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The Challenges and Opportunities to Formulate and Integrate an Effective ICT Policy at Mountainous Rural Schools of Gilgit-Baltistan

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Abstract: The study, through the lens of school principals' views, investigates the challenges and opportunities to formulate an information and communications technology (ICT) policy in order to integrate it in teaching and learning practices at the schools of mountainous rural areas of Gilgit-Baltistan (GB). This quantitative research approach focuses on three different educational systems (Regional, National, and International), as a source of data collection, which operate in GB, Pakistan. To collect the required data, questionnaires with principals and policy document reviews were used. Applying SPSS, the data were analyzed. The results show that both groups (male and female) strongly agree to formulate a policy on ICT in order to integrate it in teaching and learning to improve at the school level. The results also show that the school heads face a number of challenges (e.g., lack of infrastructure, finance, Internet, technical staff, time, awareness, and training facilities, etc.) in the formulation of ICT policy and its integration in teaching and learning. The results revealed that the majority of the schools have an absence of ICT policy instead of having competent principals in those schools. Therefore, the research recommends that the school level ICT policy should be developed and integrated in teaching and learning practices to create an environment of powerful learning at schools, in order to fulfill the needs and demands of the 21st century education.

Keywords: ICTs; policy formulation; technology integration; leadership; infrastructure

1. Introduction

ICTs are effective tools to play a vital role in enhancing the quality of teaching and learning in schools [1]. It is observed that the advancement in ICTs brought an enormous revolution in the field of teaching and learning in the 21st century education at all levels. However, it highly depends upon the level of awareness, skills, and competence of institutional leaders (e.g., school principals/heads and teaching staff, etc.) regarding ICT policy formulation and integration in their everyday practices at schools, colleges, and universities [2].

This paper focuses on exploring the views of school principals regarding the challenges and opportunities to formulate and implement an effective ICT policy at the school level in rural mountainous areas of GB, Pakistan (Hassan and Sajid, 2013). The schools in mountainous rural areas of developing countries such as Pakistan face enormous challenges to formulate a policy on ICT, access technological resources, and to develop relevant skills amongst the teaching staff to integrate technologies into their teaching and learning situations at almost all levels [3]. In the context of GB, the above mentioned three educational systems have some limitations in formulating an ICT policy document for their schools [4].

However, there are a few school systems having ICT policy documents, which enable principals and teachers to integrate ICT in teaching and learning practices to improve at the school level. Whereas, a majority of the schools have no such policy guidelines for technology integration, which creates a huge problem for schools to introduce and integrate ICT into their everyday practices [5]. If these systems encourage, empower, and facilitate school principals, a context responsive ICT policy can be formulated in order to integrate it into teaching learning practices to improve at the school level. A number of studies in another context have been conducted on ICT policy integration [6,7], yet none of the studies have been conducted to address this problem.

2. Conceptual Framework

Keeping in view the challenges and opportunities, this study develops a conceptual framework for the schools of mountainous rural areas to formulate and integrate an ICT policy for improving teaching and learning practices. The components of this framework are (1) the effective role of the school principal (i.e., to develop a clear vision on formulating ICT policy and integrating it in teaching and learning at the school level; (2) readiness of the school (allocating the budget and developing awareness on why formulation of an ICT policy at school is important and how to integrate it in teaching learning practices); (3) systematic ICT integration models (e.g., designing, developing, and implementing an ICT integration mechanism in schools); and (4) ICT policy indicators (which enable the school principal to monitor and evaluate the impact of technology integration).

2.1. Principal Role

Previous studies revealed that an effective role of the school principal is fundamental in formulating an effective ICT policy and integrating it into teaching learning practices at school. Research also found that a technologically competent principal can better address the challenges of technology integration and generate opportunities for teachers to improve teaching learning practices at school [8]. An efficient role of the school principal is vital to convert contextual challenges into opportunities [9]. For example, the efficiency of the principal in formulating a policy on ICT and integrating it in teaching learning at school. The principal, as an educational leader, can create opportunities for developing skills and motivation amongst teachers and inspire students to use technology in their everyday learning activities [10]. Therefore, it is the school principal who can develop awareness on ICT policy formulation at the school level and engage teachers in learning ICT, developing relevant skills to integrate technology into their teaching and learning practices [11]. The schools in mountainous rural areas of GB, Pakistan need to focus on the capacity building of school principals who can convert contextual challenges into meaningful opportunities, which is obligatory for integrating ICT policies into their teaching learning practices.

2.2. School Readiness

The second most important component of this framework is school readiness. This framework includes three basic indicators of technology integration at the school level. These indicators, as shown in Table 1, are (1) infrastructural settings, (2) integration factors, and (3) competence and resources. The presence of such indicators in schools shows the level of school readiness to provide an environment where teachers can get easy access to technology, acquire knowledge, and develop skills to use in their teaching and learning practices.

Table 1. Three main areas of indicators of information and communications technology (ICT) policy formulation and integration at the school level.

| Main Indicators | Effective School Level ICT Policy Indicators |
|--------------------------|---|
| Infrastructural Setting | Technology infrastructure, Classroom arrangement, Electricity, computer labs location, effective Local Area Network (LAN), multimedia projectors, Interactive white board, Digital camera, video conference hall [12–14]. |
| Integration Factors | Open source software tools, training models for teaching and learning, efficient learning environment [15], perceptions of School community and their willingness to integrate ICT [16], connection of Internet, Learning Management System and open educational resources (OER), integration of ICT in the curriculum [17–21]. |
| Competence and resources | Vision of the Principal about ICTs and skills about the computer, motivational skills for ICTs integration at the teaching, learning, and administration level, willingness of teachers, attitudes of teachers, professional development, and belief, Students motivation and learning abilities. The coordinator’s role for integrating ICTs and operating online learning related tools [7,10,22–25]. |

2.3. Systematic ICT Integration Models

Previous studies revealed that the successful integration of technologies related to teaching learning practices at the school level demands a systematic framework model to avoid the failure in technological integration [22,26]. For example [27], to implement the ICT successfully at the school level a framework model was proposed based on six components including technology curriculum, leadership/management, workforce, inter/intra-institutional linkages, and external linkage. Furthermore, according to [28], Bozeman (1999) proposed that five key technology application components such as planning for appropriate curriculum, administration, teachers adequate training, hardware and software ready to access, and support of technology make better sense in this context. Therefore, understanding these models and adopting them within the context of rural mountainous areas can help principals address some common challenges at the school level. For instance, issues related to the capacity of classrooms, Internet facilities, deficiency of electricity, and landline connections [29]; lack of schools coordination [11,30]; equipment costs; insufficient infrastructure of technology; lack of human experts; less literacy rates; cultural norms; ignorance and attitudes; deficiency in students’ knowledge and computer skills, etc. can be addressed by school principals using systematic ICT integration models.

2.4. ICT Policy Indicators

Framing standard ICT policy indicators at the school level especially in mountainous rural areas of GB, Pakistan can help schools develop a state of the art policy to implement [31,32]. According to [17], the infrastructure development, teacher training, pedagogical and curricular change, content development, and technical support are the operational components of ICT policy indicators, which school principals need to think about in their context.

There are many factors that contribute to the failure of ICT policy formulation and integration [33]. However, some of the prominent factors for the failure of ICT policy implementation at the school level includes (a) lack of principals’ skills in ICT; (b) poor allocation of funds; (c) ICTs provision level; (d) inappropriate trainings on ICT; (e) lack of pedagogical skills; (f) lack of proper ICTs integration in the curriculum; and (g) improper planning on the ICT infrastructure, to name a few [34,35].

3. Research Objectives

This study aims to investigate the challenges and opportunities for ICT policy formulation and implementation at the school level in mountainous rural areas of GB, Pakistan. Therefore, the research study is divided into two main objectives, for example:

- To explore the principals' competence and motivation towards formulating a policy on ICTs on gender wise at the school level.
- To find the school's ICT policy potentials (opportunities) and challenges on the way to its implementation on gender wise at the school level.

4. Research Method

A 51-item questionnaire was designed and distributed among 100 school principals of GB to collect relevant data. However, 82 research participants, randomly selected, have responded whereas 18 did not respond (08 female and 10 male). Though, before the distribution of questionnaires the researchers conducted a pilot test to ensure the validity of the tools. Ten randomly selected prospective teachers from a public sector university were provided the tools to see their level of understanding of each item in the questionnaire. After conducting this pilot test, the researchers had to rephrase a few items to reduce the level of difficulty (i.e., to comprehend the items of the questionnaire easily).

4.1. Participants

This study domain is restricted to three educational organizations, which provide their own brand of education in rural areas of Gilgit-Baltistan (i.e., organization A, B, C). Organization A is a public sector and organization B is an international funding service agency, while organization C is an NGO. These systems of education manage to run schools in Gilgit-Baltistan according to their own vision, mission, and values, etc. Furthermore, these systems vary in the size of schools, nature of schooling, and its quality services. For example, the minimum number of schools in these systems is 12 and the maximum number of schools is 500. The principal age varied by 27% from 20 to 25, 35% from 25 to 30, 18% from 30 to 35, and 20% above 35 years. The age limit above 35 years was from public sector schools. Further details about the qualification and training acquired are listed in Table 2. The schools were selected from primary to higher secondary and 82 principals were selected from these schools. The samples were selected on a quota sampling technique, by considering the age, area, gender, and organizational variation [36].

Table 2. Age of respondents, gender, qualification, and ICT training attended.

| Age of Respondents | Respondents Gender | | | | Respondents Qualification | ICT Training or Certificate | | | |
|--------------------|--------------------|----|--------|----|---------------------------|-----------------------------|----|-----|----|
| | Male | | Female | | | No | | Yes | |
| | N | % | N | % | | N | % | N | % |
| 20 to 25 | 13 | 16 | 9 | 11 | Intermediate | 2 | 2 | 5 | 6 |
| 25 to 30 | 23 | 28 | 6 | 7 | Undergraduate (14 Years) | 9 | 11 | 12 | 15 |
| 30 to 35 | 11 | 13 | 4 | 5 | Master (16 years) | 21 | 26 | 22 | 27 |
| 35 to 40 | 5 | 6 | 2 | 2 | Master (18 years) | 5 | 6 | 6 | 7 |
| 40 and above | 6 | 7 | 3 | 4 | | | | | |

4.2. Instruments and Procedures

In view of research objectives, the survey questionnaires were distributed among the school principals entitled as, "The challenges and opportunities for school level ICT policy formulation and integration in teaching and learning" (details are shown in Tables 3–5). Similarly, the survey data were supported with the relevant literature and collected to achieve another objective of the research. It was revealed that schools in rural mountainous areas are facing a number of contextual challenges to formulate an ICT policy at the school level.

Table 3. Principal competence on ICT tools.

| ICT Hardware Competence | Disagree | | Agree | | Software Items | Disagree | | Agree | |
|--|----------|------|-------|------|--|----------|------|-------|------|
| | N | % | N | % | | N | % | N | % |
| Computer | 15 | 18.3 | 67 | 81.7 | Publishing tools (e.g., Publisher, Page maker) | 13 | 15.9 | 69 | 84.1 |
| Printers | 14 | 17.1 | 68 | 82.9 | Word processing, Presentation, Spreadsheet | 20 | 24.4 | 62 | 75.6 |
| Scanners | 15 | 18.3 | 67 | 81.7 | Database (MS Access) | 25 | 30.5 | 57 | 69.5 |
| Interactive whiteboard | 24 | 29.3 | 58 | 70.7 | Image processing (e.g., Photoshop) | 23 | 28 | 59 | 72 |
| Multimedia (Overhead Projector) | 10 | 12.2 | 72 | 87.8 | Drawing tools | 19 | 23.2 | 63 | 76.8 |
| Communication Tools | | | | | Knowledge about teaching and learning tools | | | | |
| Email | 13 | 15.9 | 69 | 84.1 | Learning management system software | 19 | 23.2 | 63 | 76.8 |
| Chatting (Yahoo Messenger, Skype, etc.) | 14 | 17.1 | 68 | 82.9 | Open Educational resources | 20 | 24.4 | 62 | 75.6 |
| Blogs | 15 | 18.3 | 67 | 81.7 | Internet for search resources (ICT for schools' resources, training, teaching, and learning materials) | 16 | 19.5 | 66 | 80.5 |
| Wikis | 11 | 13.4 | 71 | 86.6 | Schools project websites | 10 | 12.2 | 72 | 87.8 |
| Social sites (e.g., Facebook, twitter, Hi5 etc.) | 18 | 22.0 | 64 | 78 | Ministry of education website | 15 | 18.3 | 67 | 81.7 |

Table 4. ICT integration challenges at the school level.

| Items | Disagree | | Agree | |
|-----------------------------------|----------|------|-------|------|
| | N | % | N | % |
| Lack of Infrastructure | 9 | 22 | 64 | 78 |
| Financial constraints | 15 | 18.3 | 67 | 81.7 |
| Lack of Interest | 17 | 20.7 | 65 | 79.3 |
| Lack of technical staff | 12 | 14.6 | 70 | 85.4 |
| Lack of time | 0 | 0 | 82 | 100 |
| Lack of awareness | 10 | 12.2 | 72 | 87.8 |
| Lack of training from head office | 0 | 0 | 82 | 100 |

Table 5. Challenges of the school level ICT policy planning.

| Items | Disagree | | Agree | |
|---|----------|------|-------|------|
| | N | % | N | % |
| Lack of organizational/school level ICT policy planning | 7 | 15.9 | 69 | 84.1 |
| Lack of regular body for ICT policy formulation and review in schools | 24 | 29.3 | 58 | 70.7 |
| Lack of ICT policy at provincial/regional context | 20 | 24.4 | 62 | 75.6 |
| Lack of involvement of stakeholders in the formation of an ICT policy plan for schools | 28 | 34.1 | 54 | 65.9 |
| Lack of proper follow national ICT strategy and policy | 11 | 13.4 | 71 | 86.6 |
| Lack of local community support technically and financially | 17 | 20.7 | 65 | 79.3 |
| Lack of policy planning for an ICT awareness campaign in social, ethical, career, and legal issues for school communities and communities/parents | 22 | 26.8 | 60 | 73.2 |
| Lack of empowerment and freedom to the principal for developing school level policies | 17 | 20.7 | 65 | 79.3 |
| Lack of support and sharing the existing ICT policy of any school with counterparts or near-by schools | 14 | 17.1 | 68 | 82.9 |

4.3. Data Analysis

The data collected through the questionnaires have been analyzed using SPSS to get findings. Each group of questions has covered different areas, which has little overlap such as the link between policy, teaching, and learning, as well as the infrastructure that is often subject to policy guidelines, etc.

5. Results

5.1. Demographic Analysis

Demographic information such as age, gender, qualification, and training/certificate courses related to the ICT of school principals have been shown on Figures 1 and 2 and Table 3.

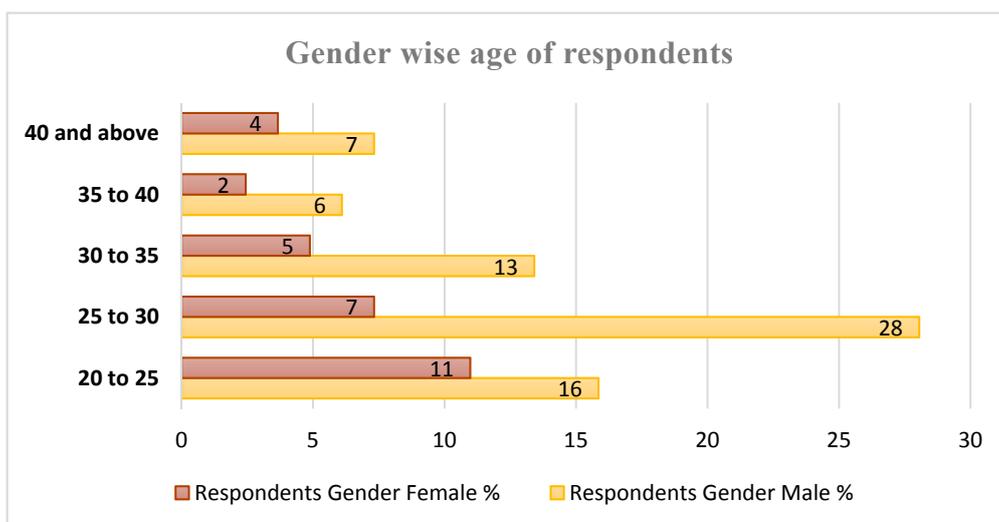


Figure 1. Gender wise age of respondents.

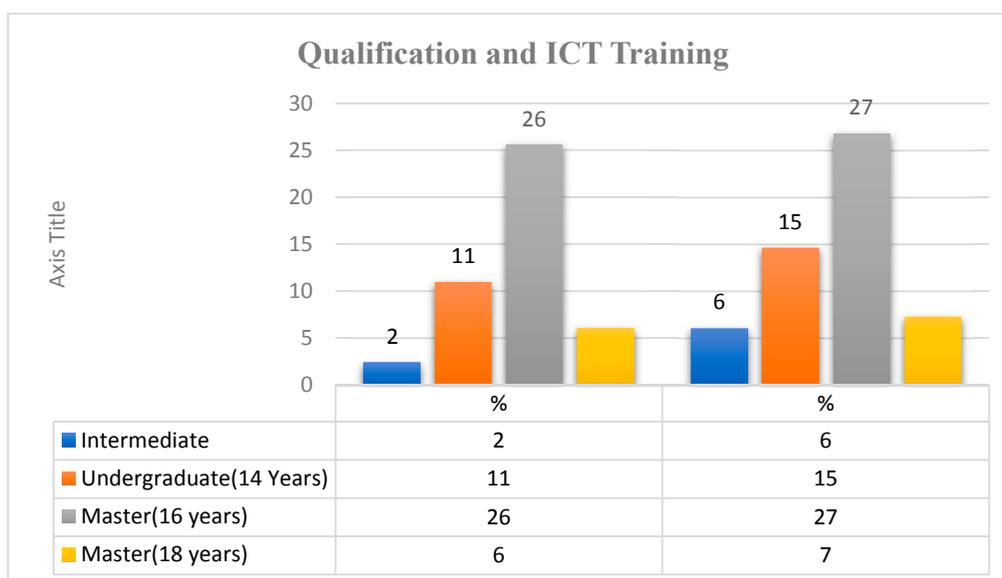
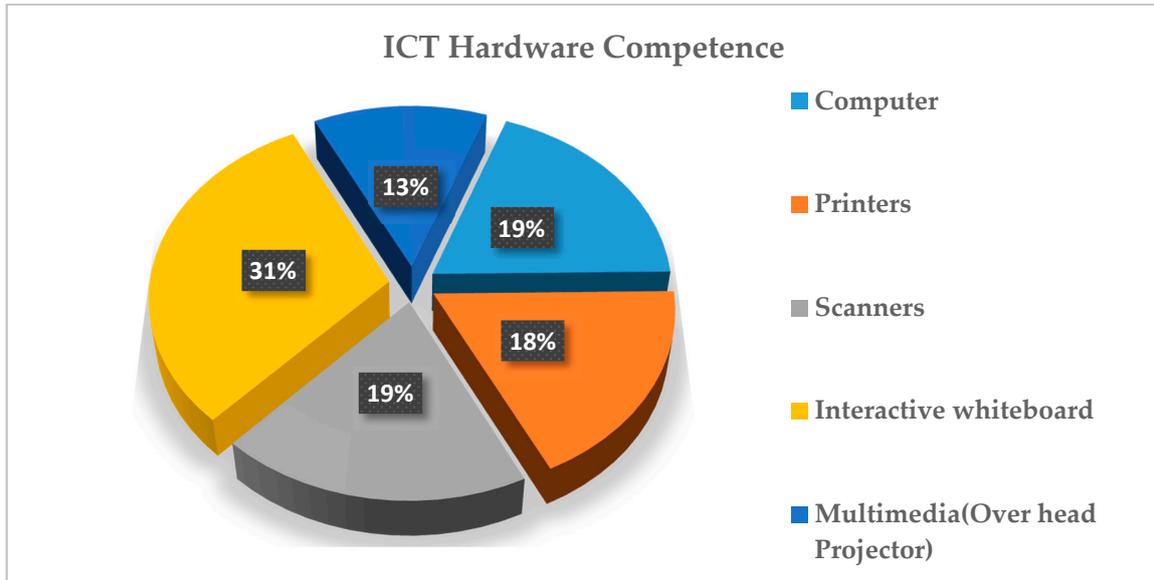


Figure 2. ICT trainings and qualification.

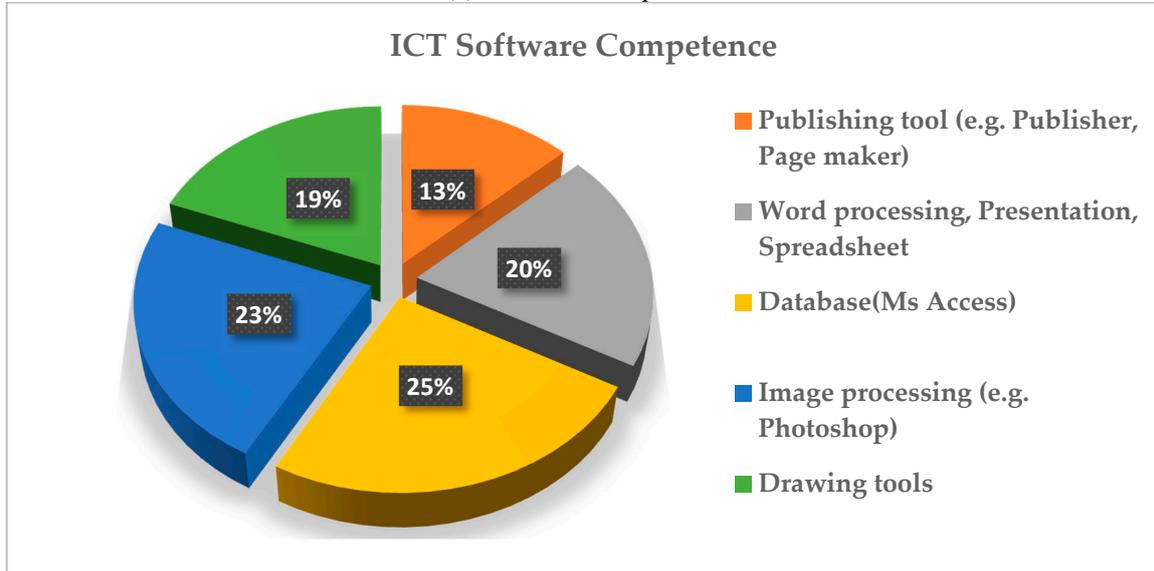
5.2. Principal Competence of ICT Tools

This section addresses the first objective which explores the competence and motivation of principals towards formulating a policy on ICTs at the school level. Table 4 shows that 80.96% of the principals agreed that they have a good understanding of using hardware tools such as a computer, scanner, printer, interactive whiteboard, and multimedia, and only 19% said that they do not have competence on the said tools. Moreover, 75.6% have competence in software and publishing tools such as Publisher, Page maker, Word processing, Presentation, Spreadsheet, Database, and Image processing, while 24.4% disagreed with the statement. Furthermore, 82.66% agreed that they can use communication tools such as Email and Chatting on Messenger (Yahoo, Skype, etc.), Blogs, Wikis, and Social sites, and 17.34% disagreed with the statement. In addition, 80.48% agreed and 19.52% disagreed with the statement that they have knowledge about teaching and learning tools (e.g., learning management system software, open educational resources, Internet for search resources such as ICT for schools’ resources, training, teaching and learning materials, schools project websites, and the ministry of education website) (details are shown in Figure 3).

Table 6 shows that there is no significant difference amongst the competence of school principals on ICT teaching and learning tools in both genders (male and female). The independent sample test in Table 6 indicates that the mean score for both, male and female, is almost equal. The result also shows that both groups strongly agree that they have knowledge and skills on ICT tools. There is no significant difference except in the scanners utilization skill (p -value is 0.038), which is less than 0.05. The highest p -value is 812 on publishing tools.

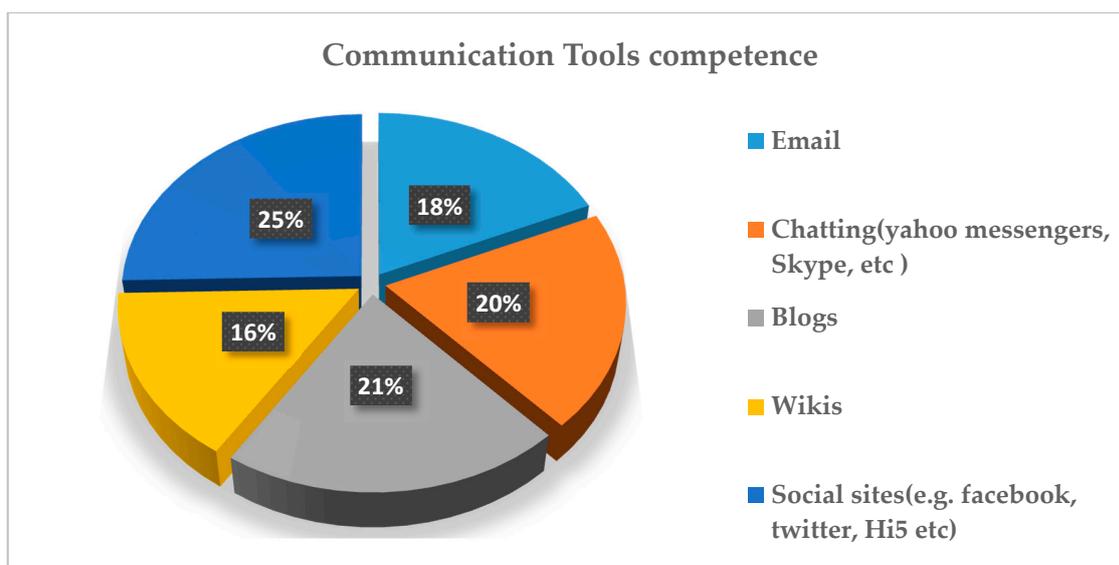


(a) Hardware competence

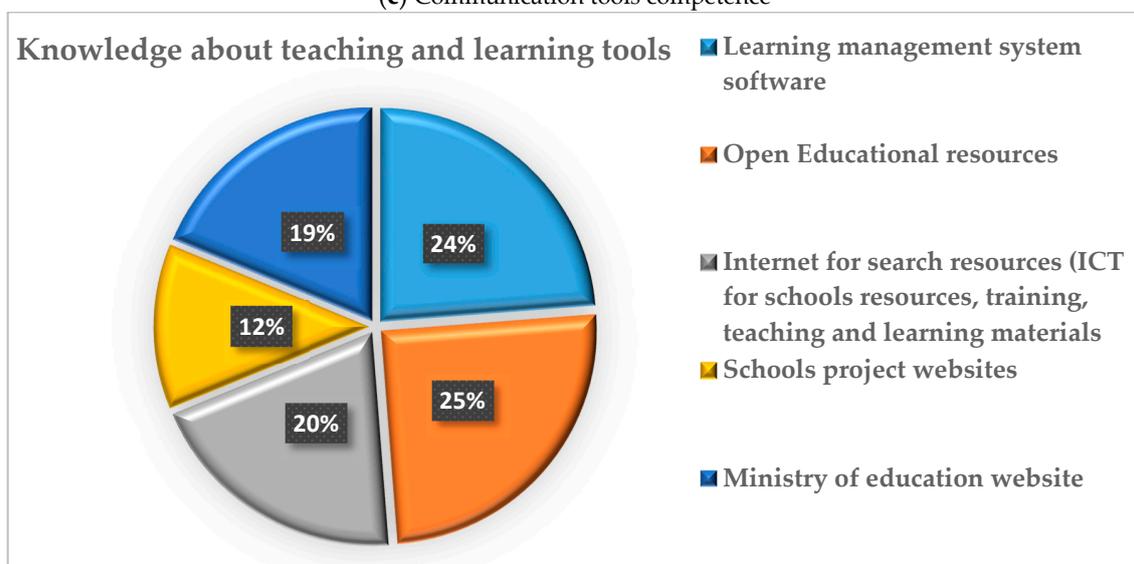


(b) ICT Software Competence

Figure 3. Cont.



(c) Communication tools competence



(d) Knowledge about teaching and learning tools

Figure 3. Principal ICT competence on hardware, software, communication, and teaching and learning tools.

5.3. School ICT Policy Potentials (Opportunities) and Challenges

In view of the second research objective, the challenges faced by rural schools have been investigated. Tables 4, 5, 7 and 8 show the challenges faced by rural school principals in ICT policy formulation and integration in teaching and learning. In Table 7, the results show that there is no significant difference between males and females regarding ICT integration challenges at the school level. The highest *p*-value is 0.963 and the lowest is 0.237. There is only one item, where there is a significant difference such as “Lack of technical staff in both male and female principals”, with a value of 0.033 which is less than 0.05. Both male and female principals have the same point of view regarding the challenges.

Table 6. Independent samples of the test school principal competences on computer teaching and learning tools.

| Respondents Gender | | N | t | df | Sig. (2-Tailed) | Mean | Std. Deviation | Std. Error Mean |
|---|-----------------------------|----|--------|--------|-----------------|-------|----------------|-----------------|
| Hardware Tools | | | | | | | | |
| Computer | Equal variances assumed | 82 | 0.377 | 80 | 0.707 | 3.645 | 1.385 | 0.235 |
| | Equal variances not assumed | | 0.358 | 38.568 | 0.723 | | | |
| Printers | Equal variances assumed | 82 | 1.008 | 80 | 0.316 | 3.494 | 1.332 | 0.225 |
| | Equal variances not assumed | | 0.983 | 40.738 | 0.332 | | | |
| Scanners | Equal variances assumed | 82 | 2.107 | 80 | 0.038 | 3.357 | 1.262 | 0.214 |
| | Equal variances not assumed | | 2.008 | 38.938 | 0.052 | | | |
| Interactive whiteboard | Equal variances assumed | 82 | 0.776 | 80 | 0.440 | 3.205 | 1.312 | 0.221 |
| | Equal variances not assumed | | 0.758 | 40.923 | 0.453 | | | |
| Multimedia (overhead projectors) | Equal variances assumed | 82 | 0.612 | 80 | 0.542 | 3.756 | 1.211 | 0.204 |
| | Equal variances not assumed | | 0.600 | 41.206 | 0.552 | | | |
| Software Tools | | | | | | | | |
| Publishing tool (e.g., Publisher, Page maker) | Equal variances assumed | 82 | -0.238 | 80 | 0.812 | 3.673 | 1.221 | 0.203 |
| | Equal variances not assumed | | -0.241 | 43.891 | 0.811 | | | |
| Word processing, Presentation, Spreadsheet | Equal variances assumed | 82 | 0.625 | 80 | 0.534 | 3.349 | 1.282 | 0.213 |
| | Equal variances not assumed | | 0.649 | 46.795 | 0.520 | | | |
| Database (MS Access) | Equal variances assumed | 82 | 1.133 | 80 | 0.261 | 3.152 | 1.394 | 0.233 |
| | Equal variances not assumed | | 1.152 | 44.582 | 0.256 | | | |
| Image processing (e.g., Photoshop) | Equal variances assumed | 82 | 0.294 | 80 | 0.770 | 3.297 | 1.339 | 0.225 |
| | Equal variances not assumed | | 0.290 | 41.837 | 0.773 | | | |
| Drawing tools | Equal variances assumed | 82 | 1.028 | 80 | 0.307 | 3.342 | 1.404 | 0.236 |
| | Equal variances not assumed | | 1.029 | 43.025 | 0.309 | | | |
| Communication Tools | | | | | | | | |
| Email (Gmail, Yahoo, Hotmail, etc.) | Equal variances assumed | 82 | 0.471 | 80 | 0.639 | 3.446 | 1.274 | 0.216 |
| | Equal variances not assumed | | 0.449 | 39.014 | 0.656 | | | |
| Chatting (Yahoo Messenger, Skype, etc.) | Equal variances assumed | 82 | -0.294 | 80 | 0.769 | 3.665 | 1.195 | 0.198 |
| | Equal variances not assumed | | -0.310 | 48.291 | 0.758 | | | |
| Blogs | Equal variances assumed | 82 | 0.558 | 80 | 0.578 | 3.662 | 1.147 | 0.191 |
| | Equal variances not assumed | | 0.577 | 46.398 | 0.567 | | | |
| Wikis | Equal variances assumed | 82 | 1.723 | 80 | 0.089 | 3.619 | 1.214 | 0.208 |
| | Equal variances not assumed | | 1.575 | 35.955 | 0.124 | | | |
| Social sites (e.g., Facebook, Twitter, Hi5, etc.) | Equal variances assumed | 82 | 1.361 | 80 | 0.177 | 3.423 | 1.315 | 0.222 |
| | Equal variances not assumed | | 1.330 | 40.989 | 0.191 | | | |

Table 6. *Cont.*

| Respondents Gender | N | t | df | Sig. (2-Tailed) | Mean | Std. Deviation | Std. Error Mean |
|-------------------------------------|-----------------------------|----|-------|-----------------|-------|----------------|-----------------|
| Teaching and learning Tools | | | | | | | |
| Learning management system software | Equal variances assumed | 82 | 1.155 | 80 | 0.252 | 3.491 | 1.414 |
| | Equal variances not assumed | | 1.165 | 43.878 | 0.250 | | |
| Open Educational resources | Equal variances assumed | 82 | 1.581 | 80 | .118 | 3.314 | 1.439 |
| | Equal variances not assumed | | 1.536 | 40.458 | 0.132 | | |
| Internet for search resources | Equal variances assumed | 82 | 1.992 | 80 | 0.050 | 3.463 | 1.249 |
| | Equal variances not assumed | | 1.914 | 39.567 | 0.063 | | |
| Schools project websites | Equal variances assumed | 82 | 0.244 | 80 | 0.808 | 3.827 | 1.185 |
| | Equal variances not assumed | | 0.245 | 43.421 | 0.807 | | |
| Ministry of education website | Equal variances assumed | 82 | 1.801 | 80 | 0.076 | 3.390 | 1.255 |
| | Equal variances not assumed | | 1.677 | 37.224 | 0.102 | | |

Table 7. Independent samples test of ICT integration challenges at the school level.

| | t | df | Sig. (2-tailed) | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|-----------------------------------|-----------------------------|--------|-----------------|--------|--------|------|----------------|-----------------|
| Lack of Infrastructure | Equal variances assumed | 0.046 | 80 | 0.963 | Male | 58 | 3.431 | 1.313 |
| | Equal variances not assumed | 0.049 | 47.696 | 0.961 | Female | 24 | 3.417 | 1.176 |
| Financial constraints | Equal variances assumed | 1.179 | 80 | 0.242 | Male | 58 | 3.621 | 1.309 |
| | Equal variances not assumed | 1.199 | 44.552 | 0.237 | Female | 24 | 3.250 | 1.260 |
| Lack of Interest | Equal variances assumed | 0.670 | 80 | 0.505 | Male | 58 | 3.500 | 1.260 |
| | Equal variances not assumed | 0.654 | 40.857 | 0.517 | Female | 24 | 3.292 | 1.334 |
| Lack of technical staff | Equal variances assumed | 2.164 | 80 | 0.033 | Male | 58 | 3.914 | 1.014 |
| | Equal variances not assumed | 2.127 | 41.468 | 0.039 | Female | 24 | 3.375 | 1.056 |
| Lack of time | Equal variances assumed | -1.110 | 80 | 0.270 | Male | 58 | 4.328 | 0.659 |
| | Equal variances not assumed | -1.163 | 47.781 | 0.251 | Female | 24 | 4.500 | 0.590 |
| Lack of awareness | Equal variances assumed | 0.494 | 80 | 0.622 | Male | 58 | 3.793 | 0.951 |
| | Equal variances not assumed | 0.438 | 34.089 | 0.664 | Female | 24 | 3.667 | 1.274 |
| Lack of training from head office | Equal variances assumed | 1.420 | 80 | 0.160 | Male | 58 | 4.034 | 0.561 |
| | Equal variances not assumed | 1.346 | 38.523 | 0.186 | Female | 24 | 3.833 | 0.637 |

Table 8. Independent samples test of the school level ICT policy formulation challenges.

| Items | | t | df | Sig. (2-Tailed) | Gender | N | Mean | Std. Deviation |
|--|-----------------------------|--------|--------|-----------------|--------|----|------|----------------|
| Lack of Organizational/School level ICT policy planning | Equal variances assumed | 2.629 | 80 | 0.010 | Male | 58 | 4.00 | 1.06 |
| | Equal variances not assumed | 2.330 | 34.060 | 0.026 | Female | 24 | 3.25 | 1.42 |
| Lack of regular body for ICT policy formulation and review in schools | Equal variances assumed | 0.731 | 80 | 0.467 | Male | 58 | 3.43 | 1.48 |
| | Equal variances not assumed | 0.722 | 41.816 | 0.475 | Female | 24 | 3.17 | 1.52 |
| Lack of ICT policy at Provincial/regional context | Equal variances assumed | 1.923 | 80 | 0.058 | Male | 58 | 3.60 | 1.34 |
| | Equal variances not assumed | 1.838 | 39.158 | 0.074 | Female | 24 | 2.96 | 1.49 |
| Lack of involvement of stakeholders in the formation of ICT policy plan for Schools | Equal variances assumed | -0.139 | 80 | 0.890 | Male | 58 | 3.24 | 1.51 |
| | Equal variances not assumed | -0.142 | 45.376 | 0.887 | Female | 24 | 3.29 | 1.43 |
| Lack of proper follow of National ICT Strategy and Policy | Equal variances assumed | 1.326 | 80 | 0.189 | Male | 58 | 4.07 | 1.18 |
| | Equal variances not assumed | 1.234 | 37.196 | 0.225 | Female | 24 | 3.67 | 1.40 |
| Lack of Local community support technically and financially | Equal variances assumed | 1.103 | 80 | 0.273 | Male | 58 | 3.83 | 1.37 |
| | Equal variances not assumed | 1.087 | 41.682 | 0.283 | Female | 24 | 3.46 | 1.41 |
| Lack of Policy planning for ICT awareness campaign in social, ethical, career, and legal issues for school communities and communities/parents | Equal variances assumed | 1.079 | 80 | 0.284 | Male | 58 | 3.40 | 1.40 |
| | Equal variances not assumed | 1.138 | 48.554 | 0.261 | Female | 24 | 3.04 | 1.23 |
| Lack of empowerment and freedom to the principal for developing school level policies | Equal variances assumed | 1.463 | 80 | 0.148 | Male | 58 | 3.67 | 1.30 |
| | Equal variances not assumed | 1.456 | 42.555 | 0.153 | Female | 24 | 3.21 | 1.32 |
| Lack of support and share of an existing ICT policy of any school with counterparts or near-by schools | Equal variances assumed | 0.808 | 80 | 0.421 | Male | 58 | 3.79 | 1.27 |
| | Equal variances not assumed | 0.795 | 41.505 | 0.431 | Female | 24 | 3.54 | 1.32 |

Most of the principals agreed that they have challenges of ICT formulation at the school level. Tables 4, 5, 7 and 8 and Figures 4 and 5 cover the details of the challenges faced by the school principals.

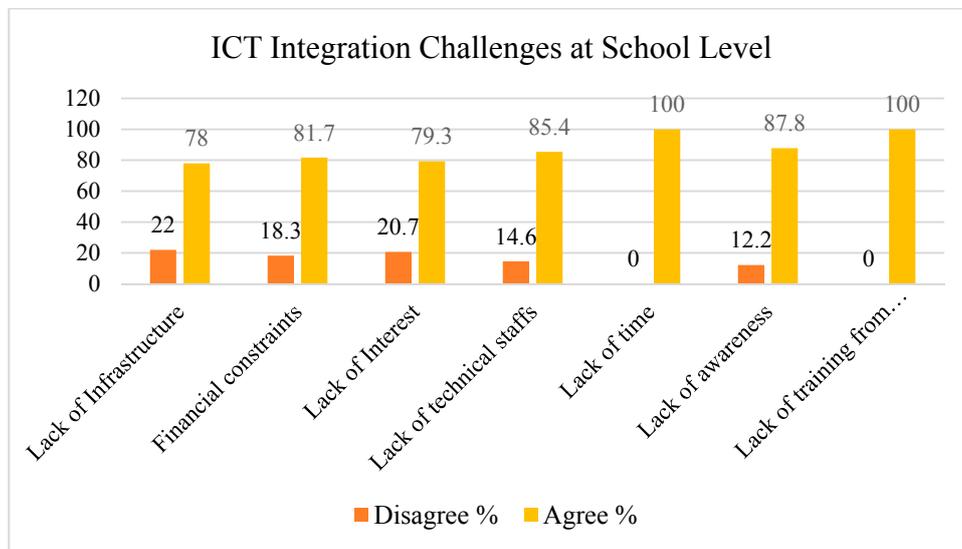


Figure 4. ICT integration challenges at the school level.

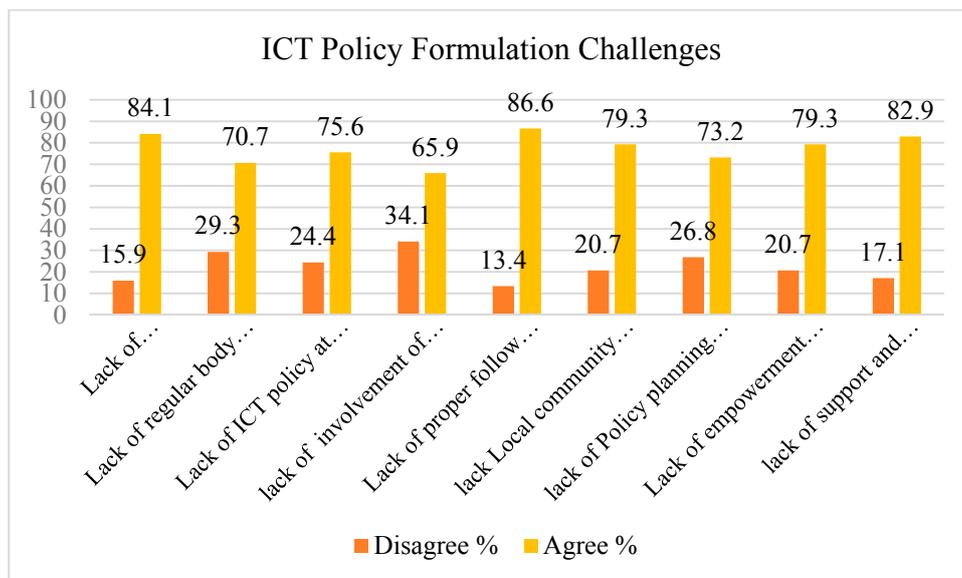


Figure 5. School level ICT policy formulation challenges.

The results in Table 8 show that there is no significant difference in ICT policy formulation between male and female principals. The highest *p*-value of the question “Lack of involvement of stakeholders in formation of ICT policy plan for schools” is 0.890 for equal variances assumed and 0.887 for equal variances not assumed. Moreover, the lowest *p*-value of the question “Lack of organizational/school level ICT policy planning” is 0.10 for equal variances assumed and 0.026 for equal variances not assumed. Both male and female principals facing challenges in ICT formulation at the school level should be considered on a priority basis for implementation and integration of ICT at the school level.

6. Discussion

6.1. Qualified Young Principals as an Asset to Schools

The data revealed that these school systems have a majority of young, qualified principals (i.e., 58 male and 24 female). These qualified principals from mountainous rural areas, having a Master's Degree as a minimum qualification, would be a strong asset to their schools if the school systems were to focus on the effective utilization of their skills in computers and knowledge of ICT in formulating a school based ICT policy. The data shows that these principals vary in age (i.e., a lower limit of 20 years to an upper limit of above 40 years), qualification (from intermediate to postgraduate level), and the level of training but there is no significant difference in gender wise competencies. For example, principals in the age group from 25 to 30 are 25% and in the same age group 56% principals hold Master's degree (16 years of education) who have taken some training on ICT. This shows that, on the one hand, there are some quite young principals (both male and female) with less experience, and on the other hand, there are some more experienced principals. However, there is no significant difference in age that is related to the nature of the challenges they face in formulating a policy on ICT in their respective schools. Thus, systems can better utilize the knowledge and skills of both young and experienced principals for developing a system-based ICT policy in line with that of national ICT policy guidelines.

6.2. Principal Competence

In all three systems, it has been identified that the majority of the principals are competent enough to formulate an ICT policy for their schools because they are good at technology handling skills [11]. Results revealed that 80.96% of the principals agreed that they use computer hardware (e.g., computer, scanner, printers, interactive whiteboard, multimedia, etc.). Moreover, 75.6% agreed that they can easily use application software packages such as publishing tools (e.g., Publisher, Page maker), word processing, presentation, spreadsheet, database (Excel, MS Access), image processing software (Photoshop and Drawing tools), and 24.4% disagreed with the statement. In addition, 82.66% agreed that they can use communication tools (e.g., Email Chatting such as Yahoo Messenger, Skype, Blogs, Wikis, and Social sites such as Facebook, Twitter, Hi5, etc.). This shows that a majority of the principals are good at computer technologies and they know how to operate computer hardware, as well as computer software programs to benefit from the technologies in their lives. This further infers that there is no significant relationship between the principal's competences and the formulation of a policy on ICT at the school level with a specific reference to gender. However, principals with competence in ICT can be assets for schools to formulate and integrate policies on ICTs in their schools depending upon other factors facilitating to this end.

6.3. ICT Integration Challenges

A total of 80.48% agreed that they have knowledge on how to integrate ICT in teaching and learning [3] by using tools (e.g., learning management system software, open educational resources, Internet for search resources such as ICT for schools' resources, training, teaching and learning materials, school project websites, and the ministry of education website, etc.). The previous literature also supports the findings that the teachers that have computer knowledge and skills can better integrate the policy in their teaching and learning if other factors such as availability and accessibility of all the relevant ICT resources are ensured [3,8,9,11]. The results show that the school principals have enough expertise on how to integrate technology in their teaching and learning practices to improve, which is also based on systems support such as freedom for the school principals to take initiatives to improve practices [11]. Therefore, in the context of sample schools, the issue is neither with the principals' competence to formulate a policy on ICT nor with the gender wise difference. However, the main issue is the lack of encouragement, empowerment, and school's readiness in terms of providing freedom (i.e., a desirable level of autonomy in decision making), due to which the school principals could not

take initiatives such as developing a school vision and working on policy related matters in the school. This ultimately affects the principal's decision-making power regarding creating new opportunities to formulate ICT policy in schools, as well as implementation at their own school level. It is inferred that for stakeholders at the policy level to empower school principals, as educational leaders expecting to improve schools with technology integration, seems to be very difficult.

However, these school principals have some other specific problems such as lack of infrastructure [36], finances for installing technology and related equipment, Internet facility, lack of technical staff, time for technology usage (allocating a period for students to learn ICTs, etc.), awareness and training facilities, and absence of vision on ICT policy [31]. Such kind of challenges with these school systems do not support the principals to install technological tools at the school and integrate them in teaching learning. Therefore, before the integration of technologies at the school level, it is fundamental to formulate a policy on ICT for schools, develop capacities of principals to lead in policy formulation, apply ICT policy integration frameworks, and develop indicators to monitor and evaluate technology integration.

Keeping in view the above mentioned challenges with the school system in GB, it is essential to create a conducive learning environment at the school level [1,37] through providing basic facilities [8], introducing proper planning [5], installing an effective and efficient evaluation mechanism, and allocating special funds for technology integration [38].

Moreover, the systems need to develop content in local languages, organize more opportunities for professional training of teachers [39], involve teachers in ICT policy planning [17], engage teachers in development of strategy for the integration of ICTs in teaching and learning, and ensure the involvement of school stakeholders [40]. To develop an effective and efficient ICT policy, the stakeholders such as professionals from the community, principals, ICT coordinators, and teachers should be involved [41].

7. Recommendations

In light of key findings of the research, it is recommended that the systems should:

- Empower and encourage school principals to develop an ICT policy at the school level.
- Schools should develop a mechanism on how to implement the policy at the practice level [29].
- Schools should keep a national ICT policy document before formulating its own ICT policy.
- Provide all required ICT resources such as ICT equipment and trained human resources, etc.
- Proper budgetary plan for implantation of ICT at the school level.
- Provide trainings on ICT policy formulation and integration in teaching and learning practices at their schools.
- There should be an effective and efficient evaluation and monitoring system at the school level [42].

8. Conclusions

The study concludes that in all these three systems, school principals, both male and female, have some basic understandings of ICTs and their level of competence is at a desirable level. However, these principals are facing many challenges regarding the formulation and integration of ICTs in teaching and learning. Moreover, it is revealed that there is no such ICT policy, not only at the school level but also at the provincial level, except a document on national ICT policy. Therefore, principals need to formulate their own ICT policy at the school level in light of the national ICT policy document. In so doing, schools can reduce their challenges regarding ICT policy guidelines and its implementation to improve teaching and learning practices at schools. Without having the policy documents at school, in line with the school vision, it appears to be very challenging for principals to integrate technologies to improve teaching and learning. In light of such challenges for school principals, they appear to recommend that ICT plans should develop at the school level. School principals, both male and female, face some context specific challenges such as lack of infrastructure, poor allocation of financial resources to formulate the ICT policy at the school level, and integration in teaching and learning practices. Moreover, schools have a lack of technology-related equipment and Internet facility, as well as an

absence of highly trained technical staff. The study revealed that schools need to focus on raising more awareness on the importance of ICT policy integration in order to enhance teaching learning practices at schools. The study reveals that providing trainings to principals and all the necessary technological tools to schools may enable the systems to integrate technology in teaching and learning practices.

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