

Teaching and Learning in Fragile Contexts (TLFC) Research Paper



Effects of Play-Based and Joyful Accelerated Learning Programs on Academic and Behavioral Outcomes of Primary School Children in Post- Conflict Tigray, Ethiopia

Belay Hagos Hailu, PhD
Institute of Educational Research, Addis Ababa University
Tsegaye Hagos, PhD Candidate
Department of Psychology, Addis Ababa University

June 25, 2026



Authors' Note

This work was carried out with the aid of a grant from Global Affairs Canada (GAC), in partnership with CODE Canada and Addis Ababa University. Correspondence concerning this manuscript should be addressed to Belay Hagos Hailu, College of Education and Language Studies, Addis Ababa University, Addis Ababa, Ethiopia [Email: belay.hagos@aau.edu.et].

© 2026 Belay Hagos Hailu.

This report was produced under the Teaching and Learning in Fragile Contexts project and published by CODE with permission from the grantee. This report is licensed under the Creative Commons Attribution-Noncommercial 4.0 International Licence (CC BY-NC 4.0). Users may share and adapt the report for non-commercial purposes, provided appropriate credit is given to the author(s), and CODE.

Contents

Acknowledgements.....	4
Abstract.....	5
Introduction	6
Literature Review	7
The Problem.....	7
Method.....	8
Research Design	8
Participants and Sampling	8
The Two Groups.....	9
Tools and Measures.....	10
Data Collection and Analysis Strategy.....	10
Results.....	11
Quantitative results	11
Comparative Academic Performance by Curricular Program.....	11
Gender Differences in Academic Performance.....	12
Geographic location: District (Woreda) Variation	13
Psychosocial and Behavioral Outcomes	14
Relationship between academic and behavioral outcomes	19
Qualitative results	20
Effectiveness of the intervention.....	20
Gender Sensitive Approaches.....	23
Discussion.....	24
Conclusions and Policy Recommendations.....	25
References.....	26

Acknowledgements

We would like to acknowledge the Global Affairs Canada and CODE Canada for funding this study and Addis Ababa University for facilitating the study. Second, special thanks go to the Luminos Fund and Tigray Bureau of Education for allowing us to access the target schools in the three districts (Woredas) of Tigray. Third, we would like to express our gratitude to our respondent students, teachers, principals, parents and project coordinators. Finally, we would like to thank our data collectors for engaging in this endeavor.

Abstract

This study evaluated the effectiveness of a play-based and joyful Accelerated Learning Program (ALP)—specifically the Luminos Method—on the academic achievement and behavioral outcomes of primary school children in post-conflict Tigray, Ethiopia. Following the devastating conflict between 2020 and 2022, millions of children were left out of school, leading to significant learning poverty and trauma. Utilizing a mixed sequential explanatory research design, quantitative data were collected from a sample of 1,836 Grade 4 students (506 in the Luminos group and 1,330 in the regular group) across 24 schools in three woredas: Atsbi, Endamohoni, and Seharti Samre. Academic outcomes were measured across local language (Tigrigna), English, and Mathematics using standardized T-scores. Behavioral outcomes were evaluated via the Strengths and Difficulties Questionnaire (SDQ) among 501 and 510 primary school children in the Luminos and Regular tracks respectively.

Results from independent samples t-tests revealed that children in the Luminos ALP performed significantly higher in Tigrigna ($M = 50.92$), English ($M = 50.93$), Mathematics ($M = 51.14$), and overall academic average ($M = 50.64$) compared to their peers in the regular track, with respective mean scores of Tigrigna ($M=49.55$), English ($M=49.53$), Mathematics ($M=49.46$) and overall average ($M=49.57$). Furthermore, the joyful pedagogy significantly mitigated behavioral difficulties, with 80% of children falling within the normal range, though peer relationship challenges remained a distinct concern. Gender analysis indicated that while boys generally outperformed girls in conventional settings, the gender gap was minimized within the Luminos program. Besides, significant regional variations were also observed, with Atsbi Woreda ($M=53.52$) showing the highest overall academic gains as compared to those in Endamohoni ($M=48.11$) and Seharti Samre ($M=48.04$).

The findings demonstrate that child-centered, activity-based and joyful pedagogies offer a highly effective mechanism for post-conflict educational recovery and psychological rehabilitation, providing a second chance to catch up on lost years of schooling.

Keywords: Accelerated Learning Program, Joyful Pedagogy, Post-Conflict Recovery, Tigray Ethiopia, Play-Based Learning, Academic Achievement, Behavioral Outcomes.

Introduction

Global education systems increasingly face massive disruptions due to localized and regional armed conflicts, natural disasters, and pandemics, leaving millions of children vulnerable to severe institutional exclusion. According to recent international estimates, approximately 9 million children remain out of school in Ethiopia alone due to a compounding matrix of violence, internal displacement, and environmental crises (UNICEF, 2024). Among these crises, the two-year civil war in northern Ethiopia (2020–2022) had a singularly catastrophic impact on the Tigray region, completely dismantling infrastructure and forcing the total closure of primary and secondary educational institutions. Consequently, an entire generation of children experienced prolonged educational deprivation, creating an unprecedented inflation of out-of-school and overage learners when formal peace was restored in mid-2023. These children did not merely lose years of formal skill acquisition; they also endured pervasive psychosocial trauma resulting from violence, economic collapse, and social displacement.

Prior to the conflict, Ethiopia was already struggling with systemic learning poverty. Data published by the World Bank (2022) indicated that up to 90% of children by age 10 could not read or comprehend a simple, age-appropriate text. Standardized evaluations, such as the Early Grade Reading Assessment (EGRA), consistently demonstrated that while nominal access to lower primary school had improved nationally over the preceding decade, actual foundational literacies remained drastically low. For instance, the national EGRA (2018) reported that only 6.2% of students in Grades 2 and 3 across all local instruction languages achieved reading fluency with full comprehension. In the Tigray region specifically, this baseline was even more alarming, with a mere 2% of lower primary students demonstrating fluent reading and reading comprehension (EGRA, 2018). Following the multi-year total shutdown of schools, subsequent evaluations by organizations such as the Luminos Fund revealed deep, regressive learning losses among students in Grades 2, 3, and 4 relative to their 2018 regional cohorts (Luminos Fund, 2023). When schools finally reopened in 2023, educators were confronted with children who were significantly overage for early primary content, profoundly detached from standard cognitive routines, and bearing severe emotional wounds.

To address this acute regional crisis, standard educational models were deemed fundamentally inadequate. Conventional pedagogical frameworks require three full academic calendar years to advance students through Grades 1 to 3, an unrealistic timeline for overage children aged 9 to 14 who need to rapidly reintegrate into the formal school system. In response, targeted civil society interventions introduced specialized Accelerated Learning Programs (ALPs). Chief among these was the Luminos Method, a remedial model

that condenses the standard three-year primary curriculum into a single, intensive twelve-month cycle. Crucially, the Luminos model pairs this curricular compression with a joyful, play-based, and highly engaging child-centered pedagogy that utilizes games, music, narrative storytelling, interactive flash cards, and hands-on crafts. This dual emphasis aims to simultaneously bridge foundational cognitive gaps and provide a form of non-clinical therapeutic support to counter post-war psychological distress.

Literature Review

The theoretical underpinning of joyful and play-based pedagogy is rooted deeply in constructivist frameworks of development, notably pioneered by Vygotsky and Piaget, which argue that cognitive processing is optimized when children actively manipulate their environments through play. Modern educational neuroscience confirms that chronic stress and trauma—such as that experienced during armed conflict—hyper-activate the child's amygdala and suppress the prefrontal cortex, heavily impairing working memory, attention regulation, and executive functioning (Shonkoff & Garner, 2012). In post-conflict configurations, traditional chalk-and-talk rote instruction often fails because it exacerbates feelings of anxiety and alienation among traumatized students, thereby reinforcing learning resistance.

Empirical reviews of Accelerated Learning Programs globally demonstrate their capacity to rapidly return out-of-school children to regular tracks. Research across sub-Saharan Africa indicates that curricular condensation combined with interactive, participatory instructional techniques can yield literacy and numeracy gains that match or exceed those achieved over multiple years in standard public systems (Longden, 2013). However, traditional ALPs often focus narrow attention on structural efficiency and basic test preparation, neglecting the parallel imperative of emotional and social repair. The integration of a joyful, active pedagogy addresses this gap by utilizing physical games, structured peer socialization, and music, which collectively lower the affective filter, re-establish internal safety, and foster cooperative social behaviors (Baron, 2022). While several studies have examined the academic utility of compressed instruction, sparse empirical work has concurrently mapped its direct impact on both standardized academic achievements and validated behavioral profiles in active post-conflict settings.

The Problem

Due to COVID-19 and the war in Tigray almost all children were out of school during 2020-2022. As a result the out of school children became overage when peace was restored in post conflict Tigray by 2023. The target children were exposed to learning loss during the school closure and encountered traumatic experiences. To address these problems some interventions were implemented in selected schools in Tigray, one of which was an

alternative education program called Accelerated Learning Program (ALP) designed and implemented by the Luminous Fund. The purpose of this study was to assess if the interventions using the Luminos Method were effective in improving the literacy and numeracy performances of out of school. In other words, the primary purpose of this investigation was to conduct a rigorous, empirical evaluation of the effectiveness of the joyful Accelerated Learning Program (ALP) on the academic achievement and behavioral outcomes of primary school children in post-conflict Tigray, comparing them directly to peers enrolled in conventional government tracks. To achieve this objective, the study addressed four specific research questions:

1. To what extent was the joyful ALP effective in terms of literacy and numeracy scores of students by the end of Grade 4?
2. Do students included in the ALP perform differently from those in the regular program in literacy, numeracy, and overall academic performances?
3. To what extent do students enrolled in the ALP and those in the regular program differ in behavioral problems as well as pro-social behaviors?
4. What systemic lessons and policy recommendations can be drawn from the findings of this study to guide post-conflict educational recovery?

Method

Research Design

This study utilized a mixed sequential explanatory research design. In the first phase, a dominant quantitative approach was deployed to structurally evaluate and compare the standardized academic achievement results and behavioral indexes of children across the two study tracks (the Luminos ALP group and the conventional Regular group). Following the collection and statistical mapping of quantitative scores, a subsequent qualitative phase was planned to deeply contextualize and explain the empirical distributions through localized focus group sessions and institutional reviews.

Participants and Sampling

The total quantitative sample for the academic outcomes comprised of 1,836 Grade 4 students drawn from 24 primary schools distributed across three purposefully selected districts (i.e., local structure called Woredas) in the Tigray region: Atsbi, Endamohoni, and Seharti Samre. The sample was structurally stratified by program type, consisting of 506 students in the Luminos Group, all of whom had successfully completed the one-year compressed ALP cycle and transitioned into formal Grade 4 and 1,330 students in the Regular Group, who had proceeded through the standard primary progression of Grades

1,2 and 3. The gender balance of the sample was almost perfectly symmetrical, with 916 males (49.89%) and 920 females (50.11%).

On the other hand, the sample for the assessment of behavior (both pro-social and difficult behavior) was 1011, where the Luminos Group were 501 and the Regular track children were 510.

Table 1. Demographic characteristics of the Luminos and Regular Track Groups

Demographic Variables	Luminos ALP Group (N=506)	Regular Track Group (N=1330)	Total (N=1836)
Male N (%)	272 (29.70%)	644 (70.30%)	916 (49.89%)
Female N (%)	234 (25.40%)	686 (74.60%)	920 (50.11%)
Mean Age (SD)	13.15 (1.518)	12.61 (1.389)	12.08 (1.587)
Atsbi Woreda N (%)	174 (28.80%)	431 (71.20%)	605 (34.30%)
Endamohoni Woreda N (%)	167 (32.30%)	350 (67.70%)	517 (28.20%)
Seharti Samre Woreda N (%)	165 (23.10%)	549 (76.90%)	714 (38.90%)

The 24 sampled institutions across the three districts were as follows: in Atsbi Woreda: Abdidera, Adishumaekobe, Agowo, Akoren, Gendet, Golgolnaele, Kuret, and Serdi Akishti; in Endamohoni Woreda: Adi Agam, Enderqan, Gelewsa, Gereb Abdela, Janamora, Keniyat, Sale, and Serenga; and in Seharti Samre Woreda: Adi Eshir, Daero Tekli, Debrehayla, Deqra, Gitet Halefom, Hintsä, Mewael, and Tesfay Ferede.

The Two Groups

The Luminos Group had the opportunity to learn using the Luminos Method, which was focusing on target groups of children who were out of school children age 9-14. As they were overage for their grades due to the missed opportunity during the COVID-19 followed by the war in Tigray which lasted about three years (2020-2022). The Accelerated Learning Program (ALP) was a condensed form of the regular curriculum, which reorganized and condensed the three year curriculum (i.e., for Grades 1-3) into one year. The condensed curriculum is called Accelerated Learning Program (ALP) which employed joyful, playful and activity-based pedagogy by actively engaging children using games, music, stories, flash cards, and hand crafts while the teacher was a facilitator of their learning.

After completing the three-year curriculum in one year students were tested by the Woreda Education Offices for their knowledge and the required competencies, where those scoring the pass mark had to join directly grade 4, skipping Grades 2 & 3.

The Regular Group learned using the government three-year curriculum designed for Grades 1-3 and had to stay for three years before joining Grade 4. They were not overage for their grade levels. They were taught using the conventional pedagogies, in most cases teacher centered pedagogies.

Tools and Measures

Academic achievement scores were extracted from institutional records at the end of the Grade 4 term, capturing raw percentage scores across three core curricular domains: Local Language Literacy (Tigrigna), English Language Literacy, and Mathematics, alongside an Overall Average Score. To guarantee absolute statistical comparability across distinct testing environments and schools, raw performance percentages were converted into standard scores: first converted into Z-scores, and subsequently transformed into linear T-scores utilizing the standard formula: $T = 50 + 10Z$. This mapping forces a standardized mean of 50 and a standard deviation of 10 for the population baseline.

Behavioral and psychosocial scores were gathered using an adapted version of the Strengths and Difficulties Questionnaire (SDQ), a validated tool mapping developmental psychology attributes across explicit subscales. The subscales were partitioned into: (a) Internalizing Behavior Problems (encompassing emotional symptoms and peer relation problems), (b) Externalizing Behavior Problems (encompassing conduct problems and hyperactivity/inattention), and (c) a Total Difficulty Score. Additionally, a distinct positive subscale measured Pro-social Behavior. Raw scores on the difficulty and pro-social measures were mathematically categorized into clinical thresholds based on established diagnostic criteria: Normal, Borderline, and Abnormal configurations.

Data Collection and Analysis Strategy

Data collection was executed over a structured field window by six professional field data collectors directly supervised by three senior research supervisors, all of whom underwent an intensive preparatory training regime. Primary survey materials and administrative secondary records were merged into a digital dataset. Statistical computations were performed using SPSS software. Quantitative variances between the Luminos and Regular groups, as well as internal gender permutations, were tested using independent samples t-tests, while geographic/woreda differences were computed via a series of one-way Analyses of Variance (ANOVA) accompanied by post-hoc comparisons. Bivariate associations were mapped via Pearson product-moment correlation coefficients (r).

Results

Quantitative results

Comparative Academic Performance by Curricular Program

To address the primary research question regarding academic variance, independent samples t-tests were executed to compare the mean T-scores of the Luminos ALP group against the conventional Regular group across all academic performance domains. The analysis revealed a statistically significant performance advantage for the Luminos group in every domain.

Table 2. Descriptive Statistics of Academic Performances of Students in the Luminos and Regular Tracks

Academic Domain	Group	N	Mean T-Score	SD	t	p
Tigrigna Literacy	Luminos Regular	506 1330	50.92 49.55	10.40 10.00	2.597	p < 0.05
English Literacy	Luminos Regular	506 1330	50.93 49.53	10.74 9.88	2.553	p < 0.05
Mathematics	Luminos Regular	506 1330	51.14 49.46	10.47 9.94	3.187	p < 0.05
Overall Average Score	Luminos Regular	506 1330	50.64 49.57	10.67 10.19	1.995	p < 0.05

First, in local language literacy (Tigrigna), primary school children in the Luminos group scored significantly higher ($M = 50.92$, $SD = 10.40$) than those in the Regular track ($M = 49.55$, $SD = 10.00$), $t(1834) = 2.597$, $p < .05$. In other words, those who were out of school and enrolled in the Luminos approach scored significantly higher in local language literacy (in Tigrigna) than those enrolled in Regular track. Second, in English language literacy, a parallel trend was observed, with the Luminos group ($M = 50.93$, $SD = 10.74$) outperforming the regular group ($M = 49.53$, $SD = 9.88$), $t(1834) = 2.553$, $p < .05$. Third, the largest statistical divergence occurred within Mathematics instruction, where the Luminos cohort achieved a mean T-score of 51.14 ($SD = 10.47$) compared to the conventional cohort mean of 49.46 ($SD = 9.94$), $t(1834) = 3.187$, $p < .05$. Finally, the Overall Academic Average was significantly higher for the Luminos Group ($M = 50.64$, $SD = 10.67$) than for the Regular track ($M = 49.57$, $SD = 10.19$), $t(1834) = 1.995$, $p < .05$. These results indicate that despite condensing of the

three-year curriculum into one year, the joyful ALP methodology achieved superior and efficient academic progression of out of school children from Grade one to Grade 4 in just one year.

Gender Differences in Academic Performance

Gender-focused t-test models revealed substantial academic performance disparities in the aggregate population, with male students registering significantly higher scores than female students across all subjects at Grade 4.

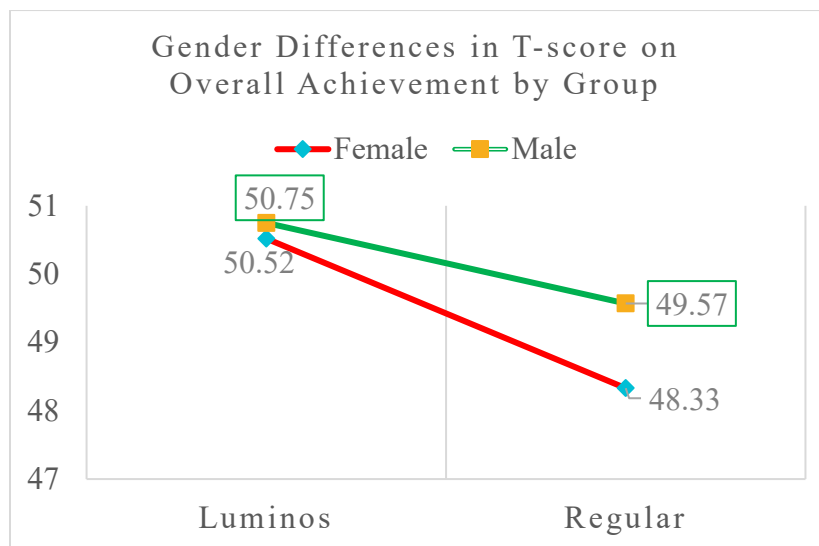
Table 3. T-test: Gender differences on academic achievement

Gender		N	Mean	SD	t	df	p
T-score Tigrigna	Female	686	48.78	9.61	-2.92	1328	P<0.05
	Male	644	50.38	10.35			
T-score English	Female	686	48.50	9.61	-3.96	1328	P<0.05
	Male	644	50.64	10.06			
T-score Math	Female	686	48.35	9.59	-2.30	1328	P<0.05
	Male	644	50.65	10.17			
T-score Overall	Female	686	48.33	9.96	-2.55	1328	P<0.05
	Male	644	50.89	10.27			

In local language Tigrigna literacy, males achieved a mean T-score of 50.38 (SD = 10.35) while females scored 48.78 (SD = 9.61), $t(1328) = -2.92$, $p < .05$. In other words, male students performed significantly higher. Besides, in English literacy, males scored 50.64 (SD = 10.06) versus females at 48.50 (SD = 9.61), $t(1328) = -3.96$, $p < .05$. In Mathematics test performance, the male mean reached 50.65 (SD = 10.17) against the female mean of 48.35 (SD = 9.59), $t(1328) = -2.30$, $p < .05$. Structurally, the overall academic achievement average demonstrated a major gap: males (M = 50.89, SD = 10.27) scored significantly higher than females (M = 48.33, SD = 9.96), $t(1328) = -2.55$, $p < .05$. Critically, sub-group stratification revealed an important interaction effect: the gender difference was non-significant for students within the Luminos ALP Group, indicating that the joyful, activity-based

methodology acted as an equalizer, neutralizing typical female learning disadvantages that persisted strongly within the conventional regular classrooms.

Figure 1. Interaction of Gender and Group on Overall Academic Achievement



Geographic location: District (Woreda) Variation

A series of one-way Analyses of Variance (ANOVA) evaluated the impact of regional geographic location (Woreda) on student learning outcomes. The structural differences were profound across all domains.

Table 4. One way ANOVA of District by Academic Achievement

Scores	District (Woreda)	N	Mean	SD	One way ANOVA
T-score Tigrigna	Atsbi	605	53.46	9.38	F(2, 1833)= 61.48, p<0.05
	Endamohoni	517	49.00	9.74	
	Seharti/Samre	714	47.61	10.21	
	Total	1836	49.93	10.13	
T-score English	Atsbi	605	52.80	10.15	F(2, 1833)= 38.03, p<0.05
	Endamohoni	517	48.73	8.19	
	Seharti/Samre	714	48.34	10.87	
	Total	1836	49.92	10.14	
T-score Math	Atsbi	605	54.11	9.64	

	Endamohoni	517	49.02	9.53	F(2, 1833)= 91.09, p<0.05
	Seharti/Samre	714	47.04	9.74	
	Total	1836	49.92	10.11	
T-score Overall	Atsbi	605	53.52	9.76	F(2, 1833)= 60.17, p<0.05
	Endamohoni	517	48.11	9.65	
	Seharti/Samre	714	48.04	10.47	
	Total	1836	49.87	10.33	

One way analysis of variance of district (or Woreda) was statistically significant on Tigrigna literacy, $F(2, 1833) = 61.48$, $p < .05$; on English literacy, $F(2, 1833) = 38.03$, $p < .05$; on Mathematics performance, $F(2, 1833) = 91.09$, $p < .05$; and on the Overall Academic Average, $F(2, 1833) = 60.17$, $p < .05$. Post-hoc tests established that students in Atsbi Woreda achieved substantially higher mean scores across every single academic performance (Overall $M = 53.52$, $SD = 9.76$; Tigrigna $M = 53.46$; English $M = 52.80$; Math $M = 54.11$) compared to students located in Endamohoni Woreda (Overall $M = 48.11$, $SD = 9.65$) and Seharti Samre Woreda (Overall $M = 48.04$, $SD = 10.47$).

Psychosocial and Behavioral Outcomes

The behavioral evaluations generated via the Strengths and Difficulties Questionnaire (SDQ) provided a clear map of the children's psychosocial adjustments in post-conflict conditions. Analysis of the behavioral outcomes were based on pro-social behavior and behavior difficulties.

Pro-social Behavior

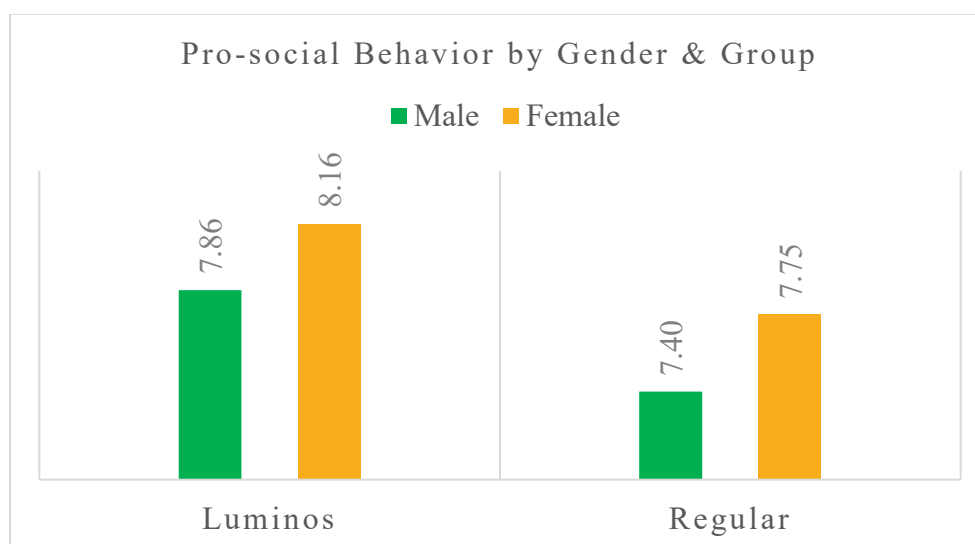
On the positive metric of Pro-social Behavior, the vast majority of the school children (81.8%) fell within the designated normal range (scores 6–10). This distribution was led by the Luminos group, where 84.0% of children demonstrated highly adaptive pro-social skills, compared to 79.6% in the Regular track.

Table 5. Benchmark of Pro-social Behavior by Group

Pro-social Behavior Benchmark	Pro-social behavior by Group				Total	
	Luminos		Regular			
	N	%	N	%	N	%
Normal (6-10)	421	84.0%	406	79.6%	827	81.8%
Borderline (5)	40	8.0%	62	12.2%	102	10.1%
Abnormal (0-4)	40	8.0%	42	8.2%	82	8.1%
Total	501	100.0%	510	100.0%	1011	100.0%

Crucially, a sub-segment of 8.1% of the total sample exhibited scores falling into the clinically abnormal threshold (0–4), signifying a critical pocket of children with serious pro-social deficits requiring targeted rehabilitation.

Figure 2. Pro-social behavior by gender and group



Similar analysis also revealed that girls had significantly higher scores than boys in both groups in post conflict Tigray.

Table 6. A Two-way ANOVA: Group by Gender on Pro-social behavior

Dependent Variable: Pro-social Behavior				
Group by Gender		N	Mean	SD
Luminos	Female	230	8.16	2.12
	Male	271	7.86	2.38
	Total	501	8.00	2.27
Regular	Female	234	7.75	2.10
	Male	276	7.41	2.32
	Total	510	7.56	2.23
Total	Female	464	7.95	2.12
	Male	547	7.63	2.36
	Total	1011	7.78	2.26

A two-way ANOVA was conducted to examine the interaction and main effects of gender and group on pro-social behavior of primary school students and there was no interaction effect between gender $F(1, 1007)=.022, p>0.05$. On the other hand, there were main effects of gender and group on pro-social behavior in favor of girls and the Luminos group respectively. There was a statistically significant main effect of gender on pro-social behavior, $F(1,1)= 245.47, p<.05, \eta^2=.996$. Girls scored significantly higher on pro-social behavior than boys did. Similarly, There was a statistically significant main effect of group on pro-social behavior, $F(1,1)= 427.26, p<.05, \eta^2=.998$. Students enrolled in the Luminos Group scored significantly higher scores on pro-social behavior than those in the Regular track.

Behavior Difficulty

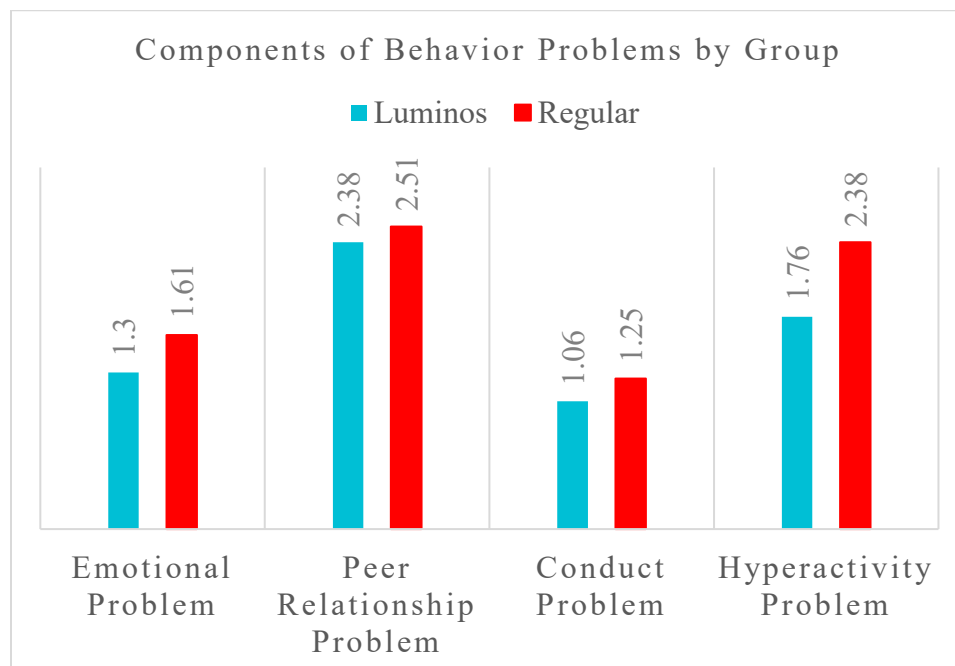
Regarding Difficult Behaviors, 79.9% of the surveyed children presented scores within the normal baseline (0–13). However, exactly 10.0% of the students exhibited severe, clinically abnormal behavior profiles (scores 17–40), which indicates serious emotional or behavioral pathology stemming from post-war stress. An additional 10.1% fell into the borderline category (14–16).

Table 7. Benchmarks of behavior difficulty by group

Benchmarks or ranges on behavior difficulty	Total Behavior Difficulty by Group				Total	
	Luminos		Regular			
	N	%	N	%	N	%
Normal (0-13)	412	82.2%	396	77.6%	808	79.9%
Borderline (14-16)	40	8.0%	62	12.2%	102	10.1%
Abnormal (17-40)	49	9.8%	52	10.2%	101	10.0%
Total	501	100.0%	510	100.0%	1011	100.0%

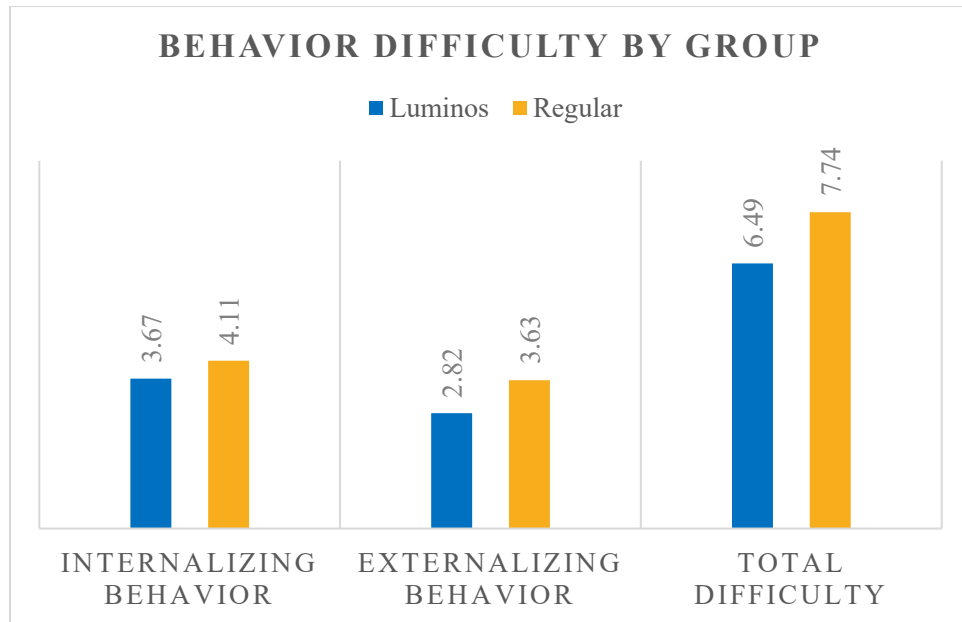
Among the distinct behavioral problem components, peer relationship problems emerged as the most prominent deficit, reflecting the disruption of social fabric caused by years of conflict. Cross-tabulations of district geographic locations showed that children from Seharti Samre Woreda exhibited significantly lower rates of difficult behavior problems compared to the other two districts, suggesting localized variance in post-war community coping mechanisms.

Figure 3. Components of behavior problems by group



Although the Luminos Group had lower total difficult behavior, the overall internalizing behavior is higher than externalizing for both groups.

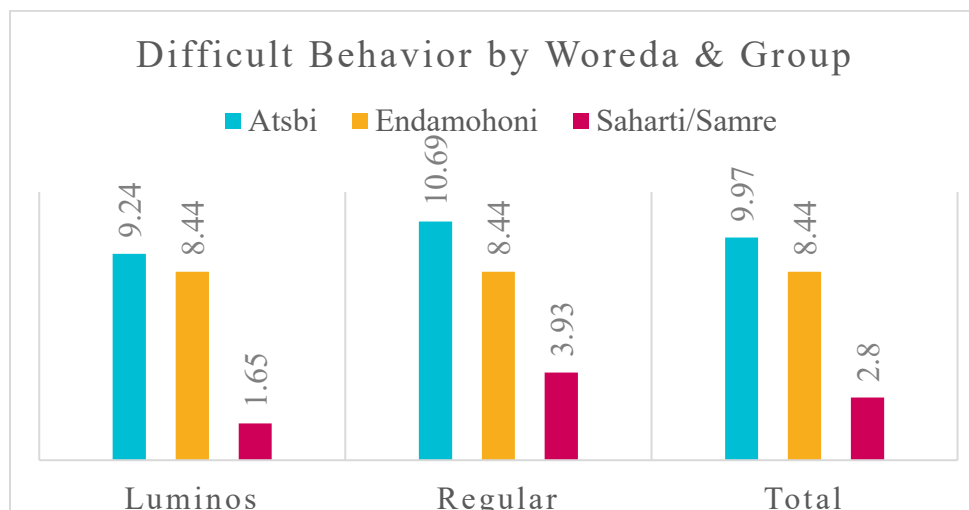
Figure 4. Internalizing and Externalizing Behavior by Group



Behavior Difficulty by Group and Location

Students from Atsbi Woreda had higher scores on behavior difficulty than those from the other two Woredas, with the lowest scores among students from Saharti/Samre. Those students supported by the Luminos approach had significantly lower behavior problems than those in the Regular track particularly in Atsbi and Saharti/Samre Woredas.

Figure 5. Behavior Difficulty by Location (Woreda) and Group



Relationship between academic and behavioral outcomes

Bivariate Pearson correlation analysis ($N = 1,011$) uncovered critical transactional links between psychology and educational performance. Pro-social behavior was found to maintain a positive, statistically significant correlation with all tracked academic achievement scores: Tigrigna literacy ($r = .085$, $p < .01$), English language literacy ($r = .118$, $p < .01$), Mathematics ($r = .088$, $p < .01$), and the Overall Academic Average ($r = .122$, $p < .01$).

Table 8. Intercorrelations among academic and behavioral outcomes

No.	Components of Behavior/Academic	Behavioral outcomes				Academic Outcomes		
		1	2	3	4	5	6	7
1	Behavioral Difficulty	1						
2	Internalizing behavior	.915**	1					
3	Externalizing behavior	.929**	.701**	1				
4	Pro-social behavior	-.625**	-.542**	-.609**	1			
5	T-score_ Tigrigna	0.012	0.019	0.004	.085**	1		
6	T-score_ English	0.002	0.007	-0.002	.118**	.668**	1	
7	T-score_ Maths	0.050	.071*	0.022	.088**	.780**	.707**	1
8	T-score_ Average	0.029	0.038	0.017	.122**	.872**	.822**	.887**

This pattern indicates that pro-social adaptive skills directly reinforce cognitive learning capabilities. Conversely, there was no statistically significant correlation between the overall behavioral difficulty index and academic scores ($r = .029$, $p > .05$), indicating that the behavior difficulty did not interfere with academic achievement. While difficult behaviors and academic achievement operated independently, internalizing behavior problems did show a weak positive correlation with Mathematics scores ($r = .071$, $p < .05$), a phenomenon that may reflect an increase in isolated study habits among anxious or internally withdrawn children in post-conflict environments.

Qualitative results

Effectiveness of the intervention

During the post conflict situation in Tigray there were many out of school children aged 9-14. Luminos Fund came up with Accelerated learning program which successfully enabled the children complete three years of education in one year.

"We make continuous monitoring visits along with Liminos Fund and the implementing partners. What we observed was there was better academic and psychological outcomes among children supported by Luminos Fund. Effective teacher training and the joyful activity-based learning were the reasons for the differential outcomes in the students supported by Luminos Fund. Unlike the usual school, teachers in the accelerated learning program assess the psychological conditions of students before starting academic subjects. Besides the students are highly engaged in joyful activities." (KII respondent, ECCE and basic education focal person, Tigray Bureau of Education)

"I don't know what the teachers teach the students. These teachers were exposed to the different traumatic exposures with us. Their education level is grade 10 or 12. What I know is within a very short period of time they were able to bring psychological change in our children. I observed the activities they do within the classroom or outside while I am engaged in the school feeding program, and I think from my observation they are the ones that bring positive changes in our children." (Parent KII, Atsbi Woreda)

"Initially, I was not comfortable to teach the out of school children who don't have the knowhow to education. I had hesitated. But my mentors advised me that it was my duty to help them learn the things they don't know. Then I returned to what I was trained in those two weeks and continued the play-based learning and all of them became excellent. Had I followed the teacher-based learning, this result would have been impossible." (KII teacher, Endamohoni Woreda)

Why is Luminos Fund intervention better than the other students?

"Unlike the usual school [practices], teachers in the accelerated learning program assess the psychological conditions of students before starting academic subjects. Besides the students are highly engaged in joyful activities." (KII respondent, ECCE and basic education focal person, Tigray Bureau of Education)



Figure 6. Students reading as a group.

"Every morning before starting lesson they are lined up and express their emotion and engage in motivational activities before they start academic learning." (Parent KII, Endamohoni Woreda)

"The play-based methodology has helped children to love education. They don't even abstain from school even for one day. For example, I asked my child to help me in household chores for one day, he resisted saying he didn't want to miss his education besides he was worried that he was given a task to present music for that particular day." (Parent KII, Endamohoni Woreda)

"I am pleased to see our children changed their thoughts from war to education. I have seen improvements in my child's behavior." (Parent KII, Samre Woreda)

"When out of school children were given the opportunity to join accelerated learning program, they were eager to learn. Besides the teaching method was enjoyable and engaging" (teacher KII, Endamohoni woreda)

"My daughter never misses a class the whole year. One day I wanted her to assist me in household chores, but she said no and went to school. I think this is due to the good lesson their teacher is teaching them." (Parent KII, Atsbi Woreda)

"Students come to school with different experiences at home. Luminos Fund supported students had the experience of emotional awareness and management because on a daily basis they express their emotions using mood meter posted on the wall and the teacher provides support accordingly." (Principal KII, Endamohoni Woreda)

"I have children learning in the usual regular school and in the accelerated learning program. Their motivation to learning is unparalleled. The way the teachers teach in the accelerated learning program is enjoyable." (Parent KII, Endamohoni Woreda)

"Because I am coming from distant village to school, I usually express the emotion of fatigue every morning on the mood meter. My teacher noticed that and asked me why I had that kind of emotion and she advised me about what I should do." (Student 1, participant, Samre Woreda)

"Every morning, we express our emotions. Because that made us curious, we strive to come to school early in the morning, not to miss that initial session." (Student 2 participant, Samre Woreda)

"In the beginning of the year, meeting our classmates was very much frightening; we used to keep quite not even able to look our teacher in the face. Later with the help of those engaging activities we were able to express our ideas, guided to express our emotions, and develop self-confidence." (Student participants, Endamohoni Woreda)



Figure 7. Mood meter posted on the wall

"This program has introduced me with enjoyable learning, my teacher and classmates. It has brought good changes in my life. For example, during the war time, my thoughts were bad. When I joined the accelerated learning program, all these were changed." (Student1 participant, Atsbi Woreda)

"It has helped me increase my awareness. For example, whenever I got angry at home with my family and I come to school, I realize the kind of emotion I felt and express it in class. When I discuss with my classmates and continue my education, my mind is renewed." (Student 2 participant, Atsbi Woreda)

"Previously, when younger students spoke rude words I used to beat them. But now I am able to control my emotions and what I do is to report to my teacher or keep quiet. Instead of being emotional, I have come to an awareness of exploring why those things happened to me." (Student 3 participant, Samre Woreda)

"Sometimes, my parents want to help them with household chores and wanted me to miss school. I decide that I want to go to school and convince them that it is important to

go. This program has helped me make better decisions.” (Student 4 participant, Atsbi Woreda)

“It has empowered us to do things ourselves. For example, if we are given a task of crafting an alphabet, we discuss among ourselves in our group and decide and divide the work among us and do it. It has empowered me to learn my lessons by myself. I do my homework myself.” (Student 6 participant, Atsbi Woreda)

Gender Sensitive Approaches

Although there is no explicit gender sensitive component in the program, the design of the intervention and its implementation is gender inclusive implicitly. Both boys and girls are treated equally. The following excerpts illustrate how girls are empowered:

“Most of the students were not at ease in communicating with their class mates. In the worst-case scenario, there was one girl who was extremely lonely, not willing to talk nor greet her classmates. I approached this girl and advised her repeatedly. I also discussed with her father, but he took it normal that she acted same way at home. Through continuous support and advise, she improved a lot. One of her achievements was she stood first in an athletic competition and she was given an award. I was proud of her.” (KII teacher, Samre Woreda)

“None of the 25 students were able to handle pen; even what surprised me was there were two girls who had difficult time to get accustomed to handling pen. Now, I am surprised that all of them are at excellent performance that I am having difficult time in distinguishing their order; almost all of them are equal” (KII teacher, Endamohoni Woreda)

“There was one girl who didn’t communicate with anyone; she stared at the wall. When I spoke to her, she never responded to me. It perplexed me; I was worried if she had problem at home or if she had psychological problems. She had feelings of fear. I had discussed this with her parents and they said she was normal at home. And then I thought “Did I frightened her?” Until the end of grade one which was three months from the start, she couldn’t bring any change. After giving tasks to other students in their groups, I brought this girl with me and gave her individualized attention. I gave her different tasks and guided her easily, lucky enough she showed interest and showed remarkable progress. Now she could speak up confidently, was able to go out in front of the class to present for her classmates. She became liberated and felt equal as her classmates after the support.” (KII teacher, Endamohoni Woreda)

Discussion

The empirical findings of this study offer clear evidence for the effectiveness of play-based, joyful accelerated learning frameworks within fragile, post-conflict settings on academic and behavioral measures. The definitive academic superiority displayed by the Luminos ALP cohort at the end of Grade 4 confirms that condensing a three-year foundational curriculum into a single year does not compromise long-term learning retention or cognitive capability. Instead, the child-centered, activity-based pedagogy utilized by the Luminos Method—integrating localized games, tactile crafts, music, and interactive flashcards—substantially improved performance across local language instruction, English language literacy, and Mathematics relative to conventional instruction in regular track, public school instruction. This outcome aligns with global literature indicating that when marginalized or out-of-school children are provided high-engagement, remedial environments, they can rapidly close development gaps (Longden, 2013).

Crucially, the non-significant gender variance observed specifically within the Luminos ALP group highlights its capacity to mitigate typical gender gaps in education. In conventional Ethiopian primary classrooms, girls frequently face structural disadvantages due to domestic labor demands, teacher biases, and systemic exclusion, which explain the depressed female means observed in the regular track sample. The highly structured, interactive, and emotionally protective environment of the joyful ALP neutralized these disadvantages, allowing female learners to achieve parity with their male peers. Geographically, the exceptional academic performance recorded in Atsbi Woreda points to the importance of localized institutional support systems, community involvement, and teacher monitoring networks, all of which vary significantly across districts and influence the implementation quality of educational programs.

From a psychosocial perspective, the behavioral data highlight the dual function of joyful pedagogies as both cognitive accelerators and mental health interventions. In a post-conflict region like Tigray, where children have experienced pervasive trauma, educational recovery cannot be divorced from psychological healing. The high concentration of children within the normal range of pro-social behavior (84.0% in the Luminos track) confirms that active, play-based interaction reduces anxiety and helps rebuild social trust. However, the presence of a distinct 10% cohort of children showing clinically abnormal behavior difficulties highlights the enduring psychological toll of war. This segment requires specialized psychological support that goes beyond standard classroom modifications. The positive correlation between pro-social behavior and academic performance reinforces the foundational principle of holistic education: emotional stability and positive social interactions are prerequisites for optimal cognitive development.

Conclusions and Policy Recommendations

In conclusion, this study demonstrates that play-based, joyful Accelerated Learning Programs provide an effective path for rapid educational recovery, structural catching up, and psychosocial stabilization for out-of-school, overage children in post-conflict settings. In other words, the following three conclusions could be drawn from this study:

- **Catch up:** Out of school children in Tigray supported by the Luminos Method got second chance education opportunity that enabled them catch up with their peers.
- **Effectiveness on academic outcomes:** Children enrolled in the Accelerated learning Program (ALP) performed better in local language (Tigrigna), English, Mathematics and in the overall academic achievement than their peers enrolled in the regular programs.
- **Effectiveness on behavioral outcomes:** The joyful pedagogy implemented by the Luminos Method, which included *games, music, stories, flash cards, and hand crafts*, not only enhanced academic skills but also improved behavioral outcome, i.e., reducing behavior problems and enhancing pro-social behaviors.

Based on these empirical insights, the following policy recommendations are proposed:

- **Systemic Adoption and Expansion:** The Ministry of Education and regional education bureaus should systematically scale up the use of activity-based, accelerated learning frameworks paired with joyful pedagogies across all regions of Ethiopia affected by conflict, displacement, and environmental crises.
- **Institutionalized Teacher Professional Development:** Conventional primary school teachers should receive systematic training in joyful, child-centered instructional techniques. These methods should be formally integrated into pre-service and in-service national teacher training curricula.
- **Cross-Institutional Knowledge Sharing:** Regional education offices should establish formalized networks to enable regular public schools to learn from and adopt the successful pedagogical practices of effective ALP centers.
- **Integrated Psychosocial Screening and Support:** Because 10% of children exhibit severe, clinically abnormal behavioral difficulties, schools must combine academic instruction with systematic psychosocial screening and targeted counseling services to fully address post-war trauma.

References

- Baron, C. (Ed.). (2022). The Luminos Method: The secret to unlocking the light of learning in every child. The Luminos Fund.
- Early Grade Reading Assessment (EGRA). (2018). National report on foundational literacy and numeracy performance in lower primary schools in Ethiopia. Ministry of Education.
- Luminos Fund. (2023). Assessing learning loss and pedagogical adaptation in post-conflict Tigray. Internal Research Monograph.
- Longden, K. (2013). Accelerated learning programs: What do we know about their effectiveness? *International Journal of Educational Development*, 33(2), 142–150.
- Shonkoff, J. P., & Garner, A. S. (2012). The lifelong effects of early childhood adversity and toxic stress. *Pediatrics*, 129(1), e232–e246.
- UNICEF. (2024). UNICEF annual report 2024: Protecting the rights of children in crisis configurations. United Nations Children's Fund.
- World Bank. (2022). State of global learning poverty: 2022 update. World Bank Group.