

Technical Appendix

*Investing in Peace Education and Teachers
for Better Refugee Learner Outcomes
in Non-Formal Education*

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Statistical Analyses

Effects of Peace Education (PE) on academic and behavior indicators

Before exploring the impact of PE on academic and behavioral outcomes as well as the relationships between key variables, the data from B&Z was cleaned and imported into the SPSS statistical software program. To explore whether peace education impacts academic and behavioral outcomes, three OLS regressions were conducted where the independent variable was PE exposure and the dependent variables, respectively, academic grades, behavioral scores and academic program attendance. To determine the intensity of intervention effects, three ordinary least squares regressions were conducted to examine the effects of PE number of days attended on academic grades, behavioral scores and academic program attendance. Lastly, in order to establish how covariates such as gender, school shift (AM versus PM classes), academic performance, behavior scores and academic program attendance mitigated the effects of peace education on the dependent variable, three regression models were run with four covariates, which changed based on the dependent variable being investigated.

Lastly, in order to provide more feedback to B&Z on the programming, tests were run to determine how important data elements such as gender, shifts (AM vs. PM), subject-specific outcomes and term-specific outcomes were interrelated. Independent samples T-tests were run to compare overall grade point averages (GPAs), behavior scores and academic program attendance by gender and whether there are any statistically significant differences between AM and PM classes in terms of both academic performance and behavior. A dependent samples T-test was then run to test for differences between overall performance by term (1st versus 2nd versus 3rd terms). Then, Analyses of the Variance (ANOVAs) were run to test if there are any statistically significant differences across classes as well as subjects in terms of both academic performance and behavior scores. Lastly, Ordinary Least Squares (OLS) regressions were conducted to explore the relationships between the number of days missed and academic performance as well as between behavior and academic performance.

Effects of teacher attitudes and characteristics on student outcomes

There is a growing body of research showing that teacher characteristics and attitudes have a significant impact on student academic outcomes. For example, according to a meta-analysis¹, there is a robust association between positive teacher-student relationships and success. However, the majority of these studies have been carried out in formal educational settings. Given the unique conditions within which organizations such as B&Z operate, there is often an emphasis on teacher availability rather than training and qualifications. Hiring and retaining teachers is central to the functioning of any non-formal educational intervention for refugees; however, in order to investigate the active ingredients of the intervention that predict success, teacher quality cannot be overlooked.² Therefore, based on research and instruments developed to measure teacher motivations³, attitudes⁴ and self-efficacy⁵, a survey was created, translated into Arabic and administered via Qualtrics to all 17 B&Z teachers under the condition of anonymity.

¹ Cornelius-White, J. (2007). Learner-centered teacher-student relationships are effective: A meta-analysis. *Review of Educational Research*, 77, 113-143.

² INEE. (2014). *Lebanon Minimum Standards for Education in Emergencies*. New York and Beirut: INEE and Lebanon Education Working Group.

³ Dweik, Bader & Awajan, Nosaybah. (2013). *Factors that Enhance English Language Teachers' Motivation in Jordanian Secondary Schools*. *English Linguistics Research*.

⁴ Whitaker, R. C., Dearth-Wesley, T., & Gooze, R. A. (2015). *Workplace stress and the quality of teacher-child relationships in Head Start*. *Early Childhood Research Quarterly*, 30, 57-69.

⁵ CASEL Panorama survey. Panorama Education. (2015)

Based on the data gathered from the Qualtrics survey, statistical analyses were run to test if teacher variables predicted student academic and behavioral outcomes as well as attendance. First, OLS regressions were conducted to test if mean student performance, behavioral scores, and attendance levels varied in a statistically significant way based on differences in teacher attitudes as measured by self-reported motivation levels, self-efficacy and warmth. Similarly, OLS regressions were conducted to test if mean student performance, behavioral scores and attendance levels varied in a statistically significant way based on differences in teacher background as measured by education level, years of experience, and self-reported content knowledge. Lastly, regressions were conducted to test if mean student performance, behavioral scores and attendance levels varied in a statistically significant way based on differences in teacher demographic characteristics (gender and ancestry).

Results

The analyses described in the methods section were run, yielding the following major results in regards to the effects of peace education:

- Peace education exposure was found to have statistically significant effects on students' academic performance ($p < .001$) as measured by overall GPA and overall behavior ($p = .004$), with similar effects for both boys and girls.
- The intensity of the PE intervention, as measured by days attended, had a statistically significant impact on academic performance ($p < .001$) and academic program attendance ($p = .022$), with similar effects for both boys and girls.
- When controlling for gender, school shift (AM versus PM), overall behavior and academic program attendance, peace education's statistically significant effect on overall academic performance remained robust to co-variate controls ($p = .028$) but the effect on behavior was not maintained.

In order to explore the effects of peace education exposure versus non-exposure, a new binary variable was generated and linear regression analyses were conducted to examine how peace education exposure affects GPA, overall behavior and academic program attendance. As seen in Table 1, the effect of attending PE at all versus not attending is associated with a 7.23-point increase in overall GPA ($p < .001$, 95% CI [3.72, 10.74]) and a .99-point increase in overall behavior ($p = .004$, 95% CI [.32, 1.67]). However, participating in peace education did not have a statistically significant effect on academic program attendance.

To dig deeper into the relationships, linear regression analyses were conducted in order to examine how intensity of exposure to Peace Education, as measured by number of days attended, impacts GPA, overall behavior and academic program attendance. Statistically significant effects were found when a regression was run to test PE program attendance, or level of intensity, on academic performance. As seen in Table 1, every additional day in the PE program is associated with a .66-point increase in overall GPA ($p < .001$, 95% CI [.33, .99]). In addition the effect of PE attendance on academic program attendance was statistically significant ($p = .02$, 95% CI [-.63, -.05]) with every day of attendance associated with a .34 reduction in days missed in the academic program though this relationship was not statistically significant when peace education was tested as a binary variable. Lastly, when examining the effect of PE program attendance on overall behavior, we noticed that the effect, although approaching statistical significance, is still below threshold ($p = .08$ (95% CI [-.01, .12]) though it was significant when tested as a binary variable.



Regression models including peace education and covariates to predict overall GPA, overall behavior score and academic intervention attendance

A multiple linear regression was conducted to test the effect of days of exposure to peace education⁶ on academic performance while controlling for the following variables: gender, overall behavior, AM versus PM classes, and number of absences from academic program. Academic performance was operationalized by creating a new variable called overall Grade Point Average (GPA), an average of each student's performance across all subjects and terms. In this model, adjusted R^2 , or the proportion of the variance explained by the model, is .595 and is statistically significant at the $p < .001$ level (see Table 2.). In other words, the model explains almost 60% of the variance in the dependent variable of overall GPA. As per the results, peace education was still highly statistically significant as a predictor of academic performance ($p = .028$, 95% CI [.03, .49]) even when other variables were added to the model. Each additional day that a student attended the peace education program was associated with a .25-point increase in GPA. Moreover, statistically significant effects on overall GPA were observed for overall behavior ($p < .001$, 95% CI [3.55, 4.35]) and AM versus PM classes ($p < .001$, 95% CI [1.99, 7.02]). Every one-point increase in overall behavior is associated with a 3.95-point increase in overall GPA. Meanwhile, a move from AM classes to PM classes is associated with a 4.5-point increase in overall GPA. The regression analysis also revealed that there are no statistically significant gender effects on overall GPA though being female is associated with a 1.5-point decrease in overall GPA. Additionally, days absent from the academic program appear to have no significant impact on overall GPA, which should be investigated further.

A second multiple linear regression was conducted to test the effect of peace education on overall behavior while controlling for the following variables: gender, overall GPA, AM versus PM classes, and number of absences from academic program. Adjusted R^2 , or the proportion of the variance explained by the model, is .591 for this model and is statistically significant at the $p < .001$ level. As per the results, the variables associated with the most statistically significant effects on overall behavior were overall GPA ($p < .001$, 95% CI [.13, .16]) and academic program attendance ($p < .001$, 95% CI [.02, .05]) followed by gender ($p = .009$, 95% CI [.15, 1.01]) (see Table 2.). Every one-point increase in overall GPA is associated with a .14-point increase in overall behavior. Meanwhile, each additional day absent from the academic program was associated with a .031-point increase in behavior. Lastly, being female is associated with a .58-point increase in overall behavior scores. In this model, a move from AM to PM classes was associated with a .45-point drop in behavior scores that approached significance ($p = .07$, 95% CI [-.93, .04]). The regression analysis revealed no significant effect of peace education on overall behavior scores, indicating a potential interaction effect between peace education and the covariates.

Lastly, a multiple linear regression was conducted to test the effect of the following variables on academic program attendance: gender, overall GPA, AM versus PM classes, behavior scores and number of days attended for the peace education program. As shown in the tables below, adjusted R^2 , or the proportion of the variance explained by the model, is .104 for this model and is statistically significant at the $p < .001$ level though it only explains 10% of the variance. The only variables associated with statistically significant effects on academic program attendance were AM versus PM classes ($p = .002$, 95% CI [-8.47, -1.88]), where a move from the AM to

⁶ The results using the binary variable of exposure to peace education (or not) did not differ and these results provide more precisions and are therefore reported.



PM program was associated with a 5.18-day increase in attendance, and behavior ($p < .001$, 95% CI [.69, 2.24]) where every point increase in overall behavior is associated with a 1.47 day decrease in attendance. Additionally, gender effects on program attendance approached significance ($p = .07$, 95% CI [-5.74, .24]); being female was associated with a 2.75-day increase in academic program attendance. The regression analysis revealed no significant effects of peace education, overall behavior scores or overall GPA on academic program attendance.

Secondary analyses yielded the following results in terms of gender, academic performance by term, as well as performance and behavior by subject:

- In terms of gender, the effect of attending a PM class versus an AM class was highly significant for girls ($p < .001$) with a move from AM to PM classes associated with a 10.64-point increase in overall GPA.
- Although academic program attendance did not have significant effects on overall GPA for either gender, boys were more likely than girls to miss days of school ($p = .07$). Being a girl was associated with a 2.75-day increase in academic program attendance.
- A statistically significant drop in academic performance was observed from the first term (average GPA = 30.17; $p < .001$) to the third term (average GPA = 26.67 ; $p < .001$).
- Of the five subjects, math was associated with the lowest GPA (25.79) and lowest behavior scores (6.29).

After disaggregating the data by gender, linear regressions were conducted to explore the relationships between the key variables (peace education exposure versus non-exposure, peace education intensity as measured by days attended, behavior scores, AM versus PM shift, and academic program attendance) and academic achievement, as measured first by overall GPA and then by subject.

From the observed results in Table 3, 4 and 5 it appears that both peace education and behavior have significant effects on overall GPA for both boys and girls, whereas there were differences in the effect of shift on academic performance by gender. Peace education exposure was associated with significant effects on overall GPA for both boys ($p = .007$, 95% CI [2.11,12.92]) and girls ($p = .003$, 95% CI [2.60, 11.99]) with exposure to PE associated with a 7.52-point increase in overall GPA for boys and a 7.29- point increase for girls. To dig deeper into these effects, regression analysis was run to examine how intensity of PE exposure, as measured by number of days attended, affected academic performance. For boys' academic achievement, each additional day of PE attendance was associated with a .568-point increase in overall GPA ($p = .015$, 95% CI [.11, 1.02]) and for girls, each additional day of PE was associated with a .789-point increase in GPA ($p = .001$, 95% CI [.32, 1.26]. Additionally, behavior had a significant effect on the academic performance of both boys ($p < .001$, 95% CI [3.36, 4.57]) and girls ($p < .001$, 95% CI [3.49, 4.58]), with every additional behavior score point associated with a 3.96-point increase in overall GPA for boys and a 4.03-point increase for girls. There were differences in the effect of AM versus PM shift on academic performance by gender, with a non-significant effect observed for boys and a highly significant effect observed for girls ($p < .001$, 95% CI [6.01, 15.28]) with a move from AM to PM classes associated with a 10.64-point increase in overall GPA. Academic program attendance had no significant effect on academic performance for either gender.

In addition, as seen in Table 6, we explored potential differences in performance across terms to test the hypothesis that gains might be more likely to be observed in the second term, due to higher absences in term 3 that may have been impacted by the month of Ramadan. A paired samples T-test does reveal significant differences between the GPA means in term 2 versus term 3 with a decrease in overall performance from an



average GPA of 27.65 out of 50 (across all four subjects) in the second term to an average GPA of 26.67 in the third term ($p = .015$, 95% CI [.19, 1.77]). To explore term-to-term trends further, we also ran a paired samples t-test between term 1 and 3. There was a statistically significant difference in the means, revealing a drop in overall performance from an average GPA of 30.17 in the first term to 26.67 at the end of the third term ($p < .001$, 95% CI [2.1, 4.9]), with a steady dip in academic performance across the three terms.

A series of T-tests were run to determine if statistically significant differences existed across subjects in terms of behavior and academic performance. Although the differences were all statistically significant ($p < .001$), the variation in behavior across English, science and Arabic did not exceed .3 points whereas the difference between these subjects and math was one full point for Arabic, 1.1 points for English and .8 points for science (on a ten-point scale). In terms of academic performance, the differences were also statistically significant ($p < .001$) with the Science average at 30.4, Arabic at 29.45, English at 27.02, and math at 25.8 (on a 50-point scale). It is interesting to note that both the math behavior average and math academic performance average are the lowest, which could be one of the drivers of the observed effect that behavior has on academic performance in the multiple linear regression model that was run earlier.

Teacher Survey Results

The results discussed in this section were gathered through an online questionnaire administered to teachers who taught at B&Z learning center during the 2017-2018 academic year. The instrument aimed to measure constructs such as teacher efficacy, teacher motivation and teacher warmth as potential predictors of student outcomes. Due to the small sample size ($n=17$), limited conclusions can be drawn from the data. However, the following observations were made and should be investigated further:

When checking whether teacher gender played a significant role as a predictor of academic performance, based on data provided by the administration, statistically significant differences were only observed for Arabic. As seen in Table 7, having a male teacher is associated with a 8.41-point increase in Arabic GPA ($p < .001$, 95% CI [4.70, 12.13]). Significant effects were not observed for any other subject. In addition, when basing the analysis on self-reported gender it was not possible to test the relationship. However, we expect the data provided by the administration to be accurate.

Moreover, when checking for teacher background the data provided by the administration suggests that having a Syrian ancestry is associated with a higher teacher warmth score (4.11). When checking whether Syrian ancestry played a significant role as a predictor of academic performance, statistically significant differences were only observed for Arabic. Having a teacher of Syrian descent is associated with a 4.70 point increase in Arabic GPA ($p = .03$, 95% CI [.57, 8.83]), (see Table 7). Significant effects were not observed for any other subject. However, this relationship goes away when restricting to self-reported data.

Lastly, as observed in Table 8, teachers with higher levels of reported self-efficacy appeared to have better performing students in Arabic and Math classes. Each 1-point increment in teacher efficacy led to an 8.85-point increase in Arabic GPA ($p < 0.001$, 95% CI [5.63, 12.07]) and a 31.56-point increase in mathematics ($p < 0.001$, 95% CI [16.03, 47.10]).⁷ Higher self-reported teacher motivation was associated with lower student GPAs in math but not relationship with students' English performance. The data range for Arabic classes was insufficient to conduct an analysis. A 1-point increase in teachers' self-reported motivation was associated with a -6.84-

⁷ Note that there were only two responding math teachers between whom the efficacy ranged less than half a point (from 3.36 to 3.80).

point decrease in students' average math GPA ($p < 0.001$, 95% CI [-11.26, -2.42]). Teacher warmth was associated with higher students scores in both Arabic and Math but was not associated with students' English grades. A 1-point increase in teachers' self-reported warmth corresponded to a 10.54-point increase in students' average Arabic GPA ($p < 0.001$, 95% CI [5.35, 15.73]) and a 11.22-point increase in students' average math GPA ($p < 0.001$, 95% CI [3.68, 18.75]). However, when mixed-effects models with nesting of students within teachers' classes are considered, none of the effects remain statistically significant.

Statistical Analysis Tables

Table 1. Simple Regression (non-cov adjusted), all genders

predictor	outcome	mean1	mean2	B	lci	uci	pvalue	adjRsqr
PE Exposure	GPA	23.58	30.81	7.23	3.72	10.74	0.00	0.05
PE Exposure	Attendance	-14.00	-13.14	0.86	-2.31	4.02	0.59	0.00
PE Exposure	Behavior	6.37	7.37	0.99	0.32	1.67	0.04	0.02
PE Intensity	GPA	23.58	33.13	0.66	0.33	0.99	0.00	0.05
PE Intensity	Attend	-14.00	-11.32	0.34	0.63	0.50	0.02	0.01
PE Intensity	Behavior	6.37	7.33	0.06	-0.01	0.12	0.08	0.07

Note. B represents the unstandardized coefficient. LCI represents the lower bound confidence interval for B. UCI represents the upper bound confidence interval for B.

Table 2. Covariate Adjusted Regression, all genders

predictor	outcome	mean1	mean2	B	lci	uci	pvalue	adjRsq	GPA	Attendance	Behavior	Gender	Shift
PE Exposure	GPA	23.58	30.81	2.06	-0.33	4.45	0.009	0.59	NA	0.06[-0.03,0.14]	3.95[3.54,4.35]	1.64[-0.64,3.92]	4.98[2.56,7.40]
PE Exposure	Attendance	14.00	13.14	0.85	-0.29	4.00	0.09	0.10	0.10[-0.05,0.25]	NA	-1.51[-2.29,-0.73]	-2.44[-5.43,0.54]	5.87[2.68,9.06]
PE Exposure	Behavior	6.37	7.37	0.17	-0.29	0.62	0.07	0.59	0.14[0.13,0.16]	-0.03[-0.05,-0.02]	NA	-0.59[-1.02,-0.16]	-0.48[-0.94,-0.01]
PE Intensity	GPA	23.58	33.13	0.25	0.03	0.49	0.003	0.60	NA	0.05[-0.04,0.14]	3.95[3.55,4.36]	1.5[-0.84,3.74]	4.50[1.94,6.96]
PE Intensity	Attendance	14.00	11.32	0.24	-0.54	0.6	0.03	0.11	-0.08[-0.06,0.24]	NA	1.47[-2.26,-0.71]	-2.75[-5.71,0.28]	-
PE Intensity	Behavior	6.37	7.33	0.00	-0.05	0.04	0.00	0.60	0.14[0.13,0.16]	-0.03[-0.05,-0.01]	NA	-0.57[-0.99,-0.13]	-0.45[-0.92,0.04]

Note. B represents the unstandardized coefficient. LCI represents the lower bound confidence interval for B. UCI represents the upper bound confidence interval for B.

Table 3. Simple Regression (non-cov adjusted), BOYS ONLY

predictor	outcome	mean1	mean2	B	lci	uci	pvalue	adjRsqr
PE Exposure	GPA	22.47	29.99	7.52	2.11	12.92	0.01	0.05
PE Exposure	Attendance	-13.87	-14.73	-0.86	-6.02	4.30	0.74	-0.01
PE Exposure	Behavior	5.85	6.99	1.13	0.08	2.18	0.03	0.03
PE Intensity	GPA	22.47	31.97	0.57	0.11	1.02	0.02	0.05
PE Intensity	Attendance	-13.87	-13.53	0.28	-0.15	0.70	0.21	0.00
PE Intensity	Behavior	5.85	6.67	0.05	-0.04	0.14	0.27	0.00

Note. B represents the unstandardized coefficient. LCI represents the lower bound confidence interval for B. UCI represents the upper bound confidence interval for B.

Table 4. Simple Regression (non-cov adjusted), GIRLS ONLY

predictor	outcome	mean1	mean2	B	lci	uci	pvalue	adjRsqr
PE Exposure	GPA	24.18	31.48	7.29	2.60	11.99	0.03	0.05
PE Exposure	Attendance	-14.07	-11.84	2.23	-1.82	6.29	0.28	0.00
PE Exposure	Behavior	6.66	7.68	1.02	0.14	1.90	0.02	0.02
PE Intensity	GPA	24.18	33.57	0.79	0.32	1.26	0.00	0.05
PE Intensity	Attendance	-14.07	-10.06	0.46	0.05	0.86	0.03	0.02
PE Intensity	Behavior	6.66	7.80	0.08	-0.01	0.17	0.08	0.01

Note. B represents the unstandardized coefficient. LCI represents the lower bound confidence interval for B. UCI represents the upper bound confidence interval for B.

Table 5. Effect of overall behavior on overall GPA, Boys and Girls respectively

predictor	outcome	B	lci	uci	pvalue	adjRsqr
Overall behavior - boys	Overall GPA- boys	3.96	3.36	4.57	0.00	0.58
Overall behavior - girls	Overall GPA- girls	4.03	3.49	4.57	0.00	0.55

Note. B represents the unstandardized coefficient. LCI represents the lower bound confidence interval for B. UCI represents the upper bound confidence interval for B.

Table 6. Analysis of differences in overall GPA by term

Term Comparison		Means	Mean Difference	lci	uci	pvalue
Pair 1	Overall GPA Term I	30.171927	2.52	1.33	3.71	0.00
	Overall GPA Term II	27.651163				
Pair 2	Overall GPA Term II	27.651163	0.98	0.19	1.77	0.15
	Overall GPA Term III	26.669851				
Pair 3	Overall GPA Term I	30.171927	3.50	2.10	4.90	4.92
	Overall GPA Term III	26.669851				

Note. B represents the unstandardized coefficient. LCI represents the lower bound confidence interval for B. UCI represents the upper bound confidence interval for B.

Table 7. Teacher gender and ancestry effects on Arabic GPA

predictor	outcome	B	lci	uci	pvalue	adjRsqr
Arabic Male/Female	Arabic overall GPA	8.41	12.13	4.70	0.00	0.62
Arabic Syrian/Non-Syrian ancestry	Arabic overall GPA	4.70	0.57	8.83	0.03	0.16

Note. B represents the unstandardized coefficient. LCI represents the lower bound confidence interval for B. UCI represents the upper bound confidence interval for B.

Table 8. Teacher efficacy, motivation, and warmth effects on Arabic, Math, and English GPA

predictor	outcome	B	lci	uci	pvalue	adjRsqr
Teacher efficacy	Arabic overall GPA	8.85	5.63	12.07	0.00	0.12
	Math overall GPA	31.56	16.03	47.10	0.00	0.09
	English overall GPA	-2.39	-8.38	3.59	0.43	0.00
Teacher motivation	Arabic overall GPA	-	-	-	-	-
	Math overall GPA	-6.84	-11.26	-2.42	0.00	0.05
	English overall GPA	1.88	-2.10	5.86	0.35	0.00
Teacher warmth	Arabic overall GPA	10.54	5.35	15.73	0.00	0.07
	Math overall GPA	11.22	3.68	18.75	0.00	0.05
	English overall GPA	-2.28	-6.46	1.90	0.28	0.00

Note. B represents the unstandardized coefficient. LCI represents the lower bound confidence interval for B. UCI represents the upper bound confidence interval for B. There was limited variance for the model estimating Arabic overall GPA by Teacher motivation. None of these effects are significant when using a mix-model that accounts for nesting of students within teachers' classes.