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Availability of Computer Facilities and Integration of Information Communication Technology in Teaching and Learning in Public Primary Schools in Kenya

Mandila Ben Shikomera[1], Janet K. Mulwa[2], Jonathan Muema Mwania[3]

[1]Department of Languages, Kitui Teachers Training College, Kenya

[2]Department of Educational Administration and Planning, South Eastern Kenya University, Kenya

[3]Department of Educational Psychology, South Eastern Kenya University, Kenya

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Abstract: **This study sought to investigate the influence of availability of computer facilities on integration of information communication technology in teaching and learning in public primary schools in Kakamega County, Kenya. The study objectives sought to: determine the influence of availability of computer facilities for ICT integration in teaching and learning in public primary schools in Kakamega County, establish the level of adequacy of computer facilities for integration of ICT in teaching and learning public primary schools in Kakamega County and to examine the influence of missing computer facilities for ICT integration in teaching and learning in public primary schools in Kakamega County in Kenya. The study used Technological Pedagogical Content Knowledge model. Descriptive survey design was used for the study. Census, proportionate, simple random and purposive sampling techniques were used for the study. The sample size included 356 and 189 public primary school teachers and head teachers respectively, and 1 county director of education. The study used questionnaires and interview schedules to collect data. Data was presented using tables and charts and it was analyzed both a quantitatively and qualitatively. The Chi-square (x^2) test was used to determine the degree of relationship between teachers' integration of information communication technology and teaching and learning in public primary schools. The study was significant in that, the findings may help policy makers develop policies that may improve on how teachers in future can integrate computer facilities into teaching and learning, particularly in primary schools. The study therefore recommends that, in order to provide public primary schools with adequate computer facilities and to increase the number of schools receiving grants in order to raise money for purchasing computer facilities for schools, the government should consider the possibility of forming partnerships with sponsors like Computer for Schools Kenya and New Partnership for Africa's Development.**

Keywords: **Computer Facilities, Information Communication Technology, Integration, Kenya, Teaching, Learning.**

I. INTRODUCTION

The availability of adequate and appropriate computer facilities has an influence on integration of ICT in teaching and learning in schools. Computers are used by schools in a number of ways to improve classroom teaching and learning. Technology has the potential to support the curriculum and enable more effective contact between teachers and students than was previously not possible [1]. By utilizing their ICT skills and knowledge, students are better prepared to handle

challenges in the future. Programs have been formed in nations like the United Kingdom, Singapore, China, Australia, and the European Union to enhance teachers' ICT integration skills [2]. Singapore and Finland have developed national plans for ICT integration in schools, which include the required hardware and software [3]. The national plans in these nations strengthen the infrastructure needed for ICT integration in schools while approving and funding particular initiatives. In the summer of 2011, there were around 150 schools in Sweden where every student had access to computers. Many pupils in Sweden already owned laptops. Many schools in European countries, including Poland, Denmark, and England, had been able to purchase smart boards since they were affordable for computer-assisted presentations and many teachers can use Power Point to simplify the process of teaching and learning [4].

Even though numerous nations have made investments in computer facilities, teachers rarely integrate ICT into their teaching and learning activities in the classroom because of a variety of challenges. The United Nations Organization for Education, Science and Culture noted that, at a time when the majority of teachers are inadequate to use ICT and the majority of existing school buildings, even in the most developed countries, are not equipped to integrate ICT, education worldwide faces a significant challenge in preparing students and teachers for "our future" "knowledge-based" society [5]. These challenges need to be lessened if the nations are to use technology in education.

ICT integration into in teaching and learning is extremely challenging in most emerging countries including Africa. Despite the fact that, ICT improves education, not all countries are currently able to benefit from the breakthroughs and improvements that technology may offer. A significant barrier known as "The Digital Divide" prevents some countries from fully utilizing technological advancement. Despite the challenges, many developing countries are presently using computer facilities extensively to enhance teaching and learning in schools [6]. Most African nations, including Ghana, Botswana, South Africa, Zambia, and Namibia, have created national ICT in education policies to address this problem, emphasizing the need of ensuring that everyone has access to and uses ICT in teaching and learning. The New Partnership for Africa's Development (NEPAD), has created projects like the e-schools program in order to encourage universal access and ICT use in all schools.

One of the most effective ways for teachers' integration of ICT in the classroom for pedagogical purposes is availability of computer facilities. The success of integrating technology into schools depends on the accessibility and availability of computer facilities, including hardware, software, and communication infrastructure [7]. Therefore, for computer facilities to be used in teaching and learning, teachers must have access to it. Even though having access to proper computer facilities is essential for enabling teachers to include ICT in teaching and learning, it should be emphasized that many educational institutions do not have these facilities due various challenges. Over 50% of teachers in schools used computers for research and lesson planning and approximately 78 percent of classrooms lack adequate computer access [8]. This suggests that teachers only barely integrate ICT into their lessons. This illustrated how limited access to computers were for teachers. Despite the challenges, teachers were eager to include ICT into the teaching-learning process. The primary concerns were lack of dependable software and outdated computers in the classroom among other obstacles.

Availability of computers in schools in affluent nations is not as challenging as it is in developing nations such as Kenya. Computer facilities was significantly more widely used in schools in the USA than it was elsewhere [9]. Between 1985 and 2005, the number of pupils per computer decreased from 63:1 to 6:1 [13]. There were 16 students for every compute in primary schools in the United Kingdom. Similar changes were occurring throughout Asia. As of 2005, more than 94% of public schools in Japan had computers, with a student-to-computer ratio of 2:1 for primary schools and 1:1 for secondary schools. Because of this circumstance, teachers in industrialized countries are more now equipped to integrate ICT into their classrooms and students' learning.

In contrast to the situation in developed nations, the ratio of students to computers in developing nations is higher. For instance, the ratio of students to computers in Kenya was 150:1 [10]. Despite institutions' best efforts to provide the necessary infrastructure and equipment, the ratio of students to computers in Ugandan educational institutions remained high [11]. Many schools only had a small number of computers, which were subsidized by the teachers' individual subscriptions. Majority of primary schools lacked adequate computer infrastructure [12]. Only 58 percent of Malawian schools had computers, with 39 percent of them located in rural areas and 19 percent in urban ones [13]. There was minimal investment in computer facilities because of the high cost of computer hardware and software [14]. Schools only had a few

computers with a wide variety of application software installed at random, including word processing, database, spreadsheet and presentation software [15].

Availability of computer facilities in schools in relation to overcrowded classes has been another impediment to teachers integrating ICT in teaching and learning. According to research, teachers' integration of computer facilities in teaching and learning is influenced by the number of pupils in each class [16]. In contrast to smaller classes, crowded classrooms make it challenging for teachers to integrate computer facilities in teaching and learning. It is extremely difficult to equip classrooms with technology when there were many students present. In order to ease congestion, primary schools should be given more money for infrastructure.

The Kenya Education Sector Support Programme (KESSP) 2005-2010 and the Sessional Paper No. 1 of 2005, both included Strength, Weakness, Opportunity and Threads (SWOT) analysis of the Ministry of Education. It was observed that, although there were CDs and DVDs in schools, functional telephones were needed in 70% of Kenyan secondary schools and a significantly greater percentage of primary schools [17]. Due to the substantial investment in computer facilities, teachers in Kakamega County were expected to successfully integrate ICTs into their teaching and learning activities, regardless of how competent they thought they were or how many challenges they encountered. However, there were knowledge gaps about the influence of computer facilities on integration of ICT in teaching and learning in public primary schools in Kakamega County. Data from the Kenya National Examinations Council (KNEC) show that the county do poorly at Kenya Certificate of Primary Education (KCPE) examinations and integration of computer facilities in teaching and learning was anticipated to improve this situation. Previous research had identified a variety of barriers and enablers that influence how well teachers integrate computer facilities in teaching and learning Kenyan primary schools. However, more research was required to determine the influence of availability of computer facilities on integration of ICT in teaching and learning in Kenyan primary schools. This study was aimed at bridging these gaps.

II. METHODOLOGY

The study used descriptive survey design. One County Director of Education, 3,204 Public Primary School Teachers and 356 Public Primary School Head Teachers from 356 Public Primary Schools that had integrated ICT in the teaching and learning in Kakamega County were the study's target population The sampling techniques used in this study included census sampling, proportionate sampling, simple random sampling and purposive sampling. The sample frame was composed of 546 respondents in total. The study used Slovin's computations to determine the sample size. Data were gathered using a questionnaire and an interview schedule. Both head teachers and teachers at public primary schools were supposed to fill out the questionnaire. In-depth information about the County Director of Education was to be gathered through the interview schedule. In order to determine whether a questionnaire's content actually measured the characteristics it was designed to, content validity was utilized in the study. Pilot study to assess the validity of the tools such as the questionnaires and interview schedules was conducted. The data was coded and analyzed using Statistical Package for Social Sciences (SPSS) to determine frequencies and percentages of the study. The data was summarized and presented in tables and charts. Open-ended inquiries from interviews were recorded, transcribed and arranged. The degree of correlation between ICT integration and teaching and learning in public primary schools was evaluated using the Chi-square (x2) test. The significance threshold was Cronbach alpha (0.05).

III. RESULTS

Public primary school teacher responses on availability of computer facilities in their respective schools for integration of ICT in teaching and learning

The study established that, there was variation in the level of computer facilities that were available in boarding and day public primary schools. The findings of the study indicated that 60 (89.55%) of sampled public primary boarding schools had computer facilities while only a small percentage, 7 (10.45%) did not have computer facilities. 22 (10.09 %) of the public primary day schools had computer facilities while 196 (89.91%) of the public primary day schools that were sampled did not have computer facilities. A cross tabulation of availability computer facilities against categories of public primary schools, public primary boarding schools scored higher than public primary day schools (X^2 = 19.331, df=0.05, P Value = 0.065) as shown in table 1.

Table 1: Public primary school teacher responses on whether or not their schools have computer facilities for integrating ICT in teaching and learning

School category	Have computer facilities	No computer facilities	Total
Boarding	60 (89.55%)	7 (10.45%)	67 (100%)
Day school	22 (10.09%)	196 (89.91%)	218 (100%)
$X^2 = 19.331$			
P Value = 0.065			

The head teachers report also mirrored teachers' responses. Table 2 responses demonstrate that, sixty (92. 31%) head teachers of public primary boarding schools reported that, their public primary schools had computer facilities for teachers integration of ICT into the teaching and learning process, while 5 (7.69%) said that their respective public primary schools lacked these facilities. 64 (84.05%) of the 78 head teachers of public primary day schools said that their respective public primary schools lacked computer equipment. Only 17.95% of the population had access to computers.

Table 2: Primary school head teacher responses on availability of computers facilities for integrating ICT in teaching and learning

School category	Have computer facilities	Have no computer facilities	Total (%)
Boarding school	60 (92.31%)	5 (7.69%)	65 (100%)
Day school	14(17.95%)	64 (84.05%)	78 (100%)

Teacher responses on computer facilities that were available in their respective public primary schools for integration of ICT in teaching and learning

Although the there was a variation in the level of availability computer facilities in boarding and day public primary schools, both boarding and day public primary schools did not have all the required computer facilities for integration of ICT in teaching and learning. Results in table 3 demonstrated that, 96 (31.69%) of the public primary school teachers reported that their public primary schools had CDs, 67 (23.60%) DVDs, 102 (33.79%) Power Point, 17 (5.96%) YouTube, 14 (3.91%) images, and 3 (1.05%) smart board computer facilities to integrate ICT in teaching and learning. No teacher mentioned the computer facility for animation captions at their particular public primary school.

Table 3: Teacher responses on computer facilities that were available in their respective public primary schools for integration of ICT in teaching and learning

Computer facility	Frequency (f)	Percentage (100%)
CDs	96	31.69
DVDs	67	23.60
Power point	102	33.79
You tube	17	05.96
Animation captions	00	00.00
Images	14	03.91
Smart boards	03	01.05
Totals	**285**	**100**

The head teachers report in table 4 showed that, 32 accounting for 22.38% of the head teachers responded that, their public primary schools had CDs computer facility, 23 (16.08%) had DVDs, 102 (48.25%) had power point, 08 (5.59%) had You tube, 07 (4.90%) had images and 04 (2.80%) had smart boards to integrate ICT in teaching and learning. No head teacher indicated that their respective public primary school had animation captions computer facility.

Table 4: Head teacher responses on the computer facilities available to teachers in their respective public primary schools for ICT integration in teaching and learning

Computer facility	Frequency (f)	Percentage (100%)
CDs	32	22.38
DVDs	23	16.08
Power point	69	48.25
You tube	08	05.59
Animation captions	00	00.00
Images	07	04.90
Smart boards	04	02.80
Totals	**143**	**100**

Adequacy of computer facilities for ICT integration in teaching and learning in public primary schools

Table 5 results indicated that, ninety seven (34.03%) of the public primary school teachers reported to be having adequate CDs, sixty four (22.46%) to be having adequate DVDs, seventy (24.56%) to be having adequate projectors, twenty eight (9.83%) to be having adequate You tube, twenty one (7.37%) to be having adequate images and only 05 (1.75%) of the public primary schools teachers reported to be having smarts boards. None of the sampled public primary schools teachers reported to be having adequate animation captions.

Table 5: Teacher responses on adequacy of computer facilities available for ICT integration in teaching and learning in their respective public primary schools

Computer facility	Frequency (f)	Percentage (100%)
CDs	97	34.03
DVDs	64	22.46
Projectors	70	24.56
You tube	28	9.83
Animation captions	00	00.00
Images	21	7.37
Smart boards	05	1.75
Totals	**285**	**100**

Head teachers responses on this variable indicated that, 51 (34.03%) of public primary school head teachers reported to be having adequate CDs, thirty three (23.08%) to be having adequate DVDs, thirty five (24.48%) to be having adequate projectors, twelve (8.39%) to be having adequate You tube, ten (6.99%) to be having adequate images and only 02 (1.40%) of the public primary schools head teachers reported to be having smarts boards. None of the sampled public primary school head teachers reported to be having adequate animation captions. The findings are presented in table 6.

Table 6: Responses from head teachers regarding the adequacy of computer facilities available for teachers to integration of ICT in teaching and learning in their respective public primary schools

Computer facility	Frequency (f)	Percentage (100%)
CDs	51	35.66
DVDs	33	23.08
Projectors	35	24.48
You tube	12	8.39
Animation captions	00	00.00
Images	10	6.99
Smart boards	02	1.40
Totals	**143**	**100**

Public primary school teacher responses on computer facilities for integration of ICT in teaching and learning that were missing in their respective public primary schools

Results in figure 1 reveals that, 45 representing 15.79% of the total teachers' population reported missing digital cameras, 71 teachers representing 24.91% reported missing cyber ware 3D scanners and 169 teachers representing 59.30% reported missing digital video editing.

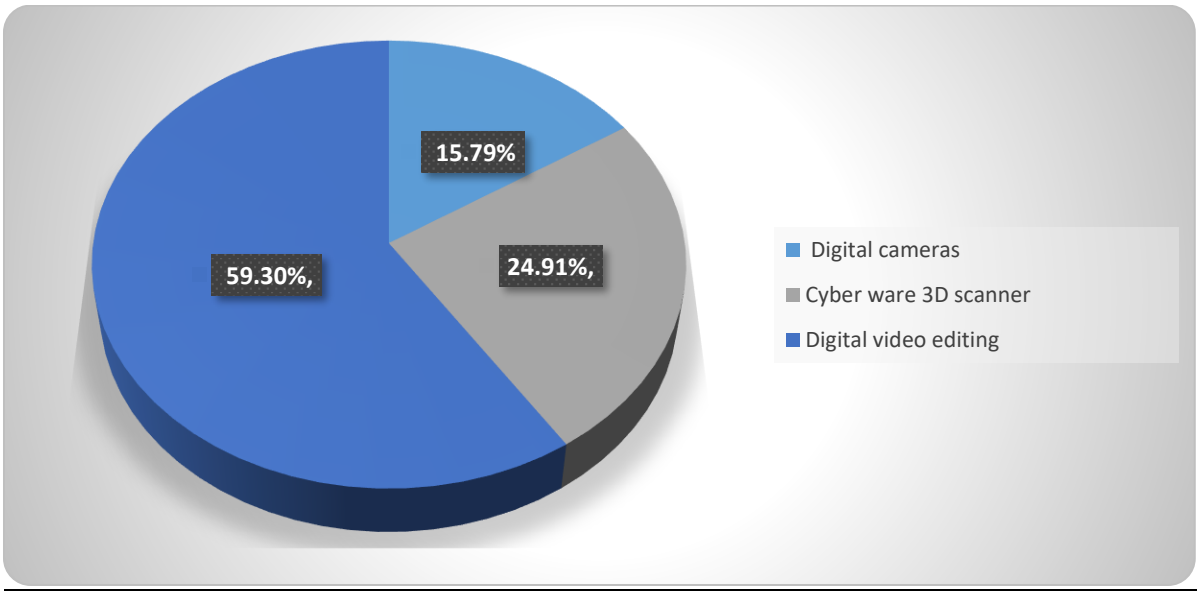

Figure 1: Public primary school teacher responses on computer facilities for integration of ICT in teaching and learning that were missing in their respective public primary schools

Findings from the head teachers on this variable indicated that, 97 (67.83%) of the public primary school head teachers reported that their respective public primary schools lacked digital video editing, 33 (23.08%) lacked cyber ware 3D scanner while only 13 representing 9.09% lacked digital cameras. Table 7 displays the findings.

Table 7: Head teacher responses on computer facilities that were missing for teachers' integration of ICT in teaching and learning in their respective public primary schools

Computer facility	Frequency (f)	Percentage (100%)
Digital cameras	13	9.09
Cyber ware 3D scanner	33	23.08
Digital video editing	97	67.83
Totals	**143**	**100**

IV. DISCUSSION OF THE FINDINGS

The availability of computer facilities is a precondition for the successful integration of ICT in teaching and learning in schools. Even some of the more tech-averse teachers develop an interest in the digital resources and eventually integrate it in teaching and learning. Accordingly, the study sought to establish the influence of availability of computer facilities for integration of ICT on teaching and learning public primary schools in Kakamega County in Kenya. Data on availability of computer facilities and integration of ICT in teaching and learning in public primary schools in Kakamega County were provided by teachers and head teachers in tables 1 and 2 respectively. The data showed that the majority of these schools lacked computer facilities. Further analysis of the results indicated that the situation was worse in public primary day schools than in public primary boarding schools. In a cross-tabulation of the availability of computer facilities against categorizations of public primary schools, public primary boarding schools outperformed public primary day schools (x^2 = 19.331, df=0.05, P value = 0.065). This implied that, in general, teachers in public primary schools in Kakamega County were not integrating computer facilities in their teaching and learning. Report on how well junior secondary school teachers in Nigeria integrated computer and ICT education using a case study of Abia State, support these findings [15]. The report

revealed that, the program's primary goal to be implemented in junior secondary schools could not be fully achieved due to the lack of a computer lab. Even if the computer education curriculum was sufficient, it did not meet the program's primary goal. Because computer equipment and software were so expensive, there was little investment in ICT infrastructure [14]. The results also showed that, there was no proof to back up the assertion that ICT integration improves teaching and learning in classrooms.

The provision of computer facilities is one of the essential components for ICT integration in teaching and learning. Lack of certain facilities in schools may impede the effective integration of ICT in the classroom. The study investigated the computer facilities that were available in respective public primary schools. The study's findings in table 3 revealed that, CDs and DVDs made up the majority of the computer facilities in public primary schools. This might be as a result of them being less expensive. The typical public primary schools sampled lacked adequate computer facilities, making it challenging for teachers to successfully integrate ICT into their curricula. In table 4, head teachers report indicated that, their public primary schools had a CD computer facility, a DVD facility, a power point facility, a You tube facility, an image facility and a smart board facility for ICT integration in classroom instruction. No head teacher mentioned a computer facility for animation captioning in their particular public primary school. Further investigation from the County Director of Education in Kakamega County through in-depth interview revealed that, CDs and DVDs were favoured to any other computer facility because they were easy to use as teachers simply use the students to fix them and leave them to watch the recorded programs as they continue with their own things. One does not need technical skills to operate them and the students do not have to wait for them to come to class, they watch, discuss and revise on their own. (An interview with the County Director of Education).

The results of this study lead us to the conclusion that teachers in public primary schools in Kakamega County were not integrating ICT into their teaching and learning process because they lacked a variety of computer facilities. Teachers should be supplied with a variety of computer facilities in order for them to effectively integrate ICT into teaching and learning. These findings are in agreement with assertion that CDs and DVDs have been used often in all learning contexts [17]. In contrast to the findings of this study, many schools, particularly in developed nations, have all the necessary computer facilities for ICT integration in teaching and learning in the classroom Smart boards for computer-assisted presentations are affordable, making them available to many schools in Europe, including those in Denmark, England, and Poland [4]. Many teachers utilize Power Point as a tool to facilitate teaching and learning.

The presence of adequate computer facilities influence how much ICT is integrated into classroom education by teachers. The development of good teacher attitudes toward ICT integration in teaching and learning is made easier for teachers in schools with adequate computer resources. The study findings, which were presented in tables 5 and 6, showed that public primary schools teachers in Kakamega County were discouraged from integrating computers facilities into their lessons due to a lack of adequate computer facilities. In support of the findings of this study, it was reported that, while institutions made every effort to provide the appropriate equipment and infrastructure, the ratio of computers to students was still relatively high, particularly in teacher training schools with a 1:15 [11]. The survey additionally revealed that, access to computers is restricted for teachers and administrators. In particular, teachers must share their laptops with the students. These findings further concur with assertion that the student-to-computer ratio was 150:1 in developing countries like Kenya [10].

These results are further confirms the report that only 58% of Malawi's schools possessed computers, with 39% of those located in rural areas and 19% in urban ones [13]. Additionally, the study revealed that schools had a range in ICT resources, both in terms of quantity and quality. Moreover, another study found that, inadequate or nonexistent computer infrastructure in schools had hindered the adoption of ICT in teaching and learning. The study's findings showed that Saudi Arabia's lack of infrastructure restricted the use of technology in schools. Several Saudi Arabian schools, which were supported by the teachers' individual subscriptions, only possessed a modest number of computers. It was also revealed that, all of the participating schools only had a small number of computers with a wide range of application software installed at random, including word processing, database, spreadsheet, and presentation software [15]. These findings are further supported by the Government of Kenya strategic plan for 2007–2011. According to the proposal, working telephones were needed by 70% of Kenya's secondary schools and a significantly higher percentage of its primary schools in order to access the internet [17].

These results, however, contradict the British Educational Suppliers Association report that, there were 16 students for every computer in primary schools in the UK [9]. Similar changes were occurring throughout Asia. As of 2005, more than 94% of public schools in Japan had computers, with a student-to-computer ratio of 2:1 for primary schools and 1:1 for

secondary schools. According to the study's findings about the computer facilities that were missing in public primary schools, it is apparent from the responses of the head teachers in table 7 and figure 1 of the teachers that these institutions frequently lack the essential computer facilities that would enable teachers to integrate ICT into both teaching and learning. These findings are corroborated with a report that, barriers still exists even though many different approaches have been developed to successfully integrate ICTs into educational programs. The study listed a number of obstacles, the main one being a lack of suitable software [15].

V. SUMMARY

The study sought to investigate the influence of availability of computer facilities on integration of ICT in teaching and learning in public primary schools in Kakamega County in Kenya. According to the study's findings, teachers' ability to integrate ICT into teaching and learning in public primary schools was greatly influenced by the availability of computer facilities. The the proliferation of knowledge has made it impossible for educational institutions to continue serving as platforms for the transmission of knowledge from the teacher to student or as a repository for information solely derived from textbooks. This suggests that in order to provide effective, continuous, and lifelong learning, schools are expected to support the acquisition of information and skills through the use of technologies. However, a closer look at the study's findings revealed that most public primary schools lacked computer facilities. From the few schools that possessed computer facilities, it was observed that the facilities were inadequate and inappropriate for teachers to integrate ICT in teaching and learning.

VI. RECOMMENDATIONS

Majority of public primary schools lacked computer facilities. This had a negative impact on teachers' integration of ICT in teaching and learning in public primary schools in Kakamega County. The priority given to information communications technology (ICT) in the purpose and vision of schools, as well as ICT financing, has an impact on whether or not computer facilities are purchased. This translates into teachers' integration of ICT in teaching and learning in public primary schools. This stimulates the students' enthusiasm in learning new things. Therefore, the study recommends that, in order to provide public primary schools with adequate computer facilities and to increase the number of schools receiving grants in order to raise money for purchasing computer facilities for schools, the government should consider the possibility of forming partnerships with sponsors like Computer for Schools Kenya and New Partnership for Africa's Development. The head teachers should also plan how to mobilize computer facilities.

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