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The Effectiveness of School Network in Promoting Pre-College Students' English Language Performance

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Abstract

The government of Ethiopia has invested over 20 million dollars to improve the quality of education through digital technology. However, the effectiveness of such huge investment on education is overlooked. The purpose of this study was to assess the effectiveness of School Network (SN) in promoting students' English Language performance. The researcher deployed a descriptive research design and a mixed research approach to collect data on the implementation processes and other contextual factors potentially influencing the process. The researcher also utilized UNESCO's input, process, and output logic model to set standards of effectiveness. The research was conducted in the City Government Administration of Addis Ababa, specifically in four selected sub-cities, based on their achievement in SN implementation. The participants of the study included one English language expert, four school principals, 20 male and 10 female English Language teachers (a total of 30 teachers), six ICT/plasma technicians, and 160 pre-college students (80 males and 80 females). Five instruments were used to collect data from primary and secondary sources. Classroom observations were conducted to assess the delivery of School Network instruction in teaching English. Moreover, focus group discussions were held, and questionnaire was administered to examine the role of the School Network on students' English language performance. Additionally, these instruments were used to identify challenges related to School Network usage in ELT. Furthermore, explorative interview was conducted and documents were analyzed to prove whether there was difference in effectiveness of the School Net instruction in teaching English language based on sex and stream(natural and social science students) or not. Besides, these instruments were utilized to identify challenges related to School Net usage in ELT. Both quantitative and qualitative approaches were employed to analyze and interpret the data gathered through these tools. The findings of the study indicated that SN has the potential to be accessed through platforms like plasma, e-learning, and cloud computing, and it provides video on demand (VOD). This enabled interactive blended language learning (IBLL), mobile-assisted language learning (MALL), and computer-assisted language learning (CALL) and Technology Assisted Language Learning (TALL). However, factors such as minimal teacher's involvement, low level of students' participation, lack of support services and facilities, frequent network disconnections, electric power fluctuations causing damage and theft of accessories such as set-top boxes, adapters, batteries and remotes; and school rules restricting students from using electronic devices in school, hindered its effectiveness. Hence, concerned authorities should evaluate the program's effectiveness and address the identified problems to help students benefit from the potential of School Network platforms to learn the target language (English).

Keywords: English Language Performance, School Network, Platforms, Blended Language Learning, Instructional Media, Video on Demand

1. Introduction

The concept of ET deals with the use of technology for instructional purposes. As stated in Ghavifekr & Rosdy (2015), and Grabe (2007), technology has changed the way people think, work, and live. Teaching aid technology (TAT), instructional media (IM), and instructional technology (IT) are usually used interchangeably with educational technology (ET). Nonetheless, ET is broad and inclusive. In light of this, Bruckner (2015) asserted that TAT, IM, IT, etc. are much more restricted in their scope than ET. Educational institutions, which are supposed to prepare students to live in "a knowledge society", need to consider ICT integration in their curriculum (Ghavifekr, Afshari & Amla 2012). These

scholars asserted that technological innovations simplify the lifestyle of society and advance the education system.

Regarding technology integration in education, Wakgari and Babu (2017) stated that the government of Ethiopia has adopted the goal of ensuring universal access to quality education and the completion of basic education and reducing the adult illiteracy rate by 2015. The country agreed to and signed ten key strategies of the Geneva Action Plan that mainly focus on connecting schools, universities, public libraries, health centers, and government offices with ICT, and adapting all primary and secondary school curricula to meet the challenges of the information society, taking into account national circumstances, etc. (Wakgari and Babu, 2017). However, there are challenges to achieving the agreement. As Fiseha (2011) noted, the inadequacy of existing infrastructures is the most challenging condition for implementing ICT in schools. In addition, Birhanu (2015) stated that the integration of ICTs in education systems may face various challenges concerning policy, planning, infrastructure, learning content and language, capacity building and financing. Education requires clearly stated objectives, mobilization of resources, and the political commitment of the concerned bodies. Furthermore, Fisseha (2011) stated that the effectiveness of integrating ICT into pedagogies or teaching-learning depends on high levels of interactivity amongst and between students and instructors, and between students and the technologies they use.

According to Baker, Mhid & Mailand (2015), one modern approach used in ESL classes is leveraging technology to help the students learn. Technology has been evolving rapidly over the past decade and, as such, some forms of it are beginning to play a role in the classroom. With proper integration, technology could help improve students' performance inside and outside the classroom. In addition, ET can play a major role in the way language can be taught and learned. As Boles (2011), technology can foster interaction and motivation in ways that lessons without technology could not. As technology becomes more readily available, it has also become easier for every student to access resources through technology (Baker, Mhid & Mailand, 2015). In line with this, Eave (2009) highlighted that, technology integration in foreign language teaching demonstrates the shift from a behavioral to a constructivist learning approach. The shift continued and reached the connective paradigm. This is a recent phenomenon that requires a detailed investigation to understand its link with students' language learning outcomes.

According to the Education Technology Plan (2017), there is an evident relationship between language learning and technology in the 21st century. Educational technology development has brought tremendous changes in the way students learn language. This is because IM meets learners' varied needs and appeals to their different learning styles, achieving these objectives better than any other technique (Education Technology Plan, 2017). To be specific, language learning is one of the major parts of education that plays a key role. We cannot even imagine education without language. Thus, devoting time and expertise to identifying problems that hinder language learning is worthwhile (Motteram, 2013).

Although TV has been used as an educational broadcasting tool, its development was restricted by its limited airtime due to agreements between the Educational Media Agency and Ethiopian Television.

The Federal Ministry of Education (MoE) launched the School Net program in collaboration with Huawei Technologies Co., Ltd. in the 2004/5 academic year and implemented the first platform, satellite TV instruction (plasma) during the first phase. The newly commenced SN program has connected more than 756 high schools and preparatory schools nationwide, and 69 high schools and preparatory schools in Addis Ababa. The two platforms of the School Net program (e-learning and cloud computing) solved these problems of plasma instruction, and they have much more advanced features than the plasma program. Nevertheless, like the plasma program, the effectiveness of the newly deployed program is still debatable due to different researchable reasons, mainly its role in students' learning, among others. In light of this, Bayne (2015), Bulfin, Johnson and Bigum, (2015); Kirkwood and Price 2014) and Selwyn (2015) implied that the effectiveness of educational technology is a potential research area due to its volatile nature.

SN programs could be accessed easily whenever needed with different devices such as plasma, laptops, tablets, smartphones, etc. In addition, SN is unique because it enables users to select, pause, rewind, and forward lessons. Furthermore, SN uses desktop cloud computing that enables schools to share centralized huge data through server-based networks. These and other advanced characteristics make SN more advanced than plasma broadcasting. Moreover, SN does not need an internet connection because it uses a local area network (LAN), compared with plasma which requires a wide area network (WAN). It also enables schools to share hard disk, CPU, RAM, operating system, applications, etc., by using server-based 'Thin Client' that has 'on' and 'off' buttons, and a speaker and USB drive. Apart from LAN, the SN program also used a metropolitan area network (MAN) to connect schools to share servers and similar data and manage government schools found in the City Government of Addis Ababa. Although the government, more specifically, MoE, has strived to enhance the quality of education in general using technology, the effectiveness remains questionable. In light of this, Munro (2018, p. 1) stated that "there is a growing body of critical commentary around the use of digital technologies in Higher Education." The use of sophisticated modern technologies in the classroom does not guarantee the effectiveness of these tools. Effectiveness lies upon the appropriate utilization of inputs, proper processes, and generating

desired output.

The ministry spent millions of dollars hoping to improve the quality of education. However, the effectiveness of these technologies is questionable due to different researchable reasons that this and other researchers attempted to explore. In this regard, the attitude of teachers and students towards SN, adaptability, accessibility, and functionality of the technologies should be examined thoroughly (Baker, Mhid & Mailand, 2015). Therefore, identifying the main reasons that hinder the effectiveness of SN is a cornerstone of this study. Hence, the researcher strived to reflect the reality and show whether SN contributes to quality target language education or not.

Despite the advantages of using technology in language learning, English as a Foreign Language (EFL), students in Ethiopia, particularly in Addis Ababa pre-college schools, are not proficient in the target language. Besides, they are not communicatively competent. Hence, realizing the main factors that affect students' performance in the target language is crucial. Furthermore, identifying the limitations of incorporating technology in language learning enables the development of possible strategies to minimize shortcomings. In line with this, Calfee (2006), described educational technology in schooling as "one of the 'Really Important Problems' (RIP) for future educational psychology researchers to examine." This argument is critical because the implementation of technology in language learning requires the effective integration of tools with theories of language learning and technology integration pedagogical knowledge (TIPACK), and so forth. Hence, such related issues make this area fertile for research.

Taking these challenges into account, Nwosu and Ugbomo (2012), stated that the field of education has certainly been affected by the penetrating influence of ICT worldwide, and in particular, in developed countries. Similarly, Fiseha (2011), argued that the most challenging condition to implement an ICT strategy in Ethiopian schools is the inadequacy of existing infrastructure. Birhanu (2015) further added that the integration of ICTs in education systems may face various challenges concerning policy, planning, infrastructure, learning content and language, capacity building, and financing. Moreover, Yunus et al. (2009) discussed students' use of ICT to learn the English language, in addition to examining the challenges that they (students) face.

Besides, Berhanu (2009), in his research entitled 'Some Latent Problems for Utilizing the Plasma-Based Instruction in Ethiopia', discovered certain problems that hinder the implementation of plasma. Moreover, he further extended his studies and conducted a dissertation (2012), titled 'The Effectiveness of the Practice of Plasma-channeled ELT in Addis Ababa Preparatory Schools'. The findings of the study revealed that Plasma-channeled ELT is a latent practice. In his article published in (2013), titled 'The Plasma-Based Instruction in Ethiopia: Utopia or Dystopia?', he concluded that the technophobic attitude of direct and indirect users of ET hindered the effectiveness of plasma instructions.

Generally, the aforementioned studies conducted in different contexts focused on the use of technology in ESL teaching, technology in language education (advantages and barriers), the effectiveness of teaching aids for elementary students etc. Although such efforts were made by different researchers, the effectiveness of using ET particularly, SN in promoting ESL students' language performance was not studied adequately. Therefore, the effectiveness of SN in promoting students' ESL performance demands research and detailed investigation. Besides, neither the Ministry of Education nor the Education Bureau of Addis Ababa researched to evaluate the effectiveness of the newly deployed programs. Thus, the researcher aimed to fill this gap.

This study is unique because it has tried to evaluate the effectiveness of the newly deployed SN program, which is different from the previous plasma program in terms of its advanced features like accessing the lessons anytime needed, controlling the lesson delivery, etc. Besides, unlike these studies that focused on technology implementation in second language teaching, the effectiveness of teaching aids, and plasma broadcasting, this study focuses on the effectiveness of SN in promoting students' English language performance as a whole. Furthermore, the researcher claimed that using a particular technology alone would not be effective in promoting target language learning performance. Multimedia ET should be used along with a certain main technology that can facilitate a productive language learning condition.

The main purpose of this study was to assess the effectiveness of School Net in promoting students' English language performance. To achieve this, the following six research questions were asked:

1. How is SN-assisted English Language Teaching delivered?
2. What role does School Net have in improving students' English language performance?
3. Do English language teachers have technology-integrated pedagogy and content knowledge and implement it in SN-assisted English lesson delivery?
4. Is there an English language performance difference between male and female students as a result of using School Net?

5. Is there an English language performance difference between social and natural students as a result of using School Net?
6. What are the challenges of the practice of School Net in promoting students' English language performance?

2. Methodology

The researcher deployed a descriptive research design. The descriptive design was favored to examine the actual practices that this inquiry aimed to assess: how teachers and students use social networking (SN) and its effectiveness in promoting students' English language performance. Neuman (2007) and Riddell (2008) stated that this design is also relevant to gathering detailed descriptions of the existing conditions and current practices of an educational phenomenon.

Ross, Morrison, and Lowther (2010) examined research designs and trends of a leading educational technology international journal over three years, analyzing a total of 43 articles published between 2006 and 2008. They found that the majority of the articles (25 or 58%) were classified as using a descriptive design.

A mixed research approach was employed in the study and the researcher favored this approach to analyze qualitative and quantitative data with equal emphasis. Moreover, having a full understanding of such an embedded issue in teaching and learning situations using a mixed methods approach suggested being productive.

The study was conducted on grade 12 students from six schools in four Sub Cities found in Addis Ababa. Grade 12 students, teachers, school principals, vice principals, supervisors, plasma technicians, and experts from MoE and Addis Ketema Sub City, Akaki Kality Sub City, Arada Sub City, and Bole Sub City preparatory schools were participants in the study. 742 male and 585 female totally 1,600 students of which 447 males and 490 females, totally 937, natural science students and 295 males and 368 females, totally 663, were social science students. Additionally, 62 males and 17 females, totally 79, teachers, five males and one female, totally six, plasma technicians, and 37 males and 6 females, totally 43 ICT teachers, 23 males and 1 female, totally 24, school principals, 3 males and 1 female, totally 4, supervisors, and 2 experts were targets of the study.

In this study, 10% of the total population was taken as samples or representatives of the study. Forty social sciences and 40 natural sciences, totally 80 males, and similarly, 40 social sciences and 40 natural sciences, totally 80 females, generally 160 pre-college students, were selected using stratified random sampling. The researcher assigned participants of the study into groups (based on sex and stream).

Additionally, 23 male and 7 female, totally 30, randomly selected English teachers, three males, and one female randomly selected English language supervisor from each sub-city, three male plasma technicians, two male, and two female ICT teachers from their respective schools were taken as samples of the study. Besides, different stakeholders such as the City Government of Addis Ababa Bureau of Education ICT department Director, and EFDR Ministry of Education, the Educational Media Agency directorate, and an English program expert, were targets of the study.

The researcher also utilized non-probability sampling, particularly the purposive sampling technique, to determine the teachers, principals, and supervisors who participated in the study. Purposive sampling was employed to select samples based on their knowledge of the research problem. Additionally, the researcher collected the EUEE (Ethiopian University Entrance Examination) results of grade 12 students from the target schools as a sample. Here, sample students were selected using the systematic random sampling technique, choosing every 10th subject from the list of English EUEE results. In general, the researcher employed five types of data-gathering tools in the study: observation, focus group discussions, questionnaires, interviews, and document analysis, to collect relevant data. These instruments were adapted from previously tested ones and were designed to address the objectives and research questions of the study.

A Likert scale with five points ranging from "strongly agree" to "strongly disagree" was constructed by the researcher to gauge students' and teachers' impressions of the use of educational technology and their level of experience with it. Question items were adapted from previous research, such as Birhanu Abere (2012) and Javad M. and Allahyar N. (2012), and also from UNESCO's effectiveness evaluation model and standards of effectiveness. The items mainly focused on assessing access, process, and outcomes of technology-mediated language instruction, tailored to address the study's objectives.

Exploratory interviews were conducted to gather in-depth data rather than just facts and figures, allowing respondents to freely express their thoughts and emotions on the topic. Interviews were conducted with teachers, school principals, plasma technicians, and experts. Additionally, authorities from the Federal Ministry of Education and the Addis Ababa Educational Bureau were consulted regarding policy issues related to educational technology.

The researcher designed an observation grid based on Baker, Mhid and Mailand (2015), Wingate, Lori, Schroeter and Daniela (2016), and Birhanu (2012). The items were reviewed and simplified to enhance their understandability. The researcher employed semi-structured observation, which entails stating issues and collecting data to clarify them in a

predetermined or systematic manner. An observation grid was devised, comprising dichotomous and Likert scale questions. Acting as a 'non-participant observer,' the researcher recorded ongoing events for research purposes.

The researcher conducted a focus group discussion (FGD) after selecting students using snowball sampling. The FGD aimed to gather authentic information from students and compensate for any shortcomings of other data collection instruments.

The inferential document analysis technique was employed to analyze Grade 12 students' Ethiopian University Entrance Examination (EUEE) English language results since 2010. Considering various variables, the English performance of Grade 12 students from Addis Ababa Preparatory Schools after SN program implementation was scrutinized in comparison with results from plasma broadcasting and earlier periods. Data spanning nine years were collected to facilitate comparative analysis among three distinct periods: chalk and board period (2010-2012), plasma period (2013-2015), and SN period (2016-2018/19), which included e-learning and cloud computing. The final three years of each period were selected, considering the saturation period of the newly implemented program.

The researcher observed actual SN practices in the study schools, followed by an FGD, questionnaire administration, interviews, and document analysis. This sequential approach aimed to minimize informant bias and data contamination.

The validity of variable measurements was assessed using Analysis of Variance (ANOVA). Reliability was evaluated using Cronbach's Alpha coefficient, test-retest reliability, and Kappa agreement. Items with Cronbach's Alpha values below 0.60 were revised or omitted to ensure data reliability. Kappa agreement was calculated to assess inter-rater reliability, with items below or above the standard Kappa value were modified or rejected accordingly.

A pilot study was conducted after designing data-gathering instruments. The objective of the pilot study was to test and improve instruments and to be aware of possible problems that might occur while administering the actual instruments. The instruments of the study were tested at Bulbula Preparatory School and 30 students were selected using random sampling techniques. Additionally, two principals and one supervisor were selected for interviews using purposive sampling.

Once the qualitative and quantitative raw data were collected through different data collection techniques, the next step was interpreting and analyzing it. Then, the results were thoroughly discussed.

The data collected through FGD, questionnaires, interviews, observation, and document analysis directly from primary and secondary sources were analyzed using both concurrent and mixed data analysis techniques. The researcher used inferential statistics and descriptive analysis to analyze qualitative and quantitative data concurrently. Quantitative data were tabulated for arithmetic mean, standard deviation, tests of significance of difference, and percentage. The data obtained through questionnaires and observations were quantitatively analyzed using simple statistical analysis. Furthermore, the researcher used SPSS version 22.0 to analyze quantitative data. Mean and standard deviation were calculated using this software.

On the other hand, qualitative data from interviews, FGDs, and document analysis were analyzed qualitatively using thematic analysis techniques. Qualitative data were transcribed and coded to interpret and analyze the raw data. Meaning was derived from the data, objectives, concepts, and results of the study. Thematic analysis techniques were employed to analyze qualitative data inductively.

3. Result and Discussion

One of the specific objectives of the study was to assess the delivery of School Net instruction in teaching the English language. The triangulated results from teachers' and students' questionnaires, as well as observation (by the observer and co-observer), indicated that the assistance provided by School Net in English language lesson delivery fell below the expected mean, which is 3.

Table 1. Delivery of the School Net Instruction in Teaching English Language

Items		**N**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Teachers	Delivery	30	1.75	3.35	2.3716	.24173
Students	Delivery	160	2.10	3.31	2.2463	.61725
Combined Mean					**2.266**	

From the table above, it can be deduced that the average value of teachers' delivery of School Net instruction in teaching the English language is 2.3716. This indicates that the delivery of School Net instruction in teaching the English language fell below the standard, as the expected mean score for delivery of School Net was 3. The observed mean score from the data was 2.3716, which is lower than the expected mean score for delivery of School Net instructions. Considering the delivery of School Net instruction in teaching the English language to students, the average delivery score was 2.2463. This suggests that School Net instruction in teaching the English language was not delivered properly, given that the

expected mean score for delivery of School Net was 3. The combined mean score obtained from teachers and students regarding the delivery of School Net instruction in teaching English language (the overall mean being 2.266) was lower than the expected mean score for delivery of School Net instructions. Thus, it can be inferred that School Net instruction in teaching the English language was not delivered effectively.

Table 2. Frequency Distribution of Observation Grid about Delivery of the School Net Instruction in Teaching English Language

Delivery		Frequency	Percent
Observation	Yes	134	30.45
	No	306	69.55
	Total	440	100.0

The table illustrates the frequency and percentage of observations regarding the delivery of School Net instruction in teaching the English language. The results from observers and co-observers indicated that 134 (30.45%) answered 'yes' and 306 (69.55%) answered 'no' to the questions regarding the delivery of School Net instruction in teaching English. This suggests that the School Net instruction in teaching English was not delivered properly.

The available Educational Technologies (ET) was not functioning properly due to various factors that hindered the actual delivery of School Net. Hence, the utilization of ET available in schools was greatly hindered by electricity, accessories, network issues, lack of skilled personnel, and administrative problems. Moreover, teachers' lack of interest in using technology as a pedagogical tool affected School Net delivery. The results obtained from triangulated data (students, teachers, and observers) regarding this showed that School Net had a modest role in improving students' English language performance. The mean obtained from both teachers and students was below the standard mean. This suggests that students' English language performance was not adequately improved, despite the presence of various School Net platforms in their school.

Table 3. The Role of School Net on Students' English Language Performance

Performance	N	Minimum	Maximum	Mean	Std. Deviation
Students	160	2.01	3.71	2.4732	.69455
Teachers	30	1.95	3.83	2.5889	.32676
Observers	22	1.82	2.73	2.6678	.05881
Combined Mean				**2.5098**	

The table demonstrates that the average value of students' English language performance was 2.4732, and the average value of English language performance obtained from teachers was 2.5889. This implies that the School Net has a modest role in students' English language performance, as the expected mean score of English language performance was 3, whereas the observed mean scores from the data were 2.4732 and 2.5889, both lower than the expected mean score.

The results obtained under Table 4.3 indicate that the School Net enabled students to improve their vocabulary, grammar, textual, and sociolinguistic knowledge modestly. However, it had no role in improving their strategic competency. Therefore, it can be concluded that the School Net slightly helped students to improve their English language skills or their performance, based on the combined mean of 2.5098. Similarly, the data obtained from the document analysis of grade 12 students' EUEE English results show that students' target language performance has declined considerably. Teachers were requested to rate their technology-integrated pedagogy content knowledge of the School Net-assisted English language lesson delivery. The results obtained from the questionnaire indicated that lower level of Technology Integrated Pedagogy and Content Knowledge (TIPACK).

Table 4. Teachers' Technology Integrated Pedagogy and Content Knowledge (TIPACK)

NO	Items	N	Mean
1.	Technology Knowledge TK	30	1.9367
2.	Pedagogical Knowledge (PK)	30	3.0861
3.	Content Knowledge (CK)	30	3.1530
4.	Technology Pedagogy Knowledge (TPK)	30	1.6385
5.	Technology Content Knowledge (TCK)	30	1.5751
6.	Pedagogical and Content Knowledge (PCK)	30	1.8693
	Combined Mean		**2.0922**

The table indicates that teachers' Technology Integrated Pedagogy and Content Knowledge (TIPACK) are generally below the standard mean. As shown in Table 4.4, the mean score of technology knowledge (TK), which refers to the knowledge of using SN-assisted instruction in teaching the English language, is 1.9367, revealing that teachers lack proficiency in this domain. In contrast, the mean scores of content knowledge (CK) and pedagogical knowledge (PK) are 3.0861 and 3.1530 respectively, indicating that teachers have a relatively better understanding of these domains. However, the mean scores of technological content knowledge (TCK) and technological pedagogical knowledge (TPK), which are

1.6385 and 1.8693 respectively, suggest that teachers have a lower level of knowledge in these areas. Similarly, the mean score of pedagogical content knowledge (PCK), 1.5751, shows that teachers also lack proficiency in this domain.

One of the specific objectives of this study was to investigate whether gender plays a role in the effectiveness of students' English language performance. The results obtained from the questionnaire indicate that gender plays a significant role.

Table 5. Result of inferential Statistics on the Effectiveness of SN in Light of Sex

	sex	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Effectiveness	male	80	3.2518	.72568	.08113
	female	80	3.6946	.58737	.06567

The inferential statistics results presented in Table 4.2 show a mean score difference between male and female students. The mean for male students, 3.2518, is lower than that for female students, 3.6946. The actual difference of 0.4428 indicates a significant difference in language performance between male and female students. This result was further triangulated with independent t-test analysis, which indicated an effectiveness difference between male and female students as a result of using SN.

Table 6. Result of Independent Samples Test

		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Effectiveness	Equal variances assumed	10.029	.002	-4.243	158	.000	-.44286	.10438	-.64902	-.23670
	Equal variances not assumed			-4.243	151.426	.000	-.44286	.10438	-.64908	-.23663

The table indicates an independent sample t-test for the equality of means in sex for the effectiveness of School Net (SN). Since the p-value is 0.000, which is less than the α-value of 0.05, it indicates that the means are not equal. Therefore, it can be concluded that sex affects the effectiveness of SN at a 5% level of significance. The results obtained from inferential statistics and the independent sample t-test indicates that sex plays a significant role in the English language performance of students as a result of using SN. However, previous study findings concluded that sex has no significance.

Examining the effectiveness of SN between social and natural science students was another specific objective of this study. The results obtained in the study indicated that the stream also plays a significant role. One-way ANOVA was computed and the 'p' value obtained in the study signifies that the 'mean of effectiveness is equal in both streams' should be rejected based on the computed evidence.

Table 7. Result of One-way ANOVA

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	2.947	1	2.947	6.313	.013
Within Groups	73.755	158	.467		
Total	76.702	159			

As shown in the table, the 'p'-value of 0.013 is less than the α-value of 0.05. Thus, we have enough evidence to reject the hypothesis that the mean effectiveness is equal in both streams at the 5% level of significance. Therefore, it can be concluded that the effectiveness of School Net (SN) in promoting English language performance between social and natural science students was significantly different at the 5% level of significance. The results have shown that natural science students performed better than social science students.

Identifying challenges related to School Net usage in teaching the English Language was the final specific objective of the study. The results revealed that a lack of teachers' skills and interest in integrating technology into their lessons, poor infrastructure installation, and frequent power outages were some of the major challenges identified in the study.

40.0% of the respondents agreed that using technology in class has a positive effect on students' learning. In addition to quantitative data analysis, the data obtained from observation, focus group discussion, and documents were analyzed qualitatively using thematic data analysis techniques. The results obtained from classroom observation indicated that

teachers have tried to play their roles by monitoring the SN-assisted English lesson delivery. However, most English teachers did not introduce SN-assisted lessons, encourage students to follow attentively, or support them. They were also observed summarizing the lesson without recapping the technology-integrated lesson.

Although teachers could pause and raise questions to enable active participation, students stayed silent until the SN-assisted English lesson ended, mainly because teachers did not play their role as facilitators. Nonetheless, the instructional technology contents presented were smart. The lessons and activities designed were of the highest quality and standard, evaluated from a bird's eye view. However, students sat and chatted with classmates, and the teacher stood somewhere in the class until the time provided ended.

The observation indicated that the support services and facilities in observed schools were found to be disorganized and of the lowest level, except for the support materials like program manuals, students' textbooks, teacher's guides, reference books, and soft copies of English lessons. In line with this, technical support like installation, operation, maintenance, network administration, and security was mainly facilitated by a centralized body (the bureau), and this has created the main problem in the SN program because these important aspects in the implementation and integration of technology were not decentralized to actual users. Self-access centers (SACs) were also not available in all schools. The only e-learning labs established in collaboration with ZTE Telecom Company as a pilot program in Addis Ketema Preparatory School have been locked.

Interviewees were asked if they were interested in using SN and if it helps students improve their English language skills. They stated that SN enables students to improve their language skills in general. However, a few respondents said that it is rather confusing. On this point, one interviewee said, "SN helps improve students' English language skills, mainly in listening and speaking. It also helps them obtain detailed target language data that their teachers couldn't provide. Regarding interest, it is not true to say that all of them are interested in it." On the contrary, interviewee three said that SN confuses both teachers and students.

Interviewees were also asked about platforms of SN that are potentially available in their school and the barriers that affect their use of these platforms in the classroom. Interviewees stated that plasma TV is the most abundant tool available to assist EFL lesson delivery. However, they also stated that it did not work properly due to infrastructure problems. According to interviewee two, network disconnection, electricity failure, accessory theft, etc., are some of the challenges that teachers experience. They were asked if they consider SN as a pedagogical tool and if they integrate English lessons with different platforms. Interviewees explained that SN is one of the best pedagogical instruments available at the moment. They also said that they wish to integrate their daily lessons with SN platforms; unfortunately, they indicated that the three platforms of SN were not functional due to administrative and technical problems.

Interviewees asserted that inconsistent use of SN for English language delivery and students' lower level of target language proficiency affected their academic as well as language achievements. As interviewee two said, "SN didn't work regularly; students were confused with inconsistent use of ET. SN should be properly used for English lesson delivery." Afterward, they were asked if there was a language performance difference between male and female students and between social science and natural science students. Respondents indicated that there is a language performance difference between male and female students as well as between social science and natural science students. About this, interviewees one and two stated that "female students seem to be more effective in all academic aspects. Similarly, natural science students are very much interested in technology and they are effective too, unlike social science students; although it needs to be researched."

Likewise, discussants were asked if there was a significant difference between chalk and board teaching and SN English language lesson delivery. Discussants indicated that the two modes of language teaching and learning are different. SN saves time, expense, and energy.

Then, the discussants were asked about the benefits they get from SN. The respondents stated that they had not benefited as it was not functional. Regarding this, respondent two said, "We didn't gain actual knowledge because the available potential platforms were not functional." Similarly, respondent Five said, "Although I believe that it has merits, I haven't benefited from it." After that, discussants were asked if their teachers use SN to enhance students' English language learning. In line with this, discussants responded that teachers did not regularly use SN during English lesson delivery. They stated that they would rather use conventional methods. About this, respondent Six said, "Our teacher prefers teaching using chalk and board rather than SN." Afterward, discussants were asked which platform of SN they used to learn English inside and outside the classroom. They stated that they used plasma most commonly, although it was not functional like the other platforms.

Moreover, discussants were asked if they have smartphones and for what purpose they use them. Concerning this, discussants replied that most of them have smartphones. However, they stated that they did not use them for academic purposes or specifically for second language learning commonly. For example, respondent two said, "Yes, I have one!

However, it is not allowed by the school administration. I think the school is conservative. I believe that the school didn't consider the positive side of technology." On the other hand, respondent two mentioned, "We use our phones to download fun videos, but not for learning purposes. Only a few students try to Google and access audiovisual materials to do their assignments. I obtained soft copy books from teachers using my phone, but I paid 100 birr because it goes against the school rules and regulations." Then, the discussants were asked if there were any problems in learning English through SN. About this, discussants indicated that the main problem is the lack of awareness about the technology. Besides, they said that a lack of skill is another major problem.

The other discussants said that lack of interest and motivation are additional problems. They mentioned that teachers are not interested in using SN as it is not always functional.

From the document analysis conducted, it has been found that students' English language results of the EUEE have declined since the SN program began. This was not a coincidence. The results obtained from other data-gathering tools indicated that both teachers and students were confused due to the unclear boundary between conventional methods and technology integration. They were not using either conventional methods or blended learning appropriately. This has affected students' achievements, among other factors.

Students' EUEE English results declined year after year. The average result during the first period (2010-2012) was 62.7%, followed by the second period (2013-2015) with 59.5%, and the third period (2016-2018) with 54.6%. This indicates that the EUEE English results have declined considerably. The data obtained from target schools under the study show that the average English examination result during the second period declined by 3.2% compared to the first period. Moreover, the recent period's result has declined by 10.1% and 4.9% compared to the first and the second periods, respectively.

In line with this, the data shows that female students' results were better than male students in all these periods. The average result of male students was 54.4%, which was lower than female students' result of 63.43%. More specifically, the results indicate that there was an 11.1% difference between male and female students during the first period. Likewise, there was a 10.4% and 5.6% difference during the second and third periods, respectively. Similarly, natural science students performed better than social science students.

According to the data obtained from the document from 2010 to 2018, the average result for natural science students in the English EUEE was 65.83%, whereas for social science students, it was 52%. Thus, the average results suggest a significant performance difference between natural and social sciences.

RQ1. How does School Net assist ELT delivery?

The findings of the study indicated that schools are not using it effectively due to various obstacles. Specifically, SN lesson delivery was not as effective as expected. Technology-assisted language learning (TALL) was highly implemented using plasma. However, e-language learning, specifically through CALL, MALL, and other technologies, was not available in schools. Thus, the findings from these tools indicate that SN-assisted English language lesson delivery is less than the expected mean. Regarding this, Balanskat et al. (2006) noted that teachers' lack of confidence was rooted in their fear of failure or lack of technology knowledge, which made them feel anxious. Moreover, Ismail & Almekhlafi (2010) reported that teachers' lack of time for preparation and technology implementation were the most important barriers.

Furthermore, the findings in this study indicated that students' test scores in EUEE significantly decreased. The findings revealed that SN relatively improved their listening and speaking skills. However, the other two major language skills and sub-skills were not emphasized properly. Therefore, students' language performance in macro (major skills) and micro-skills (sub-skills such as vocabulary and grammar) would not be similar. Moreover, it affected their enhancement in communicative language ability or knowledge.

The plasma lesson delivery was not functional due to accessory and network problems. Teachers attempted to solve such problems using soft copy video lessons and broadband internet.

The data obtained from interviews indicated that SN is one of the best pedagogical instruments available at the moment. However, the results indicated that the three platforms of SN were not functional due to administrative and technical problems. , the results obtained indicate that the technology integration level in most schools was at level 2 or the exploration category. There were also schools at level 0 (nonuse) category, or level 1 (awareness) and level 3 (infusion) categories. These categories are similar to Rueben's (2011) SAMR Model for Enhancing Technology Integration; the 'substitution' stage, in which technology acts as a direct tool.

RQ2. What role does School Net have on students' English language performance?

The available ET in schools was not properly functioning due to different factors that hindered actual SN delivery. The results obtained from triangulated data (students, teachers, and observers) concerning this show that SN has a modest or

little role in improving students' English language performance. This finding contradicts Yunus et al. (2009), who asserted that ICT can enhance students' language learning in grammar except vocabulary and speaking, which are similar to the findings of the current study. Moreover, the findings show that schools are not working up to the expected standard and utilize technology to develop students' target language skills.

RQ.3: Do English language teachers have technology-integrated pedagogy and content knowledge and implement it in SN-assisted English lesson delivery?

The findings of the study indicate that teachers have limited technology integration pedagogical and content knowledge (TIPACK). Baker, Mhid, and Mailand (2015) emphasized the relationship between technology and foreign language pedagogy as a "chicken and egg" scenario. Moreover, Bherhanu Abera (2012) clearly stated that teachers lack technology integration pedagogy and content knowledge. Likewise, Coghlan (2004), Lai & Kritsonis (2006), and Schwab & Foa (2001) agree that teachers must increase their computer competency to use technology effectively.

RQ4: Is there an English language performance difference between male and female students as a result of using the school Net?

The results obtained in the study indicated that sex plays a significant role in students' language performance. Female students were significantly more effective compared to male students. The finding of the present study contradicts the findings of Wallentin (2009), and concludes that sex is not a significant predictor of language proficiency. Moreover, Cameron (2009), Baron-Cohen, Knickmeyer & Belmonte (2005), also argue that gender differences in language ability are not accepted by most language researchers.

RQ5: Is there a difference in English language performance between social science and natural science students as a result of using the school Net?

Similar to gender, there was a difference in performance between the two streams. Natural science students performed considerably better than social science students when using SN, considering other factors such as the '70% natural science and 30% social science policy'. Bryan and Volchenkova (2016) strongly argued that technology integration or blended language learning appeals to students with varied learning styles more than any other method, hence it could improve their achievement (Bryan and Volchenkova, 2016). Generally, the findings of the current study need to be examined further.

RQ6: What are the factors that hinder the effectiveness of School Net in promoting students' English language performance?

The findings indicate that the lack of teachers' technology skills and interest in integrating technology with their lessons, poor infrastructure installation, and intensive power outages were some of the major challenges identified in the study. The results also indicate that students do not know much about SN; they did not know that there are different platforms of SN such as e-learning (CALL, MALL) and DTCC. The DTCC in the school was not functional; as a result, students could not use it for language learning.

The findings from five different instruments show that the utilization of ET available in schools was highly hampered by electricity, accessories, weak network connection, lack of skilled personnel, and administrative problems. On top of all, teachers' lack of interest in using technology as a pedagogical tool hurt SN delivery. These and other factors influenced students' overall language achievement among other factors. Additionally, students were forbidden to use mobile phones in the school compound because it is stated in the student's school rules and regulations set by the education bureau in 2018. Moreover, poor infrastructure installation and intensive power outages were the major challenges investigated in the study. Furthermore, the findings of the study revealed that new apparatuses such as RAK were replaced by used apparatuses imported from China.

The results of the study indicated that the major problems were plasma installation problems due to a shortage of set-top boxes, network failures, corrupted systems, and a lack of skilled experts. The schools tried to inform the Addis Ababa Education Bureau's ICT department about the problems, but they couldn't solve any of them. Additionally, intensive network disconnections, technical failures of SN devices, and the inability to obtain accessories to replace deformed and lost devices were major problems observed or explored during the study. The bureau couldn't solve these problems because there were no skilled technicians in the schools or the sub-city.

Moreover, students steal devices such as set-top boxes that wouldn't support any other technology due to a lack of awareness. Additionally, materials in all observed schools were full of dust. Apart from these and other problems affecting the effectiveness of SN, the inability to obtain accessories in the markets has intensified the problem. The results obtained from open-ended questions show that principals didn't support and regulate teachers' SN usage properly. Furthermore, adequate training wasn't given to teachers and students on how to use SN.

The findings show that technical problems took more than two months, as opposed to administrative problems that would

take more than a year. On the other hand, network problems could be immediately solved. For instance, set-top boxes, adapters, and other accessories couldn't be replaced once they were burnt or lost. Moreover, a ditched fiber cable requires complete replacement. Battery failure is also another problem that could take a quarter because accessories aren't available in our country. Huawei brings these apparatuses from China only after the bureau orders. This could have been eliminated if they worked collaboratively and planned contingencies earlier. As the findings indicate, the absence of an ICT policy is another major factor hindering the effectiveness of SN implementation. The findings of the study indicate that using plasma TVs compatible with USB drives, overhead projectors, smartphones, etc., is a possible means to overcome the problems.

4. Conclusion and Recommendations

The main purpose of this study was to assess the effectiveness of School Net (SN) in promoting students' English Language Performance.

First, School Net was developed to solve quality education problems through plasma TV, e-learning, and cloud computing (the three platforms) of SN. The second and third alternatives, cloud computing and e-learning, enabled teachers and students to access video on demand (VOD) while teaching and learning the English language in the classroom.

Secondly, the school network enabled blended language learning both in and outside the classroom. Daily English language lessons were integrated with various platforms of the school network, including audio, pictures, videos, and text, catering to students with different learning styles.

Thirdly, the technology implementation level of most schools was categorized as level 2 (exploration category). Some schools, however, were found to be at level 0 (non-use category) or level 1 (awareness category). Only a few schools were found to be at level 3 (infusion category).

Fourthly, the results revealed that students lacked awareness of the platforms provided by the school network. Many were unaware of the existence of a server in their school, leading to underutilization of available technologies for language improvement. Additionally, some students who were aware of the network used it for irrelevant purposes such as chatting on social media and downloading unwanted videos.

Fifthly, ICT technicians lacked sufficient training to effectively manage technical, network, and server administration failures. Additionally, accessory problems and the termination of the three-year contract agreement with Huawei exacerbated the issue. Finally, teachers' lack of interest in teaching English through the school network, due to their limited technology manipulation and technology pedagogy (TIPACK) skills, hindered its use. Furthermore, the study also revealed intensive network disconnections and electricity fluctuations, leading to accessory damage and theft, such as set-top boxes, adapters, and remotes. Despite this, the education bureau was unable to mitigate these issues, resulting in irregular English language learning through the school network.

Based on the findings of the study, it can be concluded that mere access school network infrastructure, including plasma TVs, e-learning, and DTCC (Digital Teaching Content Center) or Cloud Computing (CC), does not ensure proper delivery.

The study revealed gaps in the utilization of SN for English language lesson delivery. Hence, the following recommendations are proposed to address these and other potential gaps. Initiating a comprehensive technology integration regulation manual would be a good start for the Education Bureau to ensure effective target language delivery. Additionally, language learning should be complemented with multimedia pedagogical technologies to achieve lesson objectives in an integrated manner.

The Ministry of Education (MoE), Education Bureau, Sub-City, and Wereda Education Offices should collaborate to develop an integrated plan to enhance schools' implementation of infant technology, ranging from non-use to infusion categories. They should also evaluate the program's developmental stages and implement an effectiveness and efficiency framework (E/E framework) to improve student performance.

The Education Bureau should establish an ICT policy to govern SN utilization and implement responsible actions. It should promote technology-integrated blended target language learning and adapt simplified technologies in collaboration with local technology institutions. The bureau should also establish Student Access Centers (SACs) in all schools to facilitate individualized target language learning. Additionally, supervisors and school principals should regulate teachers' roles in utilizing SN and students' involvement in SN-assisted lesson delivery.

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Authors' contributions

Dawit Tefera Habtewold is responsible for data collection, analysis and write-up of the manuscript

Haile Kassahun (PHD) is responsible for research design, proofreading and editing

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