum because by logging in to the system, you can trip and exit when the time comes*' (M62).

### Negative metaphors

Negative metaphors consist of a total of nine categories and a total of nine themes under these categories (Table 2). A total of 33 positive metaphors were determined, as shown in Table 2.

According to Table 2, negative metaphors are separated within the answers given by the students to the relevant question. The negative metaphors are examined

in detail according to their categories in the following sections. In terms of frequency and percentage, it is seen that the most slice is on the captivity category and “lantern”, which is under the theme of isolation.

### **Captivity categories**

The theme that emerges under this category and is the most dominant among all themes is the ‘isolation’ theme. For example, one of the participants used the metaphor: *‘Distance education is like bird in cage we live in an isolated environment because of the corona’* (F16). With this metaphor, the student likened distance education to a birdcage and drew attention to the captivity of people here.

### **Distance communication categories**

The theme that emerges under this category and is the most dominant among all themes is the ‘command’ theme. For example, one of the participants used the metaphor: *‘Distance education is like cleaning robot because commands us with remote keys’* (M31). With this view, the student likened people to the metaphor of a cleaning robot set up for distance education.

### **Fault categories**

The theme that emerges under this category and is the most dominant among all themes is the ‘disconnection’ theme. For example, one of the participants used the metaphor: *‘Distance education is like my heart because it breaks off very quickly’* (F01). With this metaphor, distant education is likened to the human heart and it is expressed that there are problems that it quickly breaks.

### **Loneliness categories**

The theme that emerges under this category and is the most dominant among all themes is the ‘friendship longing’ theme. For example, one of the participants used the metaphor: *‘Distance education is like black cat because it prevents me from meeting face to face with my friends’* (F13).

### **Tasteless categories**

The theme that emerges under this category and is the most dominant among all themes is the ‘sapless’ theme. For example, one of the participants used the metaphor: *‘Distance education is like unsweetened tea because very tasteless and boring’* (M29). With this metaphor, the

student compared distance education to tea without sugar and expressed its tastelessness.

### **Confusion categories**

The theme that emerges under this category and is the most dominant among all themes is the ‘fear’ theme. For example, one of the participants used the metaphor: *‘Distance education is like ghost because I’m afraid that I won’t be able to attend the lesson if my Internet is disconnected at any moment’* (F9).

### **Obligation categories**

The theme that emerges under this category and is the most dominant among all themes is the ‘necessity’ theme. For example, one of the participants used the metaphor: *‘Distance education is like drug because it heals me even if I don’t like to take’* (M34).

### **Hear from far away categories**

The theme that emerges under this category and is the most dominant among all themes is the ‘can’t touch’ theme. For example, one of the participants used the metaphor: *‘Distance education is like drum I hear its voice from away but I can’t see or touch’* (F45).

### **Difficult categories**

The theme that emerges under this category and is the most dominant among all themes is the ‘impossibility’ theme. For example, one of the participants used the metaphor: *‘Distance education is like snowy air because you miss the sunny weather and stay at home’* (M43).

## **DISCUSSION**

In this study, which is an example of a metaphoric study, gifted students were studied and in this context, students were asked to define distance education conceptually. The participants of the study, for whom the ethical rules were taken into account, consisted of 63 gifted students in total studying at primary and secondary school levels. In the collection of data, each participant was asked to fill in the form containing an open-ended item for the concept of distance education, e.g., distance education is like ..... / similar, because .....

For the method part in the research, metaphors were coded and divided into categories, and these categories and themes can be associated with the distance education literature. In this section, where positive and

negative metaphors are discussed separately, the resulting categories and findings are presented. Direct quotations are included in order for the reader to add their own comments and to increase the reliability of the study. After presenting the emerging themes, the context of the relevant literature is discussed. When we examine the results of the research, the following are noted.

When the categories of positive metaphors were examined, it was noted that they were listed as *'Entertainment, Assistant, Education, Technology, Follow-up, Freedom, Comfort, Flexibility, Speed, Wideness and Trip'*. When the themes associated with the categories were examined, *'Motivation, Facilitator, Sense of community, Virtual environment, Accessibility, Visuality, Independence, Easiness, Planning, Time-saving, Backing time, Unlimited and Discover'* rankings drew attention. When the positive metaphors in which students define the concept of distance education are examined, it has been observed that there are remarkable details among them.

A few examples of the quotations are as follows: for entertainment categories: *'Distance education is like a talking robot because it did not deprive us of our lessons during the pandemic process'* (F7). In this context, the role of distance education applications is attributed to the continuity of education to the metaphor of talking robot. For speed categories, *'Distance education is like Superman because when the teacher asks a question, I quickly scan the question from the search engine, I save time'* (M06). With this view, the student emphasised that they can access information with a single click through the wide Internet network and this situation saves time in the lesson. For comfort categories, *'Distance education is like armchair because I can reach everything with just one click from where I sit'* (F11). The student drew attention to the comfort of distance education with the metaphor used in this expression.

When similar studies in the literature are examined, Bozkurt (2020) revealed a metaphoric study that tested the perceptions of primary school students towards distance education during the coronavirus pandemic. When the positive metaphors of students for distance education are examined, the themes *'facilitator, lifelong learning, teaching presence, structured learning, sense of community, autonomy, independence of time and space, intrinsic motivation and accessibility'* emerged. When examining the metaphoric perception examples of students towards distance education, *'Distance education is like a remote control because the moment you open it, you can reach it'; 'I think distance education is like the fastest information network because we can easily access the information we want, whenever we want.'* Interaction is one of the most important factors in the success of distance education. The development of ICT in recent years offers opportunities that increase student–student interaction and student–teacher interaction. Interaction between students and teachers is facilitated

by various applications such as chat, video, discussion, application sharing and group work (Ferguson and DeFelice, 2010; Tremblay, 2006). In this research, students tried to explain the beneficial aspects of distance education with these positive metaphors. With a similar study, Ozdogan and Berkant (2020) examined stakeholder views on distance education. As a result, the advantages such as being independent from time and place, being able to watch the lessons repeatedly, meeting the educational needs during the pandemic period and being protected against the transmission of the disease have been revealed.

When the categories of negative metaphors were examined, it was noted that they were listed as *'Captivity, Distance communication, Fault, Loneliness, Tasteless, Confusion, Obligation, Hear from far away and Difficulty'*. When the themes associated with the categories are examined, *'Command, Disconnection, Friendship longing, Sapless, Fear, Necessity, Can't touch, Impossibility'* rankings drew attention. When the negative metaphors in which students define the concept of distance education are examined, it has been observed that there are remarkable details among them. A few examples of the quotation areas follow: for captivity categories, *'Distance education is like bird in cage we live in an isolated environment because of the corona'* (F16). With this metaphor, the student likened distance education to a birdcage and drew attention to the captivity of people here. For obligation categories, *'Distance education is like drug because it heals me even if I don't like to take'* (M34). For tasteless categories, *'Distance education is like unsweetened tea because very tasteless and boring'* (M29). With this metaphor, the student compared distance education to tea without sugar and expressed its tastelessness.

When similar studies in the literature are examined, Civril et al. (2018) revealed the metaphoric perceptions of distance education students towards distance education in their studies and as a result, students stated their negative opinions in the expectation category, *'Distance education is like a radio because it does not never play the track you want'*. With this negative metaphor, the student stated that distance education could never give the desired outcome like radio.

When the study is evaluated in general and positive-negative metaphors are examined, the number of positive metaphors about distance education is too much than negative metaphors. In this context, it has been revealed that although distance education has many disadvantages arising from communication barriers, it is accepted by students especially during the pandemic process.

The recommendations are as follows: in order to examine students' perceptions of distance education in more detail through metaphors, further studies can be conducted using different demographic variables of students. In addition to the point of implementation, it is recommended that distance education institutions

primarily focus on the issues involving negative metaphors and make improvements by developing new policies and practices on these issues.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

## REFERENCES

- Al Lily AE, Ismail AF, Abunasser FM, Alqahtani RHA (2020). Distance education as a response to pandemics: coronavirus and Arab culture. *Technology in Society* 63(1):101317.
- Arthur-Nyarko E, Agyei DD, Armah JK (2020). Digitizing distance learning materials: measuring students' readiness and intended challenges. *Education and Information Technologies* 25(4):2987-3002.
- Bashir M, Afzal MT, Azeem M (2008). Reliability and validity of qualitative and operational research paradigm. *Pakistan Journal of Statistics and Operation Research* 4(1):35-45.
- Bozkurt A (2020). Images and perceptions of primary school students towards distance education during coronavirus (COVID-19) pandemic: a metaphor analysis. *Usak University Journal of Educational Research* 6(2):1-23.
- Buluk B, Esitti B (2020). Koronavirus (COVID-19) surecindeuzaktanegitiminturizmlisansogrencileritarafindandegerlendirilmesi. *Journal of Awareness* 5(3):285-298.
- Buyukozturk S (2018). *Bilimsel Arastirma Yontemleri*. Pegem Akademi Publishing. Ankara.
- Chatterjee I, Chakraborty P (2020). Use of information and communication technology by medical educators amid COVID-19 pandemic and beyond. *Journal of Educational Technology Systems* 49(3):310-324.
- Civril H, Arugaslan E, Ozkara OB (2018). Uzaktan eğitim öğrencilerinin uzaktan eğitime yönelik algıları: bir metafor analizi. *Eğitim Teknolojisi Kuram ve Uygulama* 8(1):39-59.
- Ferguson JM, DeFelice AE (2010). Length of online course and student satisfaction, perceived learning, and academic performance. *International Review of Research in Open and Distance Learning* 11(2):73-84.
- Fidalgo P, Thormann J, Kulyk O, Lencastre JA (2020). Students' perceptions on distance education: a multinational study. *International Journal of Educational Technology in Higher Education* 17(18). doi:10.1186/s41239-020-00194-2
- Gencoglu C, Ciftci M (2020). COVID-19 salgınında eğitim: Türkiye üzerinden bir analiz. *Journal of the School of History* 46(46):1648-1673.
- Guragai M (2020). Nepalese medical students in the COVID-19 pandemic: ways forward. *Journal of the Nepal Medical Association* 58(225):352-354.
- Merriam SB, Tisdell EJ (2015). *Qualitative research: a guide to design and implementation*. Hoboken, NJ: John Wiley & Sons.
- Moser KS (2000). Metaphor analysis in psychology—method, theory, and fields of application. *Forum Qualitative Sozialforschung* 1(2). Retrieved from [https://www.researchgate.net/publication/245032041\\_Taking\\_actors\\_perspectives\\_seriously\\_Whose\\_knowledge\\_and\\_what\\_is\\_managed\\_Knowledge\\_management\\_in\\_a\\_transdisciplinary\\_perspective](https://www.researchgate.net/publication/245032041_Taking_actors_perspectives_seriously_Whose_knowledge_and_what_is_managed_Knowledge_management_in_a_transdisciplinary_perspective)
- Ozdogan A, Berkant H (2020). COVID-19 pandemisindeki uzaktan eğitim için paydaşların incelenmesi. *Journal of National Education, The epidemic process in Turkey and the World Education* 49(1):13-43.
- Parsons SC, Brown PU, Worley V (2004). A metaphor analysis of preservice teachers' reflective writings about diversity. *Curriculum and Teaching Dialogue* 6(1):49-58.
- Saban A (2006). Functions of metaphor in teaching and teacher education: a review essay. *Teaching Education* 17(4):299-315.
- Stojanovic M, El-Khatib Z, Rovic Brandic A, Maalouf W (2020). Lions quest skills for adolescence implementation during COVID-19 challenges in Croatia. *Psychological Trauma: Theory, Research, Practice, and Policy* 12(1):274-275.
- Tremblay E (2010). "Educating the Mobile Generation – using personal cell phones as audience response systems in post secondary science teaching. *Journal of Computers in Mathematics and Science Teaching* 29(2):217-227.
- UNESCO (2020a). COVID-19 educational disruption and response. Retrieved from <https://en.unesco.org/covid19/educationresponse>.
- Usun S (2006). *Uzaktan eğitim*. Ankara, Turkey: Nobel Publishing.
- Valentine D (2002). Distance learning: promises, problems, and possibilities. *Online Journal of Distance Learning Administration* 5(3). Retrieved from <https://www.learntechlib.org/p/94887/>, March 02, 2021.
- Watts L (2016). Synchronous and asynchronous communication in distance learning: a review of the literature. *Quarterly Review of Distance Education* 17(1): 23-32.
- Yildirim A, Simsek H (2016). *Sosyal bilimlerden itelaraştırma*. Ankara, Turkey: Seckin Publishing.
- Yip PSF, Chau PH (2020). Physical distancing and emotional closeness amidst COVID-19. *Crisis* 41(3):153-155.

*Full Length Research Paper*

# Household education expenditures in Turkey for higher education exam preparation

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The study explored the household education expenditures for higher education exam preparation in Turkey. The study employed the case study design, one of the qualitative research designs. The study group consisted of families whose children were preparing for the higher education exam. The families were living in the city of Zonguldak. While determining the study group, criterion sampling technique and snowball sampling technique were used. The study data were collected using a semi-structured interview form. The study showed that households had education expenditures for higher education exam preparation. These expenditures were in the form of exam books and private teaching institutions/private lesson expenditures. Educational expenditures of households affected the economic, social, and individual life of the household. This effect was in the form of postponing or abandoning the basic needs of the household. Families recommended a change in the education system in order to reduce/eliminate household education expenditures. In a period when neoliberal education policies are on the agenda, it can be stated that the contribution of households to education expenditures will continue. Pulling away from the marketized examination approach and strengthening public education expenditures instead of household education expenditures are not limited to education policies, but also depends on the change in political and economic policies.

**Key words:** Higher education, education expenditures, household education expenditures, neoliberalism.

## INTRODUCTION

Thinking about the question of "Do we have to have exams?" necessitates considering education at the global level together with different historical and social conditions. Since the past, education has been made sense of within the determination of economic and political conditions. The belief that economic development will be achieved with education, which emerged after the Second World War, brought the economic role of education to the agenda. As it is known, Human Capital

Theory (IHC) is the theory in which education is addressed with an economic approach. According to the theory, investment in education increases the individual's capacity and productivity. Individuals who increase their capacity in return increase the economic development by increasing national income (Schultz, 1971; Woodhall, 1994). In the 1960s, also known as the planned development period, education began to be designed to realize the sustainability of development and to be

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considered as a way to increase other human developments. In other words, while development, the magic word of the period, was identified with economic growth to a large extent, it was predicted that social welfare would be achieved with growth, as well as a modern social structure based on human rights dominated by democracy. In this context, national governments and national planning institutions have adopted the discourse of education and economic growth in order to benefit from the assistance of international organizations. Education has been regarded as public investment in the context of education expenditures.

In the 1970s, the golden years of planning started to decline, as expected, development could not be achieved in developing countries, and the increase in unemployment and poverty continued. Parallel to this, the objections that planning hinders intervention in the economy and hence freedom of enterprise started to shake the planned development. The problem of economic growth naturally expanded to include social aspects, and basic human needs began to be a problem for nation-states and the international community (Chabbott and Ramirez, 2000).

In this new period named globalization, which started in the 1980s and has continued up to the present, within the framework of neoliberal policies that started to replace developmental policies, public expenditures were reduced with education becoming an economic activity and public support began to be expressed in expenditures. Similarly, as a result of neoliberal policies in Turkey, privatization of schools was increased, the public spending on education was reduced, education services and services within education such as food, housing, sanitation, transportation, and exams were put on the market (Polat, 2013).

One of the reasons for the reduction of public expenditures, among the neoliberal policies implemented, is the argument that the individual is self-sufficient and must meet his/her economic/social needs (Kerman, 2006:53), while the other is that the contributions to education increase the quality of education (Polat, 2013). These discourses, on the one hand, make it easier for the public to contribute to education, on the other hand, they legitimize public's support of education, which is actually a public service. In reality, the public contribution to education means that education expenditures are covered by the households. Household expenditures are defined as the private cost of education (Ünal, 1996). The education expenditure or private cost of education consists of direct, indirect, and waiving costs. Direct cost refers to household expenses of a child such as school fees, books, stationery, uniform, school bag, and transportation. Indirect cost refers to expenditures on food, shelter, and clothing. Finally, the cost of waiving refers to an individual giving up earning income by attending an educational institution instead of working in a job where he/she can earn income by having an

economic activity. In this case, the waiving cost of attending an educational institution is the income that can be obtained by working in a job (Yolcu, 2011,13-14).

Globally, 20% of education expenditures are covered by households. The contribution of households to education in low-income countries is 29%, whereas this is 18% in high-income countries (UNESCO, 2019). Household education expenditures in some countries are 67% in Cambodia, 59% in Uganda, 54% in Guatemala, 49% in Peru, 30% in Vietnam 30%, 22% in Turkey, 14% in the UK, 12% in Italy 12, 8% in Canada 8%, 5% in Switzerland, 4% in Belgium and Denmark, 1% in Luxembourg, Austria and Cuba 1%, and 0% in the Netherlands and Sweden (UNESCO, 2019). These data show that the education expenditures of households are low in countries with high-income levels. This should be interpreted as low and middle-income countries having lower education expenditure and having a higher burden on households (Huebler and Legault, 2017; EIR, 2020, 31). Considering the income level of households in low- and middle-income countries, it will be inevitable that households will limit other expenditures in order to meet their expenditures on education.

Coming back to the question of "Do we have to have exams?", it can be stated that exams, which are among the education expenditures, have turned into an industry. For example, the preparation and evaluation of standardized K-12 exams in the USA is a multi-million dollar industry and standardized K-12 exams make a sale of approximately 1.5 billion dollars per year (Gluckman, 2002, as cited in McLaren, 2011, 70-71). Furthermore, Ollman (2010) explained why exams exist: Capitalists want schools to equip young people with the necessary knowledge and skills in line with the interests of the capitalists. However, besides such knowledge and skills, capitalists also want schools to teach young people the beliefs, attitudes, feelings, and habits necessary to obtain them easily. They need all of this not only to maximize profits but also to assist in reproducing the social, economic, and even political conditions and related processes enabling them to sustain profits. The entire capitalist system will collapse without workers, consumers, and citizens who have well memorized and accepted their roles in these processes. This is where the test culture has become indispensable, especially in the context of the behavioral and formal preconditions of capitalist direction (as cited in Demirer, 2016).

Higher education level is an important education level as it determines the job, position, and living conditions to be acquired afterwards. Therefore, it is possible to state that this determinant also has a significant share in household education expenditures and this share will increase more in the coming years. Although there are studies on household education expenditure in Turkey (Tural, 1998; Tansel and Bircan, 2006; Köktaş, 2009; TED, 2010; Duman, 2012; Yolcu, 2011; Algur, 2019; EIR; 2020), the lack of studies on the household education



expenditures during the higher education preparation process was the reason behind the present study. Accordingly, the study sought the answers to the following questions:

1. What are the household education expenditures during the higher education exam preparation process?
2. What is the effect of household education expenditures on the lives of households during the higher education exam preparation process?
3. What kind of solutions should be produced in order to prevent household education expenditures during the higher education exam preparation process?

## METHOD

### Study design

This study employed the case study design, one of the qualitative research designs. A case study allows one or more cases to be examined in detail. It investigates all the factors related to a case with a holistic approach, thus enabling the study to focus on how they affect the case in question and how they are affected by the case in question (Yıldırım and Şimşek, 2008, 77). This study was designed as a case study since the study aimed to address the household education expenditures made by families for their children with a holistic approach and focused on the expenditures' effects on the households.

### Study group

The study group consisted of a parent from 15 different families of 12<sup>th</sup> grade students (seniors) who were preparing for the higher education exam in the 2019-2020 academic year. In this context, mothers or fathers from 15 families living in Zonguldak participated in the study. While determining the study group, criterion sampling technique and snowball sampling technique, two of the purposeful sampling methods, were used. The criterion determined for the study was to be "making additional expenditure" during the preparation for the higher education exam. The reason for using the snowball sampling technique was based on the idea that parents who knew each other through their children could form a rich source of information pool on the subject.

The mean age of the participants was 46.33 and their mean income was 5.541 TL<sup>1</sup> (Turkish Liras, TL). Two of the parents had three children, whereas the others had two children. Seven of the participants were housewives, five were teachers, one was a nurse, and two were retired. Participants' demographic information is presented in Table 1.

### Data collection tool

The study data were collected using a semi-structured interview form. Before the development of the interview form, the literature was reviewed, the basic concepts determined related to the subject were associated with the purpose of the study, and a question draft was formed. The draft form was submitted for expert opinion, and the interview form was finalized in line with the opinions received. Six questions were included in the interview form. The pilot application of the form was conducted with two families who were

known by the researchers. After this pilot application, it was decided that the interview form was suitable for the study. The interview form also included questions about the participants' personal information (profession, age, income status, number of children) in order to get to know the participants more.

### Data collection

The data were collected face-to-face by the researchers between March 2020 and May 2020. The face-to-face interviews started with a parent of a student known by the researchers. With the name and contact information obtained from the first parent, other parents were reached using the same method. The interviews were carried out on a voluntary basis. Appointments were made with the parents before the interviews, and the interviews, which were recorded on a tape recorder, were conducted at the place and time determined by the parents. The interviews took between 45 and 60 min. During the interviews, researchers took care not to guide the parents. Different issues were talked about before the interviews so that an interview atmosphere was created. After the interviews, the transcripts of the responses received from the parents were sent to them by e-mail, thus preventing any erroneous data.

### Data analysis

Content analysis was used to analyze the data. In content analysis, data are summarized and interpreted according to predetermined themes (Yıldırım and Şimşek, 2008, 227). In the data analysis of the study, first, the study questions and the answers given by the parents were categorized and a categorical (thematic) framework was formed. Then, the data were processed according to this categorical framework. Afterwards, the findings were defined and interpreted. In order to facilitate comprehension, the responses to the questions were tabulated as frequency and direct quotations were also included from time to time. While giving direct quotations, each of the parents participating in the study was given a code with the letter "P" meaning "participant" according to the order of the interviews (such as "P1"). Since the participants specified more than one category, the sum of the frequencies in some categories was more than 15, the total number of participants.

### Validity and reliability

The assessment of the credibility (internal validity) of qualitative research is carried out using the methods of long-lasting interaction, depth-focused data collection, triangulation, expert review, and participant confirmation. While assessing the transferability (external validity), detailed description and purposeful sampling methods can be used, whereas consistency analysis method can be used while assessing consistency (internal reliability) and confirmation examination method can be used while assessing verifiability (external reliability) (Yıldırım and Şimşek, 2008, 264-272). Based on these, in the study, two expert opinions were taken for consistency (internal validity) and the study was reviewed according to the feedback received from the experts. A detailed description is included for transferability (external validity) in the study. As is known, in the detailed description, raw data are presented in their original form without any comments. Thus, readers can draw their own conclusions from the study (Yıldırım and Şimşek, 2008, 270). Therefore, direct quotations are presented in the study.

Qualitative research does not seek reliability like quantitative research, since it is based on the assumption that events and phenomena occur depending on the environment and time and therefore it is not possible to repeat them exactly. Reliability in

<sup>1</sup>During the period of the study, the average of 1 \$ was 6.40 TL

**Table 1.** Demographic information of participants.

Participant	Age	Profession	Family's total monthly income (TL)	Number of children in the family
P1	42	Teacher	6.0000	2
P2	46	Teacher	9.0000	3
P3	48	Housewife	5000	2
P4	39	Housewife	4200	2
P5	42	Housewife	6.000	2
P6	47	Nurse	6000	3
P7	51	Retired	10.000	2
P8	51	Teacher	6.000	2
P9	55	Housewife	6.000	2
P10	44	Housewife	1.520	2
P11	44	Teacher	10.000	2
P12	44	Housewife	1.900	2
P13	41	Housewife	--	2
P14	45	Professor	9.000	2
P15	56	Retired	3.500	2

qualitative research is also not a criterion for validity. For this reason, qualitative research attaches importance to consistency (Yıldırım and Şimşek, 2008, 271). In consistency, the aim is to determine whether the researcher is acting consistently in the research-oriented activities he/she conducts. Therefore, it is necessary to correlate the study data with the results. In the present study, the study data were compared with the results again after the study was completed to ensure consistency (internal reliability). In addition, for the reliability of the study, Miles and Huberman's (1994) reliability formula was used ( $\text{Reliability} = \frac{\text{Number of agreement}}{\text{Total number of agreement} + \text{Number of disagreement}} \times 100$ ) and the calculated result ( $43 / 52 \times 100 = 82.69\%$ ) was accepted as sufficient for reliability (Miles and Huberman, 1994; Şencan, 2005).

As it is known, the concept of verifiability (external reliability) is used instead of objectivity in qualitative studies, as in quantitative studies, objectivity is not met completely (Yıldırım and Şimşek, 2008, 272). In the study, it was decided to keep the raw data, voice recordings, and data collection tool for verifiability (so that other researchers and external experts can compare the study findings and results with the same data if necessary).

## RESULTS

Under this heading, the study findings are presented separately according to the study purposes. The themes, sub-themes, and codes formed regarding the types of household education expenditures during the higher education exam preparation process are given in Table 2.

As can be seen from Table 2, household education expenditure types during the higher education exam preparation process are expenditures for supplementary resources, private teaching institutions, and private lessons. All of the participants stated that they spend money to buy supplementary resources. P14, one of the participants, explained this by saying, "He went to a

private teaching institution, he used supplementary resources. He took private lessons. He did all three. He had gone to the private teaching institutions in previous years. He had rarely taken private lessons but he took in the last year. He only took private lessons for certain subjects". The aforementioned supplementary resources consisted of resources containing subjects books, test books, and mock exam books. P5 described the expenditure for the supplementary resources by saying, "Well, you should see the house right now ... The house is full of books right, even the wardrobes. We are constantly buying. I mean, we buy and buy. There is no limit to the amount of money we give to the books". Another participant (P8) drew attention to the amount of education expenditure made and said, "... You buy a test booklet for 40 TL. For example, the child does it in an hour or two hours. Imagine solving one or two every day. I mean, even the daily cost is like 150-200 liras. These are only mock exams only". Another participant (P13) talked about how the expenditures exceeded the family and went beyond to relatives. She stated, "My son gave 200 and 300 liras to books in a month. So, he gave his pocket money to books. We bought books with the allowances he received from his aunt, grandmother, and grandfather".

In addition, all of the participants stated that they spend money on private teaching institutions. In these centers, there are classes of 15-20 students as well as classes of five students, and prices vary accordingly. One of the participants (P4) explained how the family budget was strained because of the institutions and said, "Well, we send him to a place like a teaching institution, like a study center. We have a monthly installment there. This is half our monthly salary. It is not possible for us to afford this

**Table 2.** Household education expenditure types.

Theme	Sub-themes	F	Code
Expenditure types	Supplementary resources	15	Buying subject books
			Buying test books
			Buying mock exam books
	Private teaching institutions	15	Getting courses from private teaching institutions
	Private lessons	10	Getting individual lessons

**Table 3.** Effect of household education expenditures on the household life.

Theme	Sub-themes	F	Codes
The effect of household education expenditures on the household life	Economic	8	Choosing cheaper food Reducing/postponing household expenditures
	Socio-cultural	8	Postponing the needs of the house Not going out for recreational purposes Not to buy books other than textbooks Not to go to movies, plays, etc. Not to go on vacation
	Individual	4	Not to make individual spending Postponing individual needs Self-sacrifice Not to buy new clothes

space with our salary. My family is helping a little, my husband's family is helping a little. We try to manage it this way. He really wanted to go to a private teaching institution, and we sent him. We couldn't send him before, but we sent him this year because there is an exam this year."

Another type of education expenditure is getting private lessons. 10 of the participants also stated that they spend money on private lessons. On this issue, one participant (P6) said, "We started private lessons in the past years. We took private lessons from Math. Apart from those, we were buying supplemental resources. He is a senior now. Last year and the year before he always took private lessons from Maths." Similarly, P5 said: "We hired a private tutor for three subjects. So, I spend money on three private tutors. Plus, we signed up for the private teaching institutions. That money went to waste because of this pandemic."

The themes, sub-theme, and codes formed regarding the effect of household education expenditures on the life of the households during the higher education exam preparation process are presented in Table 3.

As can be seen from Table 3, household education expenditures during the higher education exam preparation

process affected the life of the households in economic, socio-cultural, and individual aspects. One participant explained this by saying, "We retrench, for example, we retrench our social life. I mean, from our clothing expenses, food expenses. I mean, we retrench from many things. So, we try to be restrained in everything we need to buy for home".

About half of the participants stated that they were economically affected by education expenditures. The effect of expenditures on households could be seen in participants choosing cheaper items or postponing household needs. On this issue, participant P3 stated, "First of all, we have been trying to find the cheapest of whatever need for two years. This is a time when we need to be economic. You only understand when you go through this, but you still succeed. You retrench, you travel less, you are more economical in your shopping. You give up stuff for the house that you really want."

Approximately half of the participants talked about how the expenditures affected their socio-cultural life. The participants stated they did not have a socio-cultural life because of the expenditures. For example, participant P5 said, "We didn't have weekends, we couldn't do anything. Social activity is zero. I haven't gone to a movie for years.

**Table 4.** Participants' solutions to reduce/eliminate household education expenditures.

Theme	Sub-themes	F	Code
Participants' solutions	Exam system	11	The exam system should be changed/eliminated
			University should be chosen according to high school scores
	Educational content	10	There should be extra courses for exams in high schools
			The content of high school education should change
			The senior year should be exam oriented

The most luxurious thing you can do is going to a picnic or cinema. Did we retrench? Yes, we did."

The individual effects of the expenditures manifested themselves as postponing the needs of family members, not making individual spending, and not buying new clothes. On the individual effects of the expenditures, participant P10 said, "We retrench from ourselves of course. We cut from everything. While we go to the market, we retrench, we can't look for new clothes for ourselves anyway." Another participant (P9) also said, "You don't retrench from food, but you retrench individually. I mean, you don't get to have a private life, you're attached to your child. You have to be economical. You even postpone some things, even your debts. I mean, we did all these, frankly, because my husband only has a pension. So, we postponed some things. We postponed them until after the exam because there is nothing to do. The system demands these."

The theme, sub-themes, and codes formed regarding participants' solutions to reduce/eliminate household education expenditures during the higher education exam preparation process are presented in Table 4.

The participants were asked about their solutions to reduce/eliminate household education expenditures. As can be seen in Table 4, these solutions were about the exam system and the quality of education. More than half of the participants believed that the expenditure issue was about the exam system. According to them, changing/eliminating the exam system, universities accepting students based on their high school scores, and providing extra courses for the exam to students in high school would solve the problem. On this issue, participant P4 said, "Of course, it would be better without the exams, but I don't know how that may happen actually. My daughter wants to be a doctor. If everyone could get into the department they want without taking the exam, there would be no exam. If there is to be an exam, then something must definitely be done to prepare the students for the exam".

The participants who associated the solution with the quality of education believed that the quality of high school education should be increased and the senior year of high school should be organized as a preparation year for the exam. P15 talked about this and said, "... how can I explain, I want the education in the school to

be a little more information-based. If the education is more in the form of preparation for the exam and if it provides more information, there would no expenses on private teaching institutions."

## DISCUSSION

In this section, the findings of the study that examined the household education expenditures during the higher education exam preparation process in Turkey are given.

The study put forth that households spend money on supplementary resources for exams, private teaching institutions, and private lessons during the higher education exam preparation process. Almost all households spend money on test books, which are supplementary resources. This result is similar to other study results. Since there is very little study on this type of expenditure for exams, an exact comparison cannot be made. However, the study conducted by the Turkish Statistical Institute (TÜİK, 2013), one of the first studies on the subject, revealed that 19.8% of the Turkish households' education expenditure is allocated to books. Another study determined that the amount of spending of households for tests, books, magazines, and similar materials for exam preparation is 2.160.968.761 TL in a year (TED, 2010, 51). Based on these results, it can be stated that households' spending on supplementary resources became widespread. This finding supports the Turkish Publishers Association (TPA) data. According to TPA (2020) data, exam preparation books has the 43.5% of the book market in Turkey, and the share of the financial sector is 389 million US dollars. It can be said that the exams are indispensable in these markets with huge profits.

In addition, the present study revealed that all of the households spend money on private teaching institutions/private lessons. The related literature (TED, 2010; Ulusoy, 2012; Köktaş, 2009; TÜİK, 2006) put forth that the households spend money the most on teaching institutions/private lessons. For example, the 2002 TÜİK study (2006), which was one of the first studies on the subject, determined that 8% of the education expenditures made by the households in 2002 were the expenditures for private lessons. In another study, approximately

9.350.164.083 TL (TED, 2010) was spent on teaching institutions/private lessons (TED, 2010).

In Turkey, 49.3% of parents believe that their children cannot get good scores on the university entrance exam without going to a private teaching institution (TED, 2010). In the literature, the concept of "shadow education" is used for out-of-school education activities such as private teaching institutions/private lessons. This concept was introduced to the literature for the first time in the early 1990s by Bray (2010) with studies on extra-school private lessons in Malaysia, Japan, and Singapore (Bray, 2010). According to Demirer (2016, 89-90), the shadow education system, which is a kind of shadow of the education system, creates a "parallel universe" for all parties involved in education. On the one hand, one of these two universes includes students attending schools to get a diploma. On the other hand, the other universe includes students getting an education from private teaching institutions/private lessons. The biggest effect of this parallel universe is that it transforms concepts and relationships such as students, teachers, and parents (Demirer, 2016; 89-90). In other words, this transformation, according to Demirer (2016), should be interpreted in today's neoliberal understanding as transforming individuals who serve to maintain the capitalist relations with shadow education within the examination system.

Furthermore, the present study put forth that the life of the household is affected economically, socio-culturally, and individually by education expenditures. There are some variables determining the education expenditures made by households. These variables are the subject of different studies (Tilak, 1988; Adem, 1997; ECR, 2005; Tomul, 2008; Yolcu, 2011) and are related to elements such as family income, education level, family culture level, and region of residence. These variables that affect education expenditures will also bring along being affected by these expenditures. Among these variables, income is an important variable. Studies revealed that there is a direct proportion between income level and education expenditure (Tilak, 1988; Köktaş, 2009; Kahveci, 2009). Studies conducted at the country level also confirm this. For example, the education expenditure of households in Canada in 2008 was on average 2,179 \$. The income distribution given differs according to the income brackets. Accordingly, the average expenditure of the household in the lowest income bracket is \$ 415 per year, while it is \$ 8,580 for the upper-income bracket (as cited in Yolcu, 2011). In Turkey, 63,6% of the household education spending is done by 20% of the highest income segment, whereas 2% of the household education spending is done by 20% of the lowest income segment (TÜİK, 2019). A similar situation exists for the socio-cultural variable. As it is known, Bourdieu explains with the concept of cultural capital that schools are suitable for students from higher socioeconomic levels. Cultural capital is determinant in the higher academic achievement

of upper-class children compared to lower-class children (Polat, 2009). There is a similar situation in the exam preparation and exam results. For example, the PISA results between 2003 and 2012 showed that the socio-economic structure was determinant in the exam achievement. Since these determinations are related to social structure/classes, the education expenditures of the households will inevitably be affected by their social position. As a matter of fact, considering that the income levels of the participating families were from middle and lower classes, it was revealed that the exam expenditures caused families not to be able to meet their basic needs such as food and clothing. Furthermore, according to Grant (2004), exams put socio-economically disadvantaged students in a position that is against them. The economic insufficiency of the students due to their families' income causes them to achieve less in exams than the students of higher socioeconomic level. Lack of adequate support to these students at schools to compensate for the family's inadequacies brings about failure in exams.

The participants recommended changing the examination system and the educational content to reduce/eliminate expenditures during the higher education exam preparation process. In other words, families believed that when the exam system changes or the content of the education changes (more qualified or compatible with the examination system), the expenditures will decrease/be prevented. Recommendations about changing the exam system or the content of education were also stated by researchers working on this subject (Arslan, 2004; Ergun, 2013; TED, 2010; Gürbüzürk and Kıncal, 2018). Students also think similarly about this issue. For example, 49% of the high school students believe that the exam preparatory works at schools are insufficient (TED, 2010,45). Undoubtedly, it is possible to list different recommendations for the solution of the problem. However, this issue can basically be solved with educational policies that can be produced within the framework of political and economic policies.

## Conclusion

Households make education expenditures during the higher education exam preparation process. These household education expenditures made mainly consist of exam preparation books and private teaching institutions/private lessons. The expenditures made have an effect on the economic, social, and individual life of the household. This effect is in the form of postponing or giving up even the basic needs of the household. The households recommend changing the education system in order to reduce/eliminate household education expenditures.

In a period when neoliberal education policies are on the agenda, the contribution of households to education

expenditures will continue. In addition, while exams provide an opportunity for screening in the transition to higher education, they provide an economic benefit for the sectors playing a role in the exam preparation process. Both the escape of exams from the market understanding and the strengthening of public expenditures instead of household education expenditures are not only limited to education policies but also depend on the change in political and economic policies.

## Recommendations

There is a need for different studies on household education expenditures during the higher education exam preparation process. These studies can be carried out with larger study groups using mixed methods. Teachers, school administrators, educational scientists should raise the demand for a change in the system with the awareness that exams create an economic sector.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interest

## REFERENCES

- Adem M (1997). Ulusal Eğitim Politikamız Nasıl Olmalıdır? [How Should Our National Education Policy Be?]. *Journal of Ankara University Faculty of Political Sciences/Ankara Üniversitesi Siyasal Bilgiler Fakültesi Dergisi* 52(1):51-65.
- Algur G (2019). Hanehalkının eğitim harcamalarını etkileyen faktörler: Erzurum ili üzerine bir uygulama. [The factors affecting the education expenditures of the households: in Erzurum]. Unpublished master's thesis. Erzurum Technical University.
- Arslan M (2004). Eğitim sistemimizin kapanmayan yarısı yükseköğretime geçiş [Transition to higher education, the unhealed wound of our education system]. *Journal of the Institute of Social Sciences/ Sosyal Bilimler Enstitüsü Dergisi* 16(1):37-51.
- Bray M (2010). Researching shadow education: Methodological challenges and directions. *Asia Pacific Education Review* 11:3-13.
- Chabbot C, Ramirez FO (2000). Development and education. In M., T., Hallinan (Eds), *Handbook of sociology of education* (pp. 163-187). Kluwer Academic/Plenum Publishers.
- Demirer KD (2016). Eğitimde paradigma değişimi: gölge eğitim [The paradigm shift in education: shadow education]. Unpublished Doctoral Dissertation. Marmara University.
- Duman (2012). Impacts of remittances on child human capital investment, educational expenditure and living conditions of households: Evidence from Turkey. Unpublished master's thesis, Sabancı University.
- Eğitim İzleme Raporu (EİR) (2020). Eğitim yönetişimi ve finansmanı [Education Monitoring Report 2020: Education Governance and Financing]. <https://www.egitimreformugirisimi.org/egitim-izleme-raporu-2020-egitim-yonetisimi-ve-finansmani/>.
- Ergun M (2013). Fransa, İsviçre ve Türkiye'de yüksek öğretime geçiş sınavlarındaki kimya sorularının karşılaştırılması [France, Switzerland and Turkey comparison of chemistry in the transition to higher education examination questions]. *Journal of National Education/ Milli Eğitim Dergisi* 199:147-168.
- European Commission Report (ECR) (2005). Private household spending on education & training. <https://op.europa.eu/en/publication-detail/-/publication/3ad8c4c2-4246-11ea-9099-Retrieved>
- Grant C (2004). Oppression, privilege, and high-stakes testing. *Multicultural Perspectives* 6(1):3-11. [https://doi.org/10.1207/S15327892mcp0601\\_2](https://doi.org/10.1207/S15327892mcp0601_2)
- Gürbüz Türk O, Kincal RY (2018). Türkiye'de yükseköğretime geçiş sürecinin analizi: gelişmeler, modeller ve uygulamalar [The analysis of the transition process in higher education in Turkey: Developments, models and applications]. *Mediterranean Journal of Educational Research/ Akdeniz Eğitim Araştırmaları Dergisi* 12(24):33-54. doi: 10.29329/mjer.2018.147.3.
- Huebler F, Legault E (2017). The world families: Hidden funders of education. *UIS UNESCO Blog*, 5 June. 2020. <http://uis.unesco.org/en/blog/worlds-families-hidden-funders-education>., Retrieved, March 1, 2020
- Kahveci S (2009). Ortaöğretim kurumlarının geçiş sisteminde uygulanan sınavların ailelere maliyetinin, ailelerin toplam eğitim harcamaları içindeki payı [The Share of the Costs of the exams used in the transition system to the secondary education institutions to the families in the total education expenditures of the families]. Unpublished master's thesis. Gazi University.
- Kerman U (2006). Türkiye'de devletin küçültülmesi sorunu [Reducing the problem of the State in Turkey]. Unpublished doctoral dissertation. Ankara University.
- Köktaş AM (2009). Türkiye'de hanehalkı eğitim harcamalarının analizi [Analysis of household education expenditure in Turkey]. Unpublished master's thesis. Ankara University.
- McLaren P (2011). Okullarda yaşam. Eleştirel pedagojiye giriş. [Life in schools. An introduction to critical pedagogy in the foundations of education. Fifty edition]. Anı.
- Miles MB, Huberman AM (1994). *Qualitative data analysis* (2nd ed.). Sage.
- Ollman B (2010). The Writings of Bertell Ollman. [http://www.nyu.edu/projects/ollman/docs/why\\_exams.php](http://www.nyu.edu/projects/ollman/docs/why_exams.php).
- Polat S (2009). Akademik başarısızlığın toplumsal eşitsizlik temelinde çözümlenmesi [Analyzing academic unsuccessfulness in terms of the social inequality]. *Education Science Society Journal/ Eğitim Bilim ve Toplum Dergisi* 7(25):46-62
- Polat S (2013). Neoliberal education policies in Turkey and transformation in education. *Journal for Critical Education Policy Studies* 4(11):159-179.
- Schultz TW (1971). *Investment in Human Capital*. Free Press.
- Şencan H (2005). Sosyal ve davranışsal ölçümlerde güvenilirlik ve geçerlilik [Reliability and validity in social and behavioral measures]. Seçkin.
- Tansel A, Bircan F (2006). Demand for education in Turkey: A tobit analysis of private tutoring expenditures. *Economics of Education Review* 25(3):303-313.
- Tilak JBG (1988). Education and its relation to economic growth, poverty and income distribution. *Discussion Papers Washington: World Bank Discussion Papers*.
- Tomul E (2008). Türkiye'de Ailenin sosyo-ekonomik özelliklerinin eğitime katılım üzerinde görece etkisi [Relative contributions of family training on socio-economic impact properties in Turkey]. *Journal of Educational Research/ Eğitim Araştırmaları Dergisi* (30):153-168.
- Tural KN (1998). Öğrencilerin ortaöğretimden beklediği yararlar ve bireysel öğrenim maliyeti [The Benefits Expected by students from secondary education and the cost of individual tuition] M. Hesapçıoğlu ve H. Taymaz (Ed.), *Türkiye'de Eğitim Yönetimi*. [Education Administrative in Turkey] (245-259). Kültür Koleji.
- Turkey Publishers Association (TPA) (2020). *Türkiyeyayıncılar Birliği 2020 yıllık rapor* [Turkey Publishers Association 2020 book market report]. <http://turkyaybir.org.tr/wp-content/uploads/2021/03/>.
- Turkish Statistics Institution (TÜİK) (2006). *Turkey education expenditure research 2002*. Turkish Statistics Institution Press.
- Turkish Statistics Institution (TÜİK) (2013). *Hanehalkı tüketim harcaması* [Household Consumption Expenditure].
- Turkish Statistics Institution (TÜİK) (2019). *Hanehalkı tüketim harcaması* [Household Consumption Expenditure]. <https://data.tuik.gov.tr/Bulten/Index?p=Hanehalki-Tuketim-Harcamasi-2019-33593>
- Turkish Education Association (TED) (2010). *Ortaöğretime ve yükseköğretime geçiş sistemi* [Transition system to secondary education and higher education]. Turkish Education

- Association Publication.
- Ulusoy B (2012). Ailelerin ilköğretim düzeyinde yapmış oldukları hanehalkı eğitim harcamaları [Household education expenditures made by families at primary education level]. Unpublished Master Thesis. Kastamonu University.
- UNESCO (2019). GEMR: Migration, displacement and education. <https://en.unesco.org/gem-report/taxonomy/term/210>
- Ünal LI (1996). Eğitim ve Yetiştirme Ekonomisi [Education and Breeding Economics]. Epar Publications.
- Woodhall M (1994). Eğitim Ekonomisi: Toplu Bir Bakış [Education Economics: A Collective Perspective]. (Translated by Yüksel Kavak and Berrin Burgaz). Ankara, Pegem Publications No. 14,
- Yıldırım A, Şimşek H (2008). Sosyal Bilimlerde Nitel Araştırma Yöntemleri [Qualitative research methods in the social sciences]. Seçkin.
- Yolcu H (2011). Hanehalkının eğitim harcamalarını etkileyen etmenler: Kuramsal bir çalışma [The factors which affect education expenditure of household: a theoretical study]. Mehmet Akif Ersoy University Journal of Social Sciences Institute/Mehmet Akif Ersoy Üniversitesi Sosyal Bilimler Enstitüsü Dergisi 3(5):12-35.

*Full Length Research Paper*

# **Aksak rhythm studies in distance piano education with use of Midi**

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**As a result of the impact of the Covid 19 epidemic, the use of alternative mass media has become mandatory in the field of education, as in many areas, and this has led to the search for a new approach to education. In this context, communication problems may occur during rhythm practice in distance piano lessons that are conducted synchronously. Because of these potential problems, the aim of this study is to determine the effect of using midi with melodic nuclei practice for distance piano education on works with aksak rhythms. In this study, which was designed as a post-test control group design, experiment and control groups consisting of 4 people with equal piano education were formed from the 2nd grade of the Çankırı Karatekin University, Faculty of Art, Design and Architecture, Department of Music. During the lesson, a routine study was carried out with the control group for a piano piece with aksak rhythm. A treatment was given to the experimental group using midi recording, which included the melodic nuclei and rhythmic structure of this work. At the end of the lesson, student performances were measured and the data obtained was used using a t-test. No significant difference was found between the performance scores of the experimental and control groups. In this context, it is possible to say that midi supported melodic nuclei exercises has no effect the aksak rhythm practices.**

**Key words:** Piano education, distance education, Midi, Aksak rhythm, melodic nuclei.

## **INTRODUCTION**

Distance education can be expressed in its most general definition as an educational model in which educational activities are carried out without the teacher and student being in the same environment. "Distance education, which dates back to the 1700s and started with letter teaching practices as a concept, continued its development in parallel with developments in technology and gained its meaning and importance today with information technologies" (Özbay, 2015:378). "Distance education that fundamentally started as correspondence by letter, develops and becomes widespread with a

change that causes questioning of the formal education system applied in their age, thanks to communication technologies such as radio, television, interactive-audio teleconference systems, interactive audio and video-conference systems, computer and internet-based education tools" (Yungul, 2018:1336).

"Traditional face-to-face instruction involves interaction between a teacher and students who are in the same location, whereas technology-mediated instruction uses informal or online information and communication technologies (ICT) to mediate the learning experience

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and interactions without requiring that students and teacher are in face-to-face contact" (Ruokonen and Ruismäki, 2016:110). Today distance learning models based on online information and communication technologies are called synchronous, asynchronous and blended. "Synchronous education is a method in which two-way communication is provided and mutual interaction occurs simultaneously, although the teacher and the student are physically in different environments. Asynchronous education is a flexible communication model, independent of time and place, in which course content is prepared in advance and delivered to students via the internet" (Yorgancı, 2015: 1402 to 1403). In the blended model, these two models are used together.

The reflection of the developments in computer technologies in the 21st century on the field of education shows itself with the wide and diverse possibilities in teaching technologies. Thanks to these opportunities seen in teaching technologies, effective and important teaching tools are created especially in distance education, which is considered as an alternative to traditional education. Some of these tools that can be used effectively in distance education are as follows: *flipgrid*, *edpuzzle*, *playposit*, *padlet*, *wordwall*, *nearpod*, *biteslide*, *edmodo*, *wufoo*, *mindmeister*, *smore*, etc.

These innovations seen in all areas of education also affect music education, and learning in music education is supported by computer or telephone applications, videos, online media programs etc. on various platforms. "It is thought that music education, which is always in interaction with technological developments, can be much more effective and sufficient with an education method that uses developing educational technologies" (Yungul, 2018:1335).

Until 2020, the distance education, which was used as an alternative to face-to-face education or in cases where the educator and student could not come together, started to be implemented compulsorily at all levels of education within the scope of the precautions taken to protect against the epidemic caused by the emergence of the Covid-19 virus.

With the unexpected transition to distance education due to the Covid-19 epidemic, each university determined distance education models within the scope of their own means. Distance education models of universities vary with the infrastructure facilities they have, and it has been felt that different platforms should be used. In particular, various technological teaching tools were used for piano lessons conducted within the scope of instrument lessons in the music departments of universities.

In one-on-one instrumental studio teaching lessons, where the interaction between the educator and the student is very important, there may be situations where the distance education model is insufficient. In face-to-face education, the ease of communication in piano lessons with the student, allows for immediate feedback by the educator in real time studies, and allows them to

demonstrate or exemplify the correct behavior. However, in synchronous distance piano education, this situation is limited by the internet connection or the efficiency of the platforms used.

It may take time for the rhythmic structure to be assimilated by the student when applying different rhythmic structures in pieces or etudes in piano education. The rhythmic examples provided by the teacher and the supporting exercises made with these readings during the performance can also be used in works with aksak rhythms. Aksak, "is a name given to measures whose rhythmic structure is not even, as in two-and four-time periods. This name is given to the procedural patterns, which are composed of combining two and three patterns with a special construct within the measure" (Duygulu, 2014:36). "The term, AKSAK, borrowed from the Turkish terminology was adopted mainly since 1949, the year of the International Conference of Folk Music Specialists which took place at Geneva, Switzerland, by musicologists to designate a special category of rhythms, a few specimens of which were made known by Béla Bartók under the incorrect denomination of 'Bulgarian rhythm'" (Saygun, 1969:1). It is known that examples of aksak rhythm in Turkish folk music are quite rich. Although they are called Usul, these examples, which appear in 5, 7, 8, 9, 10 times, can be used in different rhythmic structures. "5 beats are either 2 + 3 or 3 + 2, 7 beats are 2 + 2 + 3 or 3 + 2 + 2, 8 beats are 3 + 2 + 3, 9 beats are 2 + 2 + 2 + 3 or 2+3 + 2 + 2 or other ways, the 10-beat usul is used as 3 + 2 + 2 + 3" (Saygun and Yönetken, 1958:154).

Although the aksak rhythm appears in a wide variety and wide range of Turkish folk music, it is also seen in works composed in the context of the current of nationalism in the twentieth century. In addition, there are many examples of works that are expressed as rhythmic modulation, in which a change of meter is made in the work. "Rhythmic modulation, also called mixed rhythm, is the use of more than one rhythmic unit and the number of rhythmic units (time signatures) in a piece, the transition between rhythmic structures, that is, the use of metric divisions consisting of different rhythms between the measures of the piece" (Yöre, 2012:90) (Figure 1).

Piano students may have difficulty in perceiving the rhythmic structure at the first stage due to the variability of the measure structure, especially when they encounter the works with rhythmic modulation for the first time. At this stage, the teacher assumes a supportive role in learning the rhythmic structure of the study, directing the student by performing rhythmic reading. However, during the piano performance of the student in distance piano education, it may have some difficulties that result in the inability of the instructor or the student to count out loud as the other demonstrates/plays due to reasons such as lack of communication, hearing problem, sound delay, signal lag.

The aim of the study was to test alternative teaching

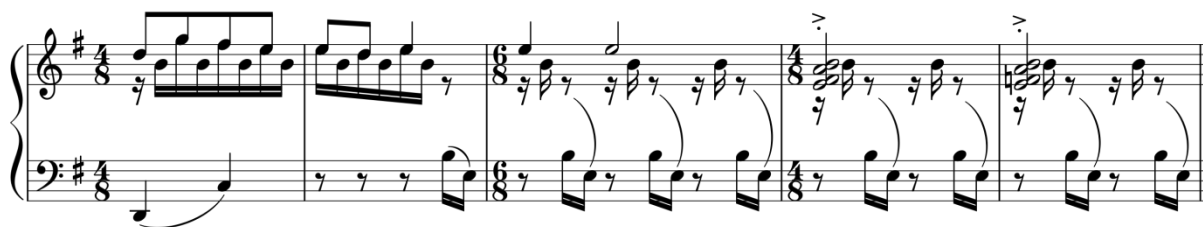


Figure 1. Example work on metric structure change, Black and White, II. Perpetual Motion (Baran, 1975:4).

Table 1. Study design.

Groups	Process	Post-test
Experimental	Synchronous online instruction + Midi	Performance scores
Control	Synchronous online instruction	Performance scores

techniques for the distance piano education model by measuring the effect of using Midi with melodic nuclei practice on piano performance in works with aksak rhythm in distance piano education. The reason for using Midi in this study is to test the effect of using an alternative teaching tool in audio transmission problems that may occur in synchronous online piano education. For the melody of the work to be studied in the preparation of the Midi file not to be memorized by the ear, it was considered appropriate to write the melodic nuclei of work instead of writing the entire melody of the work. "Melodic nuclei are characteristic structures located in melodic areas that develop with stresses and dissolves" (Yıldız and Güray, 2020:98).

For this purpose, the problem phrase of the research is designated as: 'How is the use of midi with a melodic nuclei effect practice of pieces with aksak rhythm in distance piano training?'

The hypotheses developed in the context of the problem situation of the research are stated below:

**H<sub>0</sub>:** There is no significant difference between the aksak rhythm performance scores of the experimental group that received midi support and the control group not applied.

**H<sub>1</sub>:** There is a significant difference between the aksak rhythm performance scores of the experimental group with midi support and the control group not applied.

### Ethical permissions of research

In this study, all rules within the scope of publication ethics were followed, and none of the actions contrary to publication ethics were carried out. Ethical board permissions were obtained in accordance with the principles of research ethics. Within the scope of the

ethics committee permission, an ethical evaluation certificate was obtained from Çankırı Karatekin University with the decision dated 24.12.2020.

### METHOD

#### Research Model

Research was carried out using the experimental design. Since the participant group consisted of students with equal levels of piano proficiency, a post-test control group experimental design was used. In the application of this experimental design, "both groups are given the same test at the same time, as the post-test. Changes in the participants' playing forming the experimental group caused by the experimental process at the end of the application are measured and a decision is reached by comparing them with that of the control group" (Sönmez and Alacapınar, 2019:60). In order to have an idea of the piano levels of the students in the experimental and control group, their latest studies and works were examined and their levels were found to be equal (Table 1).

#### Working group

In this study, in which the experimental method was used, the institution where the researcher worked was selected within the possibilities of the researcher. The students studying at Çankırı Karatekin University, Faculty of Fine Arts, Design and Architecture, Department of music were included in the study group. Compulsory piano lessons are carried out in the first 2 years at the institution. As part of the study, it was considered appropriate to work with students studying in the second grade in terms of their ability to play a piece with aksak rhythm. Although there are 11 students enrolled in the 2nd grade piano lesson, the study was carried out with 8 students considering the similarity of the piano level, participation in the lessons, and the studying patterns of the students (n = 8). The last studies and works of these students whose piano backgrounds were identical with each other were also examined, their last piano exam grades were also taken into consideration (8 students: A) and experimental-control groups randomly formed (n = 4, n = 4).

Table 2. Performance evaluation form.

Student code number:	Evaluation					Factor	Student score
	Very low	Low	Mid	Good	Very good		
Criteria	1	2	3	4	5		
Playing notes correctly						4x	
Correct perception of the metric structure						4x	
Smooth playing of the piece at the appropriate tempo						3x	
The harmony of the right and left hand						3x	
Paying attention to musical expressions						3x	
Specifying dynamics						3x	
Total							

Kadosa P.

Figure 2. The piece used in the study (Teöke, 1981, 21).

### Data collection tools

In this study, in which the effect of using midi with melodic nuclei practice on piano performance was measured in works with aksak rhythm in synchronous distance piano education, the performance evaluation form prepared by the researcher was used to reach the data. In the preparation of the performance evaluation form, the achievements for the work studied were taken into account and the evaluation criteria were established in this context. The performance evaluation form was presented to the expert opinion, and the form was finalized with the changes made in two items. The performances of the students were scored using the performance evaluation form consisting of 6 criteria (Table 2).

The recorded student performances were monitored by 3 field experts and scored using the performance evaluation form.

### Data collection

In this study, in which research data were reached with an

experimental approach, firstly the work with a aksak rhythm was identified. An exercise with an aksak rhythm by the Hungarian composer and pianist Pál Kadosa has been chosen. This piece, which starts at 5/8, turns back to 5/8 as 1/4 measure at the end of the 4 measures, and this rhythmic pattern repeats in the same way 3 times (Figure 2).

This work, which has rhythmic modulation, is thought to be a good example in understanding the aksak rhythm. After the selection of the piece, the melodic nuclei of this piece was written to be used in the study with the experimental group, and a midi file was created by adding the rhythmic structure to this melody. A music notation program (MuseScore) was used at this stage. First of all, the melodic structure of the work has been examined and the melodic nuclei of the work have been written. Subsequently, a rhythmic substructure supporting the rhythmic structure of the piece was added to the melodic nuclei and indicated strong times using accents. This study, given in Figure 3, has been recorded as a midi file. In the sound recording in the midi file, the melodic nuclei was recorded using the piano sound and the rhythmic structure was recorded using clap in strong times and tambourine in weak times.

The figure displays three systems of musical notation. Each system includes a grand staff (treble and bass clefs) and a separate staff for a second instrument. The tempo marking 'leggiero' is present above the first two systems. The notation includes various rhythmic values, accidentals, and dynamic markings like accents.

Figure 3. Midi file content used in experiment group.

During the application of the experimental procedure, every student was found under equal conditions. All of the students studied works that were equivalent to each other in level and studied the same etude and got similar scores (A) from the midterm exam. Also each student has a suitable study place and a piano or keyboard in their home. During the pandemic, in piano lessons conducted online with distance education, students were instructed one-on-one with teachers and students during the course of a lesson (30 min). The teaching of the piece to the control group was carried out with the traditional method, and the rhythmic structure was trained by the educator through rhythmic reading, then played on the piano. In practice with the experimental group, midi recording was used after the theoretical introduction of the work. First of all, the students were asked to listen to the midi recording while following the score, and after listening the rhythmic structure they started to play on piano. After this study, which was carried out in one class hour, the students recorded their performances by video and these recordings were evaluated by the experts using a performance evaluation form.

#### Data analysis

As a result of the application, the scores obtained by the students within the scope of the performance evaluation form were computerized and a data set was created. *R Studio* statistics

program was used in the analysis of the data. In order to determine the effect of midi-supported melodic nuclei exercises on aksak rhythm practices, the performance scores of the experimental and control groups were analyzed with two independent samples t test. "For small samples, t table is used instead of normal probability table to determine statistical significance" (Best and Kahn, 2017:456).

#### FINDINGS

In this part of the study, statistical analyses are included in accordance with the scores obtained by the piano performance evaluation form of the students.

In the analysis of the data obtained for the question "How is the use of midi with a melodic nuclei effect practice of pieces with aksak rhythm in distance piano training?", The Shapiro-Wilk normality test was applied to determine whether the groups showed normal division or not. "For the continuous data, test of the normality is an important step for deciding the measures of central tendency and statistical methods for data analysis. When our data follow normal distribution, parametric tests

**Table 3.** Shapiro-Wilk test results regarding the performance scores of the experimental and control groups.

Group	W	p
Experimental	0.90608	0.4619
Control	0.86414	0.2753

**Table 4.** Results of the F test regarding the performance scores of the experimental and control groups.

Group	V	F	p
Experimental	0.136206	0.13621	0.1357
Control			

**Table 5.** T test results for the performance scores of the students in the experimental and control groups.

	Group	N	M	T	P
Post-test	Experimental	4	68.25	0.43396	0.6795
	Control	4	65.25		

otherwise nonparametric methods are used to compare the groups" (Mishra et al., 2019: 67). The results of the test are given in Table 3.

According to the test results, it is seen that  $p > 0.05$  division are normal in both groups.

The results of the F test applied for the homogeneity of the variances of the experimental and control group performance scores are given in Table 4.

In line with the test results, variances are considered similar since the p value of 0.1357 is  $p > 0.05$ . At this stage, t test results and p value related to the performance scores of the experimental and control groups are given in Table 5.

When the results of the t test in Table 5 are examined, it is seen that the average of the experimental group is 68.25 and the control group is 65.25 in line with the performance scores of the groups. As a result of the test, the t value was found to be 0.43396 and the p value was 0.6795. In line with this result, there was no significant difference between the performance scores of the groups since  $p > 0.05$ . Accordingly, by accepting the  $H_0$  hypothesis, it is possible to say that midi-supported melodic nuclei exercises do not significantly change the aksak rhythm accuracy in students' playing.

## DISCUSSION

As a result of the study, no significant difference was found between the performance scores of the aksak rhythm of the experimental group in which midi support

was applied in distance piano training and the control group in which Midi support was not applied. In line with this result, it can be said that midi-supported melodic nuclei exercises in distance piano education have an equal effect on student performance to traditional online piano instruction. In other words, it can be said that the use of traditional teaching techniques and midi-supported melodic nuclei exercises in the applications of aksak rhythms in distance piano education contributes equally to student performance.

This finding is similar to findings by Karahan (2016) and Gürman (2019), who researched about distance piano education and technology supported piano education. In his study, Karahan (2016) investigated the effects of traditional piano training and distance piano training on student achievement, and according to the post-test analysis of the experimental and control groups, no significant difference was found between the groups in terms of piano performance. Gürman (2019), in his master's thesis, investigated the effect of piano education using the traditional method and synthesis program on student performances. As a result of the research, it was determined that there was no significant difference regarding the post-test scores of the experimental and control groups.

## Conclusion

Unlike the results of the research, Kalkanoğlu and Albuz (2019) found a significant difference between the

performance scores of the students regarding Czerny Etude and Haydn Divertimento work applied to the experimental and control groups in their study, in which they investigated the effects of the Home Concert Xtreme program on the performance of piano students within the scope of computer-assisted piano teaching. They concluded that the experimental group students played the study etude with improved accuracy the etude and piece used in the study, and in this context, the Home Concert Xtreme program made a significant contribution to the development of piano students.

Topalak (2016) found a significant difference between the performance scores of the experimental and control groups in which Topalak applied the traditional learning model and the translated learning model in her doctoral study in which she investigated the effect of the flipped learning model from blended learning models on piano teaching at the beginning level. This significant difference is in favor of the experimental group. Lehimler and Şengül (2014) used Sibelius software in their research, in which they examined the effects of the use of music software in piano education, and found that technology support contributed to piano education.

## Recommendations

Based on the results obtained in this study, it is suggested that midi-supported melodic nuclei exercises in distance piano education can be used in aksak rhythm applications; in cases where the student cannot work with the teacher; in the individual work of the student. It is recommended that midi-supported studies can be used with supportive meaning in traditional teaching, as they provide students with the opportunity to practice on their own. In addition, it may be suggested that the study can be repeated by increasing the number of students in the study group.

## CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

## REFERENCES

- Baran İ (1975). Siyah ve beyaz, Black and white for piano. Ankara State Conservatory.
- Best JW, Kahn JV (2017). Eğitimde araştırma yöntemleri (Çev. Ed. Köksal, O.) 10. Baskı. Eğitim Yayınevi.
- Duygulu M (2014). Aksak. Türk halk müziği sözlüğü. Pan Yayıncılık.
- Gürman U (2019). Piyano eğitiminde synthesia programının öğrenci başarısı üzerine etkisi: Kahramanmaraş ili Nurhak ilçesi örneği. [Yayımlanmamış yüksek lisans tezi] Afyon Kocatepe Üniversitesi Sosyal Bilimler Enstitüsü Müzik Anasanat Dalı.
- Kalkanoğlu B, Albuz A (2019). Bilgisayar Destekli Piyano Öğretiminin Öğrenci Performansı Üzerindeki Etkilerinin Araştırılması (Home Concert Xtreme Örneği). In: Minaz, M.B. (Ed), Eğitim bilimleri alanında araştırma ve değerlendirmeler. Gece Kitaplığı pp. 5-23.
- Karahan AS (2016). The evaluation of synchronic distance piano teaching in comparison with the traditional piano teaching/ Eş zamanlı uzaktan piyano öğretiminin geleneksel piyano öğretimiyle karşılaştırılarak değerlendirilmesi. Turkish Studies 11(21):211-228.
- Lehimler E, Şengül C (2014). Müzik yazılımlarının piyano eğitimine katkılarının incelenmesi. Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi 18(2):229-246.
- Mishra P, Pandey CM, Singh U, Gupta A, Sahu C, Keshri A (2019). Descriptive statistics and normality tests for statistical data. Annals of Cardiac Anaesthesia 22(1):67-72.
- Özbay Ö (2015). Dünyada ve Türkiye’de uzaktan eğitimin güncel durumu. Uluslararası Eğitim Bilimleri Dergisi (5):376-394.
- Ruokonen I, Ruismäki H (2016). E-learning in music: A case study of learning group composing in a blended learning environment. Procedia - Social and Behavioral Sciences 217:109-115.
- Saygun AA (1969). Twelve preludes on aksak rhythms for piano. Peer Music, USA.
- Saygun AA, Yönetken HB (1958). Lise müzik kitabı I-II-III. 6. Basım. Ak Kitabevi.
- Sönmez V, Alacapınar FG (2019). Örneklenirilmiş bilimsel araştırma yöntemleri. 7. Baskı. Anı Yayıncılık.
- Teöke M (1981). Selected studies for piano I. Editio Musica Budapest.
- Topalak Ş (2016). çevrilmiş öğrenme modelinin başlangıç seviyesi piyano öğretimine etkisi. [Yayımlanmamış doktora tezi]. İnönü Üniversitesi Eğitim Bilimleri Enstitüsü Müzik Bilimleri Anabilim Dalı.
- Yıldız Ş, Güray C (2020). Makam analysis of a flamenco song using melodic nucleus approach: A paso lento. International Online Ethnomusicology Symposium Past, Present and Future of Ethnomusicology in the World and Turkey. E-ISBN: 978-605-67893-1-1.
- Yorgancı S (2015). Web tabanlı uzaktan eğitim yönteminin öğrencilerin matematik başarılarına etkileri. Kastamonu Eğitim Dergisi 23(3):1401-1420.
- Yöre S (2012). Temel besteleme malzemeleriyle çağdaş müzik. Bağlam Yayıncılık.
- Yungul O (2018). Müzik eğitiminde web tabanlı uzaktan eğitim. Uluslararası Türkçe Edebiyat Kültür Eğitim Dergisi 7(2):1333-1348.

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