Causal Correlations of Letter Naming and Number Identification with Numeracy and Literacy: Evidence from Af Somali Medium of Instruction Schools, Ethiopia

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Abstract

Letter and number identifications are foundational components of literacy and numeracy development. This study hypothesized that letter naming and number identification have important implications for numeracy and literacy learning, respectively. Accordingly, the study employed a correlational design on a sample of 229 grades 2 and 3 children selected from six primary (two refugee and four host community) schools in Kebribeyah and Awbare refugee areas. Data analyzed using Pearson r showed correlational indices ranging from .40 (between number identification and literacy) to .47 (between letter naming and numeracy). The values computed on the relationship between letter naming and number identification as well as between literacy and numeracy indicated a similar relationship, i.e., r=.43. In terms of shared variances, further analysis showed shared variances that amounted to 16%, 22.10%, and 18.50% respectively. Generally, the results suggested limited predictive powers for practical purposes. Besides, linear regressions carried out taking sex and types of community yielded statistically significant contributions of type of community, favoring refugee context, on letter naming and literacy learning only. Hence, further large-scale studies are suggested to validate the findings and draw curriculum, pedagogical, and teacher development implications.

Key terms: Letter, Number, Literacy, Numeracy, Refugee, Host community.

1. Introduction

It has been nearly three decades since Ethiopia made the right to use the mother tongue as a medium of instruction in schools a constitutional right (FDRE, 1994, 1995). In the effort of using local languages in regional administration and kindergarten to primary education, languages like Af Somali came into the school compound using Latin script (MoE, 2002). This was a new shift from Amharic language and Geez script-limited practice to a multilingual medium of instruction in early childhood and primary education in the country. The policy of education and curricula too envision holistic child development.

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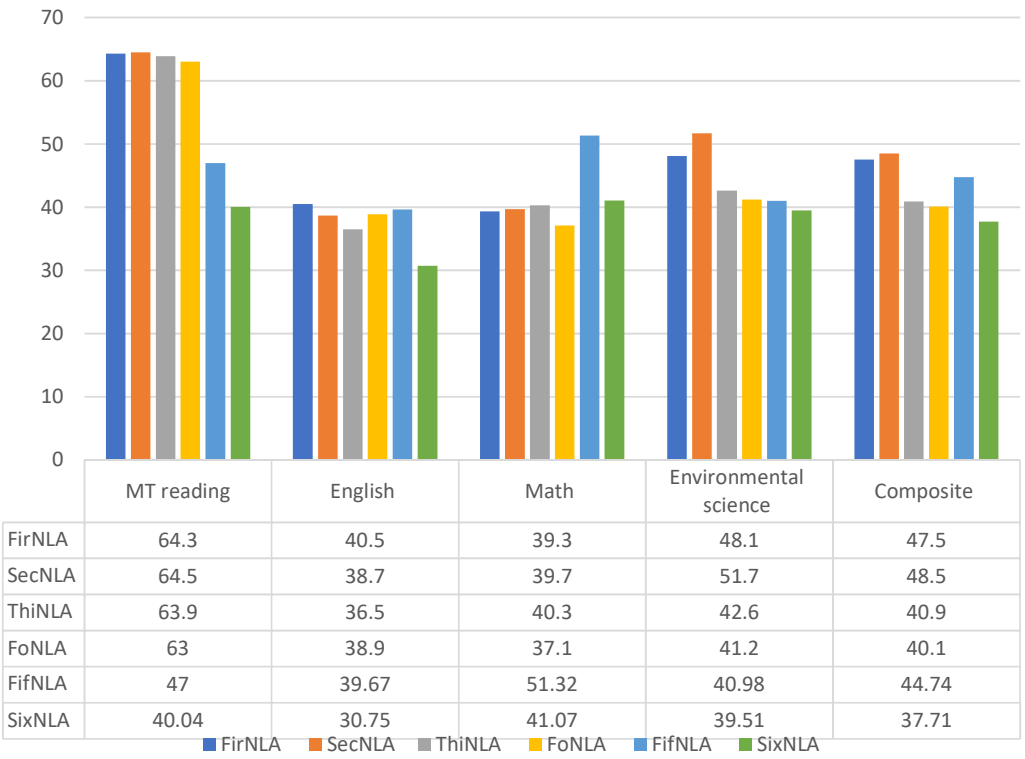
Children experience symbolic communication, activities, and learning before they enter school. Their engagement in naming, discriminating, sorting, and practicing sounds sets the foundation for connecting symbols with sounds and meanings. This gives a way to letter and number identifications (being able to name) in print script in the sense that the process of arbitrary pictorial representations of sounds and concepts becomes more systematic and connected to the fundamental learning skills called literacy and numeracy, respectively. Research also shows that literacy and numeracy are critical learning skills that affect later achievements and even success in life (including career choice and income level) (Glass, 2002; Duncan et al., 2007; Dugdale & Clark, 2008; Shomos, 2010; DES, 2011; Purdie et al., 2011; Antoni & Heineck, 2012; French, 2013; Neumann et al., 2013). In other words, the contributions of reading and number skills development to learning other subjects as well as later school achievement are not domain or subject-area-specific. Science learning, for example, requires logical thinking, quantification, and reading ability to process information for conceptualization. Besides, as much as reading and numerical skills contribute to later school achievements, the cross-correlation is also high. A meta-analysis of six studies by Duncan et al. (2007), for example, showed a higher contribution of early numerical skills not only to numeracy but also to literacy ability development. Even at the secondary education level, studies (for example, Gnambs and Lockl 2022) show a bidirectional relationship between reading and mathematics development.

On the contrary, children who fail to develop learning skills (reading, writing, and numeracy) as early as possible tend to lag behind their peers, perform low in their academic activities, and even become school dropouts (National Economic and Social Forum, 2009), as opposed to those with a good start at the early ages. Learning difficulties or strengths in literacy and numeracy learning have the characteristic of being accumulated over time and affect the academic progress of children accordingly (Cramman et al., 2018; Purpura & Reid, 2016). Learning difficulties or strengths in numeracy, for example, tend to be reflected in literacy skill development because they have shared developmental roots (Neumann et al., 2013). Therefore, letter and number learning set the foundation, has the power to unlock potential, and shapes the future of human development.

Evidence from Ethiopia on literacy and numeracy learning, however, fails short of the requirements. There is mounting proof in the country regarding the low level of quality of education and on public concern regarding the

benefits of schooling. Achievement trends of grade 4 children, revealed by the four-year cyclic national learning assessments, showed a low level of learning in mother tongue language reading, mathematics, environmental science, and English (MoE, 2000, 2004, 2008, 2013a, NEAEA, 2016; NEAEA, 2020). With the exception of mathematics (that showed a mean score increase on the fifth National Learning Assessment), the common trend (including in the composite) was characterized by a decrease over time. Figure 1 shows the magnitudes and trends by year of assessment and subject area.

Figure 1: Means scores (%) of grade four children in the six National Learning Assessments



	MT reading	English	Math	Environmental science	Composite
FirNLA	64.3	40.5	39.3	48.1	47.5
SecNLA	64.5	38.7	39.7	51.7	48.5
ThiNLA	63.9	36.5	40.3	42.6	40.9
FoNLA	63	38.9	37.1	41.2	40.1
FifNLA	47	39.67	51.32	40.98	44.74
SixNLA	40.04	30.75	41.07	39.51	37.71

Notes:

1. *FirNLA/SecNLA/ThiNLA/FoNLA/ FifNLA/ SixNLA stand for First/ Second/ Third/ Fourth/ Fifth/ Sixth National Learning Assessments*
2. *Sample sizes ranged between 10,000 – 14,000 grade 4 children for each assessment*

Literacy and numeracy assessments, too, continued to confirm the prevalence of low performances among early grade children (DeStefano & Elaheebocus, 2009; Benjamin, 2010; RTI, 2014; Abraha, 2015, 2018; AIR, 2019; Dawit et al., 2021). Relatively higher magnitudes of mean scores (amounting to about 71%) were observed in the Early Grade Mathematics Assessment reports released in 2014 and 2018 (National Educational Assessment and Examinations Agency (NEAEA), 2014, 2018). Unfortunately, there is no feasible solution at hand yet to redress the problem in the foreseeable future.

Ethiopia is a multilingual and multicultural society with the right to use mother tongue languages in kindergarten and primary education levels (FDRE, 1995). Practice also shows that while languages such as Tigrigna and Amharic use the Geez script (a local writing system with its own peculiar letter symbols), others like Afaan Oromo and Af Somali adopted the Latin script for print media communications. Given that the predictive power of letter naming and number identification is subject to the nature of its script (Cramman et al., 2018) and contextual variables such as teaching strategies employed (Mcintosh & Sparrow, 2004) and the variations in literacy and numeracy achievements, such foundational research is timely and worth investigating to inform policy, research, and practice in Ethiopia.

Problem Statement

Structurally, letters and numbers are the basis of literacy and numeracy developments, respectively. Though the prevailing situation shows a low status of learning in both literacy and numeracy, the nature of the underlying factors remains an area of further research. This research, therefore, intends to investigate the extent of shared influence between letter naming and number identification and their contributions towards the development of numeracy and literacy in general in the context of the Af Somali medium of instruction. What we know so far about the relationship between letter and number learning and their cross-correlations to literacy and numeracy development is very limited and specific to the English language context. Even from what we know so far, neither letter nor number naming fully predicts success in the corresponding domain. Thus, the correlation of letter and number naming and their cross-correlations with literacy and numeracy learning is a gray area worth investigating because of its implications for the nature of curriculum and classroom instruction in this scarce thematic area and in a multilingual context like Ethiopia (Neumann et al., 2013). In Ethiopia, since the establishment of the 1994 education and training policy, the number of mother

tongue languages of instruction in primary grades has reached 51 so far (Solomon & Daniel, 2022), and the need is ever-growing from time to time. Af Somali is one of the regional languages in Ethiopia and is the medium of instruction (up to grade 8) in Somali Regional State (Getachew & Derib, 2006; Heugh et al., 2007).

The regional state adopted Latin Script, consisting of a total of 26 alphabets (which consist of 21 consonants and five vowels), for literary purposes and the Arabic numeration system for school mathematics classes. However, prevailing policy and practice in the area are not well informed yet by scientific evidence. This study was, therefore, aimed at investigating how letter naming and number identification predict numeracy and literacy in the same order. Specifically, this research intended to answer the following basic questions:

1. What are the contributions of letter naming and number identification to numeracy and literacy development, respectively?
2. What is the shared variance between literacy and numeracy and the letter naming and number identification performances of children in the study context?
3. What are the contributions of attribute variables (gender and type of community) in predicting the performances of students in number identification, numeracy, letter naming, and literacy?

Theoretical Framework

This research is guided by a sociocultural theoretical perspective that recognizes the interaction between the environment and the individual to define learning in context and make life purposeful (Greeno, Collins, & Resnick, 1996; Bigge & Shermis, 2004). In line with this theoretical perspective, both literacy and numeracy activities are conceived as contextual, with meaningful space in academic activities, social interaction, and the lives of children.

According to the Australian Department of Employment, Education, and Training (1991), literacy is the ability to read, understand meaning, and write (in context) for the purpose of independent learning and communication. This conception supports the inclusion of letter naming, phonics, word reading, passage reading fluency, comprehension, and writing as basic components of measuring literacy development (RTI, 2009). Similarly, numeracy is defined as “a combination of mathematical knowledge, problem solving, and

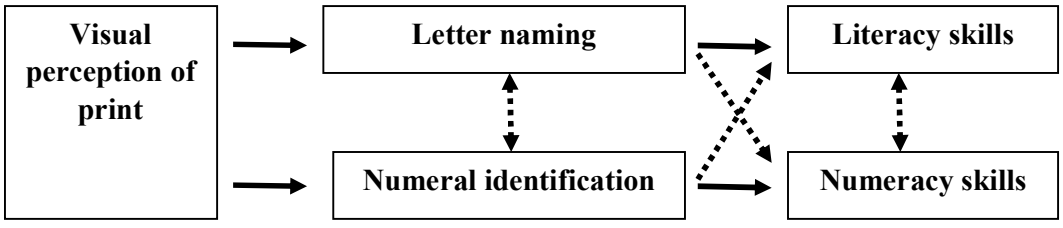
communication skills required by people to function in their broader communities" (Neumann et al., 2013, p. 9). In this sense, numeracy is not only an academic activity but also includes social and individual dimensions of life. Its measurement also covers two main constructs: counting concept (mainly one-to-one correspondence, missing numbers, and cardinality) and number sense (number identification, counting skill, quantity discrimination, and the four operations as appropriate) (Gelman & Meck, 1983; Baroody, 1993; Clarke & Shinn, 2004; Smith, 2010). Both literacy and numeracy involve symbol learning, *i.e.*, letters and numbers.

The study, founded within the theory of sociocultural perspective, therefore implies explicit recognition of its basic components, such as:

(a) Contextualization - use of operationalized definitions of literacy and numeracy, indicators, recognizing the nature of script, defining learning context and connecting measurement elements with applications in life;
(b) Providing support - use of assessor-facilitated assessment where children are not expected to read instructions not to record responses; and
(c) Focus on interaction – such as allowing children to use counting materials during assessment.

In terms of variable mappings, the study adopted the framework suggested by Neumann et al. (2013, p. 28). Figure 2 depicts the lines of investigation in context and the scope of the study: (a) relationship between (Af Somali) letter naming and number identification; (b) relationship between literacy and numeracy constructs; (c) predictive power of letter naming in numeracy learning; and (d) predictive power of number identification in literacy learning.

Figure 2: Relationships between letter naming and number identifications, and literacy and numeracy skills



2. Methods and Materials

Participants

Early grade in Ethiopia refers to grades 1–4 that focus on the development of learning skills such as literacy, numeracy, and environmental awareness (EDRE, 1994). Though the national Mother Tongue (Mt) language syllabus instructs children to learn all the Af Somali letters at grade one (MoE, 2013b), word reading, and compression capabilities mature after two to three years of education. In the area of early grade mathematics, children in grades 2 and 3 learn counting, numerals, missing numbers, number discrimination, cardinality, and the four operations. Practices in Ethiopia also show similar experiences and operational definitions of early grade assessment (Benjamin, 2010; NEAEA, 2014, 2018; RTI, 2014; AIR, 2019).

The data for this study was extracted from a monitoring research conducted to investigate the implementation progress of Save the Children's[2] project titled, 'Building Self-Reliance Project (BSRP)'. The study employed a two-stage sampling technique to identify two refugee schools (out of three) and four corresponding host community schools (two for each refugee site) using a simple random sampling technique (lottery method). Following the sampling of schools, children in grades 2 and 3 were selected using gender- and grade-specific systematic random sampling procedures. Table 1 presents the total sample size of the study.

Table 1: Total sample size of the study

Site	Name of school	Sample size	Type of school
Kebribeyah	Kebribeyah refugee school	40	Refugee
	Sheik Yusuf Kawnaye	40	Host community
	Laba Shap	39	Host community
Awbarre	Awbarre refugee school	40	Refugee
	Abdi Kamil Awale	40	Host community
	Gobyarey	30	Host community
	Total	**229**	

As presented in Table 1, Kebribeyah and Awbarre represented refugee schools, and the rest (Kawnaye, Laba Shap, Abdi Kamil Awale, and

[2] I am grateful to Save the Children for the research opportunity and support I enjoyed during the whole process.

Gobyarey) were from host community settings in the two refugee centers. Taking school-based analysis as a possibility, the desired sample size was set at 40 children per school, drawn from grades 2 and 3, with an equal number of boys and girls. The achieved sample size, however, reached 229 (95.4% of the planned), mainly because of missing participants from Gobyarey Primary School. In other words, 229 refers to the number of participant children that sat for both literacy and numeracy assessments as scheduled. Table 2 below shows additional details.

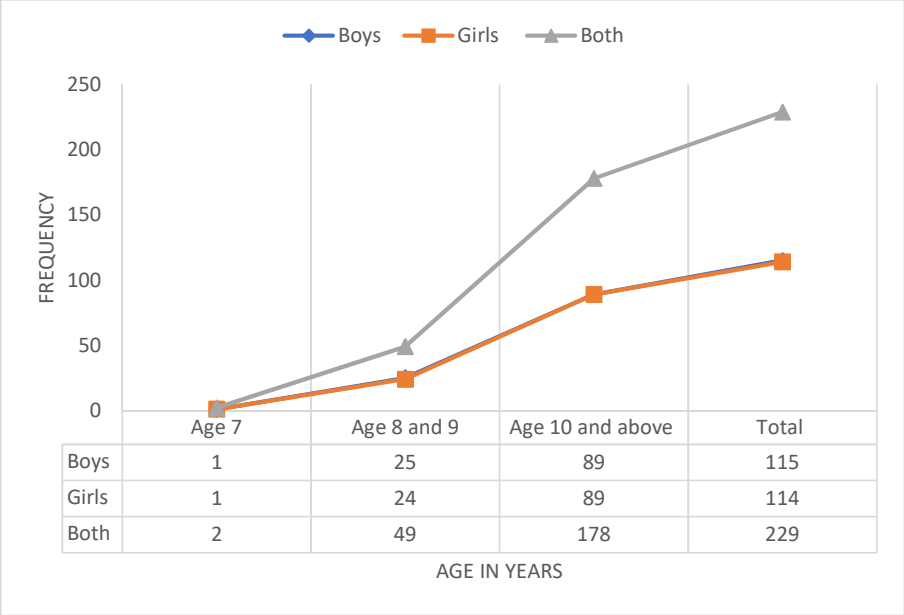
Table 2: Participant children by Grade, Gender and school type

		Grade		Gender		
No	**Type of school**	**2**	**3**	**Boys**	**Girls**	**Both**
1	Refugee (total)	**40**	**40**	**41**	**39**	**80**
	Kebribeyah	20	20	21	19	40
	Awbarre	20	20	20	20	40
2	Host community (total)	**75**	**74**	**74**	**75**	**149**
	Sheik Yusuf Kawnaye	20	20	20	20	40
	Laba Shap	20	19	19	20	39
	Abdi Kamil Awale	20	20	20	20	40
	Gobyarey	15	15	15	15	30
	Grand Total	**115**	**114**	**115**	**114**	**229**

Of the total 229 sampled students for this study, gender and grade had equal proportions, i.e., about 50% in all cases. In terms of school type, about 35% (80 out of the 229 participant children) were from refugee schools (Kebribeyah and Awbarre) and the rest from host community settings. Location-wise, while Sheik Yusuf Kawanaye and Laba Shap primary schools are from the Kebribeyah area, Abdi Kamil Awale and Gobyarey are host community schools in Awbarre.

Another variable considered here was the age of the participating children. According to the Ethiopian Education and Training Policy, the formal entry age for grade 1 is age seven (FDRE, 1994b). Consequently, children in grades 2 and 3 are supposed to be within the age range of eight and nine years old. Though the effect of gender and grade level was analyzed, age was simply used for the sake of understanding the distribution of reports as compared to the policy suggestions at the national level.

Figure 3: Age distribution by gender



	Age 7	Age 8 and 9	Age 10 and above	Total
Boys	1	25	89	115
Girls	1	24	89	114
Both	2	49	178	229

As indicated in Figure 3 above, only 49 (about 21.40%; 25 boys and 24 girls) reported that they were eight to nine years old at the time of data collection. In the perspective of the policy of education in Ethiopia, the majority (77.7%) were overage (10 or older) for both grades 2 and 3. Thus, it is in the context of this age range, if it is of any influence, that findings and concluding remarks were identified and discussed.

Data Collection Tools and Piloting

This study made use of Early Grade Reading Assessment (EGRA) and Early Grade Mathematics Assessment (EGMA) formats because of their relevance for the purpose of the study. Each format included child background items and basic subtasks (indicated in Table 3) that could measure the development of literacy and numeracy skills.

Table 3: Subtasks of EGRA and EGMA in this study

EGRA subtasks	Remark	EGMA subtasks	Remark
1. Letter identification	Timed	1. Oral counting	Timed
2. Phonics	-	2. One-to-one	Timed
3. Familiar word	Timed	3. Number identification	Timed
4. Invented word	Timed	4. Cardinality	-
5. Oral reading	Timed	5. Ordering	-
6. Reading comprehension	-	6. Quantity discrimination	-
7. Listening comprehension	-	7. Missing number	-
		8. Place value	-
		9. Addition	-
		10. Subtraction	-

As shown in Table 3, the EGRA and EGMA data collection tools consisted of seven and ten subtasks, respectively. Those included were the basic design components of the two tools selected based on their appropriateness to measure early grade reading and mathematics competencies. On the other hand, invented words and listening comprehension were included in the EGRA tool to support conclusions in familiar word reading and reading comprehension, respectively.

Though both tools have been used in the Ethiopian school context by researchers for different purposes, the tools were piloted on randomly selected grades 2 and 3 children from Garbi primary school in the Kebribeyah area. The number of participant children for the literacy and numeracy piloting was 34 (20 boys and 14 girls) and 30 (15 boys and 15 girls), respectively. Cronbach's alpha was applied to the pilot results with the intention of measuring the inter-correlations of each sub-task with the total sum of items in the tests. The findings showed resulting reliability statistics of 0.68 and 0.97 for the numeracy and literacy tools, respectively. As per the guidelines provided by Cohen, Manion, and Morrison (2007), the reliability index of a test is considered acceptable for research purposes when Cronbach's alpha value is equal to 0.67 or above. Accordingly, final data collection continued with minor modifications, like language clarity, on selected items of the tools. Similar reliability indices were also obtained on the final data collected for the purpose of the study.

Procedures

EGRA and EGMA administrations are one and the same; both follow a one-on-one protocol administered by trained enumerators and established procedures to measure competency. The data collection process, then, involved six enumerators selected on the basis of qualification (B.A. and above), experience in similar tasks, fluency in Af Somali, and willingness to travel to the field. A two-day training was organized to enhance their capacity (January 14–15, 2020), with a focus on the objectives of the study, the procedures of data collection, data quality management (on spot checking, supervision, competence through training, and ethical considerations), the schedule of field data collection, and paired practice sessions. After piloting on January 16, 2020, at Gerbi Primary School, reliability index computation, a review of experiences, and additional role-play practices were conducted. The training came to an end with final enumerator accuracy assessments, where an enumerator-child role play (with predetermined response patterns) was compared to the coding by each enumerator. Three times of such simulated practice showed that the accuracy of each enumerator reached at least an average of 95% accuracy level and was judged eligible for the task.

In the process of assessment, children were not supposed to write their answers but provide answers to questions presented by the enumerator orally, using stimuli or counting materials. The enumerator of each child records answers as per the procedures specified. Of the subtasks included, four from EGRA and three from EGMA (as indicated in Table 2) were timed to one minute with the intention of measuring competency in terms of both speed and accuracy of responses. Besides, administration rules such as scoring, time for pausing, and stopping rules were applicable to all subtasks as appropriate.

Enumerators had a list of data collection logistics (such as sample size, schedule of data collection, list of sampled schools, student sampling sheet, and contact list) to guide the process and ensure data completeness and quality. For consistency and ease of management, conducting assessments starts with literacy, followed by numeracy, and children are encouraged to take five minutes of rest in between. Unique codes were used to label children's literacy and numeracy papers for ease of matching data and processing the correlational analysis. Enumerators compiled the data and left the school after filling out the data completeness sheet prepared for the purpose.

Data Analysis Techniques

Both EGRA and EGMA data were coded into SPSS software, cleaned, and processed to identify basic findings using both descriptive and inferential statistical techniques. While descriptive statistical techniques (mean scores, standard deviations, and Pearson correlation) were used to process numerical status indicators and patterns, linear regression was used to identify the predictive power of the selected variables. Interpretation of correlational indices followed the suggestions of Cohen, Manion, and Morrison (2000: 202), i.e., correlation values that range from .20 to.35 show a very slight relationship; .35 to.65 show very limited accuracy in prediction; and .65 to .85 are accurate enough for group predictions and applicable for different purposes. Effect sizes were also computed to show the strength or size of the relationship between variables in associations (Leech et al., 2005). Finally, tables and graphs were used for the presentation and discussion of findings as appropriate.

Ethical Issues

The process of data collection followed critical ethical procedures. Following a personal introduction, enumerators provided clarifications to head teachers and participating children on the nature and objectives of the study, the limited use of the information collected, and the and the confidentiality and anonymity of individuals involved in providing data. Children were also informed regarding the possibility of taking rest in the middle, skipping an item, or declining at any stage if need be. Apart from this, no incentive was promised or provided to head teachers or children as a consequence of participation. Furthermore, consent from head teachers and assent from participant children were obtained and documented.

3. Analysis and Major Findings

Results

Normal distribution, as one aspect of checking the usability of the data for conclusions, in the four categories of measurements (letter naming, literacy, number identification, and numeracy) showed notable differences among individuals but indicated similar patterns in terms of association. Such patterns and differences are also clear in the magnitudes of standard deviations (measures of the spread of the data sets) and respective means indicated in Table 4.

The descriptive analysis at this level included maximum and minimum values, mean scores, standard deviation, and correlations. Of the four categories of assessment included here, letter naming and number identification were timed to one minute, and numeracy and literacy achievements included sums of scores in respective subtests converted into percentage points. Accordingly, computed ranges showed a relatively higher difference in letter naming (119), followed by that of literacy (amounting to 98 points). In number identification and numeracy, the ranges were 68 and 81, respectively. Besides, with the exception of numeracy, zero was the minimum score in all the other three categories of measurement.

The analysis of mean scores and standard deviations also indicated important findings that characterize the nature of the distributions. Number Identification (NI) and Letter Naming (LN) are fluency tests, and the scales indicate to what extent an average child was able to name numbers and letters correctly in one minute. Accordingly, computed fluency mean scores indicated better performances of sampled students on letter naming (Mean =56.07) than on number identification (Mean=31.14). However, comparison of overall mean values showed relatively higher performances in numeracy (mean = 61.87%) than in literacy (mean = 40.70%). In general, while mean scores of letter naming and numeracy total fall above the 50% cut-off points of the respective scales, number identification and literacy are on the opposite continuum.

Table 4: Means, standard deviations and correlations for number identification, numeracy, letter naming and literacy across the measurements

Measurement Elements	Min value	Max value	Mean	SD	Letter Naming (LN)	Literacy (L)
Number Identification (NI) per minute total correct	0	68	31.14 (fluency)	15.92	0.43**	0.40**
Numeracy (N)	14	95	61.87%	16.84	0.47**	0.43**
Letter Naming (LN) per minute total correct	0	119	56.07 (fluency)	32.45	-	-
Literacy (L)	0	98	40.70%	27.30	-	-

As can be observed in Table 4, letter naming (SD = 32.45) and literacy (SD = 27.30) scores showed higher average dispersion (ranges) from their respective means than was the case in number identification and numeracy scores. Literature shows that higher standard deviations (ranges) are associated with higher correlation values and vice versa (Kiess, 2002). The main pairing components of the basic questions of this study (letter naming with numeracy, and number identification with literacy), however, seemed to have varying

patterns of dispersion, and the effect on the correlation values is not directly observable based on similar magnitudes of standard deviations.

Cross-correlation values (between numeracy and literacy, numeracy and letter naming, literacy and number identification, and literacy and numeracy) were also analyzed to understand the magnitudes and patterns of linear relationships. Findings showed statistically significant correlational indices that ranged from 0.40 to 0.47 (i.e., $0.40 \leq r < 0.50$, $P < 0.01$, 2-tailed).

The analysis of shared variances between the variables also indicated important findings.

(a) The shared variances between number identification and letter naming were the same as those between literacy and numeracy (i.e., 18.49%, where $r^2 = (.43)^2 = .1849$). This might be an expected relationship since letter naming and number identification are the integral components of literacy and numeracy, respectively.
(b) In terms of cross-correlations, letter naming seems to share a higher variance with numeracy than number identification did with literacy. While the variance between letter naming and numeracy was 22.10% ($r^2 = (.47)^2 = .2209$), that of number identification with literacy was 16% ($r^2 = (.40)^2 = .16$).

Furthermore, the contributions of sex (boys and girls) and school type (refugee or host community) to the criteria variables were analyzed using the linear regression technique. Tables 5 and 6 present the results of the influence of sex and type of community, respectively.

Table 5: Sex as a predictor of achievement in the scales of measurements

Variable	Group /context	N	Mean (%)	S.D	Adjusted R^2	B	SE.B	Beta
Number identification	Boys	114	30.13	14.64	.00	2.02	15.92	.06
	Girls	115	32.14	17.10				
Numeracy	Boys	114	61.06	15.31	-.002	1.61	16.86	.05
	Girls	115	62.67	18.26				
Letter naming	Boys	114	57.83	30.24				
	Girls	115	54.33	34.55	-.001	-3.49	32.47	-.05
Literacy	Boys	114	41.16	27.03				
	Girls	115	40.25	27.68	-.004	-.90	27.36	-.02

**t-test (on the Beta respective weight) is significant at *p<.05 (2-tailed)*

As shown in Table 5, the contributions of sex as a predictor variable in the development of number identification, numeracy, letter naming, and literacy

were found to be negligible. Both the Adjusted R^2 (the correlations between sex and the criteria variables) and Beta (ß) values obtained showed negligible contribution and even statistically non-significant mediation of gender. In other words, sex has a limited impact on the status of early numeracy and literacy learning.

Table 6 presents further analysis results aimed at investigating whether the type of school or community of the children matters in the development of the literacy and numeracy components. Accordingly, the type of community failed to show a statistically significant contribution to predicting numeracy learning (including number identification). A significant model emerged with regard to the contribution of the refugee versus host community dichotomy in both letter naming and literacy results: $F(1,227) = 6.63$, $p < .05$ and $F(1,227) = 24.24$, $p < .001$, respectively.

Table 6: Type of community (refugee & host) as a predictor of achievement in the scales of measurements

Variable	Group /context	N	Mean (%)	S.D	Adjusted R^2	B	SE.B	Beta
Number identification	Refugee	79	32.65	11.99				
	Host	150	30.34	17.62	.00	-2.31	15.91	-.07
Numeracy	Refugee	79	64.81	14.25				
	Host	150	60.31	17.91	.01	-5.50	16.74	-.13
Letter naming	Refugee	79	63.58	27.06				
	Host	150	52.11	34.38	.02	-11.47	32.04	-.17**
Literacy	Refugee	79	52.36	22.36				
	Host	150	34.56	27.73	.09	-17.80	26.01	-.31**

**t-test (on the Beta respective weight) is significant at *p<.01(2-tailed)*

The data in Table 6 indicates that, controlling for other variables, community type as a predictor contributed 2% (Adjusted $R^2 = .02$) and 9% (Adjusted $R^2 = .09$) of the variances of letter naming and literacy in the same order. The Beta weights further indicated important implications: every one standard deviation change in favor of refugee context is accompanied by an increase of a minimum of five points in letter naming (i.e., -.17 x overall standard deviation = -.17 x 32.45= - 5.5) and 8 points (i.e., -.31 x 27.30 = - 8.46) in literacy achievement. This can also be interpreted in terms of the average decrease in letter-naming literacy in the host community context.

Discussion

Letter naming and number identification are the two basic foundations of literacy and numeracy, respectively. Both represent arbitrary symbols and concepts of communication and further learning that extend beyond the subject boundaries and early grades. Not only do letter naming and number identification have structural similarities (being symbolic languages), but they also share similar learning skills such as writing and the ability to communicate with symbols. It was in this view that this study was initiated, since the findings may imply important lessons for curriculum and instructional structures.

Correlational analysis focusing on shared variances between paired variables showed indices ranging from .40 to .47. According to Cohen, Manion, and Morrison (2000), predictive studies need higher index values since conclusions depend on the magnitudes of the correlation coefficients. Besides, the authors provided a guideline for determining the interpretations of correlation values under four categories: .20-.35 (slight relationship); .35–.65 (limited accuracy in prediction); .65–.85 (accurate for group prediction); and above .85 (high correlation; useful for individual or group predictions). Viewed from this perspective, the correlation values obtained in this study fell at a limited accuracy level and showed weak predictive powers for group achievements. While letter naming and numeracy shared about 22% of their variance, number identification seemed to contribute about 16% to literacy learning. The coefficients of determination between literacy and numeracy (as well as letter naming and number identification) were similar, amounting to 18.50%.

The correlation values (and resulting coefficients of determination) thus did not show encouraging contributions of letter naming and number identification in numeracy and literacy development, respectively. This is against the expectations of literature-based lessons learned, foundational patterns of language and mathematics structures in the early grades, and curriculum integration practices in Ethiopia (at grades 1-4). However, this notion of learning or integrated learning does not seem to have practical supporting evidence in the context of this study.

Linear regression analyses on predictive factors (sex and type of community) were also carried out to understand what best explains the situation under discussion. Statistically significant differences were only obtained on letter naming and literacy achievements, favoring refugee over host community

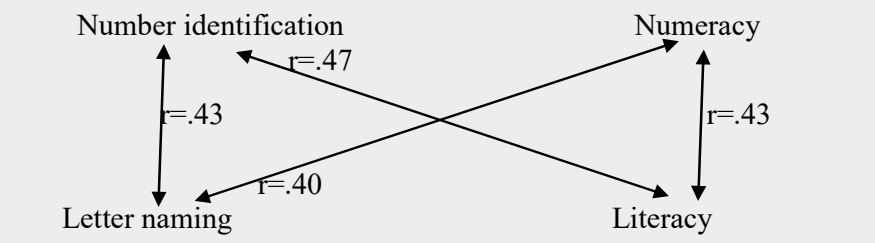
schools. That is, being in the refugee schools in the area of study seemed to be associated with an increase of five to 10 points in letter naming and literacy achievements. This did not concur with emotional theories that hypothesize displacement (being a refugee) affects emotional setup and thereby the status of learning. In fact, comparative evidence on learning is mainly from the developed world, and results favor host community children over refugee participants (Lüssenhop & Kaiser, 2019). On the contrary, the predictive power of this type of community in this study was not reflected in number identification or numeracy learning. The findings, therefore, suggest further study in the area to deepen our understanding and conclude the matter either way.

4. Conclusions

This study was intended to uncover the predictive powers of letter naming in numeracy and number identification in literacy in order to understand the implications for curricular and pedagogical issues. Results showed that, in the order of the basic research questions, proposed:

1. Paired correlations between number identification and literacy, letter naming and numeracy, letter naming and number identification, and numeracy and literacy amounted to .47, .40, .43 and .43, respectively. According to Cohen, Manion, and Morrison. (2000), these correlational figures indicate a negligible correlation, especially for group predictions.

Figure 4: Paired correlations between the measurement scales



2. The coefficients of determination computed showed shared variance that ranged from 16% between letter naming and numeracy to about 22% between number identification and literacy. Given lessons from previous studies, curriculum integration practices in Ethiopia, and the knowledge structure of literacy and numeracy domains, the figures can be considered to show more gaps in the transfer of learning in literacy and numeracy skills than strengths.

3. Linear regression results confirmed the statistically significant contribution of refugee context (over the host community) in letter naming and literacy but not in number identification and numeracy components.

Finally, this study was limited to one context and language (Somali Regional State and Af Somali); the findings did not concur with expectations of previous studies in other contexts. Thus, the findings suggest the need for further research to understand the situation in context and take appropriate actions in curriculum and instructional designs as well as teacher development modalities.

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