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The Use of Digital Technology in Implementing Differentiated Instruction in Teaching and Learning Process among Public Secondary Schools in Magu District Mwanza Region Tanzania

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Abstract: *The main purpose of this study was to examine how teaching and learning are implemented using digital technology or modern gadgets in differentiated instructional approaches to improve the teaching and learning process in secondary schools in Magu District. Specifically the study focused on to identify the rationale of technological resources for a differentiated instruction in teaching and learning process. The study was guided by Multiple Intelligence Theory. The study adopted mixed research approach and convergent parallel research design. The sample size was 187 participants. Quantitative data were collected through questionnaires and analyzed using descriptive statistics with the aid of Statistical Package for Social Science (SPSS) version 20 and presented in frequency, percentages, graphs and charts. Qualitative data were collected through interview and focus group discussion and it was analyzed thematically by creating themes. The study unveiled that the use of digital technology in implementing differential instructional approaches was not effective. The use of this approach is likely to contribute to improved teaching and learning, hence good academic performance in the district. Thus, the government should prioritize the use of technology at secondary schools, especially the public ones, which the government ensured with funds to run the school routine activities.*

Keywords: *Digital Technology, Secondary School, Teaching and Learning, Differentiated Instructional Approaches*

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1. Introduction

Differentiated instructional approach is the integration into teaching and learning that recognizes and supports individual differences in learning which teachers practice to modify teaching methods, resources and learning activities. This concept of differentiated instructional approach that identifies the use of technology in teaching

and learning was supported by Howard Gardner's concept of Multiple Intelligence. According to Tolimson & Imbeau (2010), Multiple Intelligence recognizes the purpose of emphasizing various learning styles as a setting whereby teachers were encouraged to consider students' unique learning styles as being blessed with different talents. Thereafter, differentiated educational activities presented in the class to provide for those that differ in learning styles on; what is learned, how the content is mastered by the students and how learning is carried out and evaluated. Differentiated instruction is not individualized instruction but precisely described as classroom practice with a balanced emphasis on the individual student and course content.

During previous decades of school reform, differentiated instructional approach was widely adopted as an approach to individualizing instruction for various learner profiles. No matter the students' learning styles, strength, needs and abilities, educators began to adopt classroom curricula and activities to meet these differences. In recent years, educators began utilizing new technologies and tools to empower teachers to personalize learning for every student (Henderson, 2016).

Technology has been and is considered as an important attribute in shaping learners and harnessing them as they struggle to accomplish their studies and acquire what they need. Technology in education is so far known as Digital Technology; its programs connect education to the real-world experiences and also promote equity, access and opportunity for all students. Not only that but also students develops more responsibilities for and control of their learning with more choices around the place, time and location of instruction (blog.mheonline.com).

According to Swart and Wachira (2010), MoEVT recognize the potential of applying technology to act as a tool for improving education delivery, outcomes and impact as it is addressed in the 2025 Tanzanian Vision. Referring to Calder (2009), in most regions in Tanzania, for instance in Morogoro, there are challenges for integrating technology in education. Among other things, challenges for integrating technology include low energy technology, poor maintenance of computers, lack of renewable energy; student centred learning and appropriate use of technology in learning. Despite provision of equal opportunity and education for all that Tanzania is trying to enforce, still barriers to differentiated instructions especially technological ones seem to be difficult to implement.

The government of Tanzania introduced the first National Information and Communications Technology (ICT) Policy in 2003 to support the adoption of digital technologies in the education sector, especially in the teaching and learning process. The emphasis of digital technology in teaching and learning process there were limited accessibility and network connection, limited technical support, lack of effective training, limited time and lack of teachers' competency (Srivastava & Dey, 2018). Despite the effort made by the government of Tanzania to ensure the use of digital technology for instance the introduction of TEHAMA program in schools to reinforce effective teaching and learning process, still the scenario in Magu District differ where there are schools having digital technology tools but students don't have access to them leading to the ineffectiveness of teaching and learning process in Magu to be questionable. In this sense there is a need to research on the use of digital technology in implementing differentiated instruction for effective teaching and learning process in Magu District.

1.1 Statement of the Problem

The main target with teaching is to generate and impart knowledge, information, values and skills to students. Using instructional technologies promotes sharing ideas, thoughts, feelings and knowledge (Macharia, 1987). The shortage of digital resources and programs, lack of internet equipment and unsupportive environment like weak internet connection hinders the use of technology as one of the important differentiated instruction in teaching and learning in secondary school. Komba (n.d) notes that the strategic priorities of Secondary Education Development Plan (SEDP) in 2005 mentioned four priorities including enrolments, expansion, quality improvement and optimizing human materials and financial resources utilization. However, the issue of integrating technology as one of the differentiated instruction in teaching and learning was not planned. The major problem of this study was ineffective use of digital technology in teaching and learning process in Magu public secondary schools as some of the schools are blessed with such media equipment, but they do not benefit the students and some are full of dust. There was a need to find out the challenges that learners encounter when trying to use media technology and for that matter, it was an assumption of a researcher that there is no effective use of digital technology in implementing differentiated instructional approaches which finally lead to the ineffective teaching and learning process using digital technology. This needs to be verified in the current study as to why the challenge still persists. Therefore, this study was important mostly because of the crucial need of technology especially in today's world of globalization and internet. However, most studies done haven't mentioned technology to be part of the study as most researchers focused other variables. Additionally, the need to examine the strategies that could be taken to improve the use of media technology in differentiated instruction to improve teaching and

learning process in public secondary schools in Magu District in Mwanza Region.

1.2 Purpose of the Study

This study aimed to examine the use of digital technology in implementation of differentiated instruction to improve teaching and learning process in public secondary schools in Magu District, Mwanza Region. The study specifically focused on to determine the rationale of digital technological resources in implementing differentiated instruction for teaching and learning in secondary schools

1.3 Significance of the Study

The findings from this study will add a body of knowledge to secondary school students and teachers on how the use of digital technology is important in implementing differentiated instruction in order to deal with the issue of learners with different abilities and respond to students' individual needs. Also the findings may help policy maker in education and curriculum developer to integrate the aspect of the use of digital technology in implementing differentiated instruction in the curriculum and education policy. The findings of the study may help the educational leader to identify the challenges facing teachers in the implementation of differentiated instruction with the use of digital technology and the way forward to resolve the challenges identified.

1.4 Framework

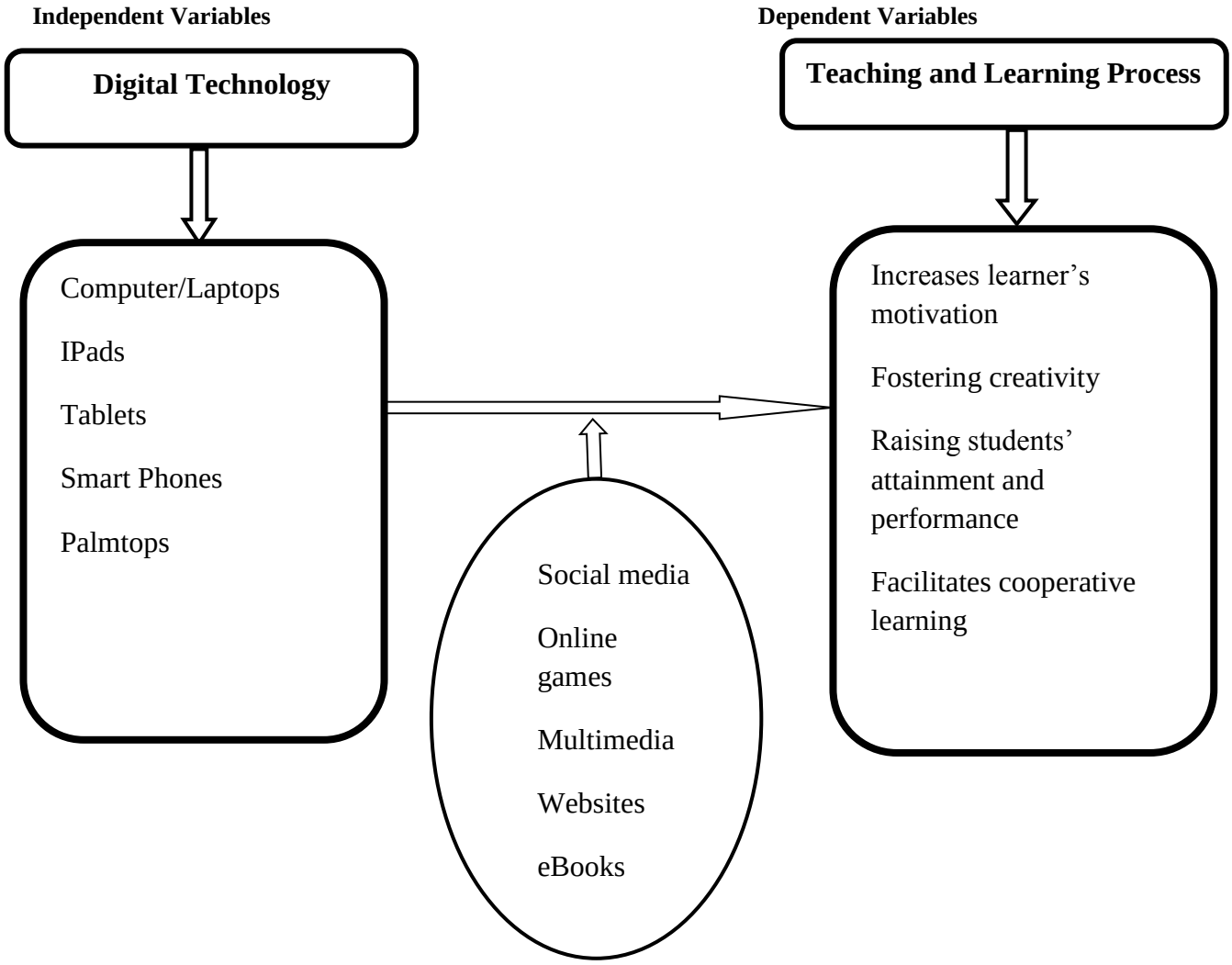

Figure 1: Conceptual Framework

Figure 1 above presents a conceptual framework which shows the association on how the use of technology in implementing differentiated instruction is geared to improve the teaching and learning process. The digital technology acts as Independent variables which include the use of Computer/Laptops, iPads, Tablets, Smart Phones, palmtops and the dependent variables include teaching and learning process with its sub variable like increasing learner's motivation, raising students' attainment and performance, facilitating cooperative learning and fostering creativity. The two variables relate in the way that the use of digital technology in implementation of differentiated instruction lead to effective teaching and learning process if well utilized. Also, the independent and dependent variables are interlinked by social media, e-Learning, e-Books, multimedia and online games that complete the connection between the two. The indicators of independent variables, if well manipulated, would provide positive outcomes to the dependent variables.

2. Literature Review

2.1 Theoretical Review

Multiple Intelligence Theory

According to Gardner (2006), Multiple Intelligence Theory was developed by Howard Gardner in 1983. The theory states that many kinds of human intelligence are independent of one another. This enables them to engage in intellectual activities in different ways. Successful educators realized that learning styles vary and that all students must make personal meaningful connections to the content to maximize learning opportunities.

The Multiple Intelligence Theory recognizes that individuals show intellectual ability in eight different scopes which are linguistic intelligence, logical-mathematical, music intelligence, bodily-kinesthetic, interpersonal, intrapersonal, naturalistic, and visual-spatial intelligence (Gardner, 2003). Individuals are intellectually stimulated by varied activities and social events specific for each intelligence (Gardner, 1983). Linguistic learners show sensitivity to words and language which is often challenged through reflecting, writing, and speaking. Logical-mathematical leaners refers to persons who experience a sense of excitement when they solve logical or mathematical problems. Spatial intelligence is the ability to manipulate objects through visual stimulation and learn through imagery. Engaging in social situations and being successful in an interactive environment are interpersonal skills. However, intrapersonal intelligence is a self-reflection as a primary component of the learning process (Owen, 2004). Multiple Intelligence Theory helps students to serious learn since some students can learn very well linguistically based on reading and writing. Others can learn well through mathematical-logic based learning while others can learn by seeing the images and by doing.

2.2 Empirical Review

Rationale for the use of technological resources in implementing differentiated instruction to improve teaching and learning process

Fostering Creative Thinking

Greenstein (2012) alludes that creative thinking is the ability to create something or to make something that already exists into something new. The student's creative thinking skills differ from one another and can be improved based on the teaching methodologies used by a teacher. Similarly, Zubaidah, Fuad, Mahanal and Suarsini (2017) assessed the improvement of the creative thinking skills of students through differentiated science inquiry in Indonesia. Based on their findings, there was a score difference in student's creative thinking skills based on the different methods used in the teaching and learning process. Their creative thinking skills were more improved since teachers employed many teaching methods in the class to make student's mind think critically. Hence, improvement of teaching and learning process was realized compared to the students who were taught by using a conventional/traditional model of teaching.

Increases Learner's Motivation

Roslan, Abdullah, & Hajimaming (2014) on the study about the effects of differentiated learning methods in teaching on student's motivation, found out that the method of teaching has a direct effect on student's motivation either to be increased or decreased. The implementation of a differentiated instruction approach like the use of media technology helps the students to develop a strong problem-solving approach in dealing with the subject matter and increase motivation to the learners since learners automatically are attracted to engage in learning activities and improve teaching and learning process. Also, Burkett, (2013) comments that monitoring the daily activities engaged teachers in supporting and motivates the students to take responsibility for leaning daily routines. Therefore, the use of technology increases student's participation and awareness in the learning process which improve their learning morale and motivation. In Tanzania for instance, at EATV Media (SKONGA session) provide

opportunities for students to demonstrate the new knowledge. The students are highly motivated to engage in demonstrations that are either live or recorded and presented on the Television.

It Facilitates Cooperative Learning

Ismail & Allaq (2019) asserts that the use of digital technology as one of the differentiated instructions helps students to work in collaboration, either with students group or with teachers to accomplish projects and tasks which strengthen their confidence and improve their learning performance. The use of technology in implementing the differentiated instruction enhances active students' participation through cooperative learning between teacher-student and student-student from all over the world through networking.

3. Methodology

This study used a mixed research approach. According to Bazeley (2019), a mixed research method is a research approach whereby a researcher interlinks both statistics and texts within a single study. Under mixed research approach the study employed the convergent parallel design where the researcher went to the field once and collected both qualitative and quantitative data concurrently and merged the findings together. This study employed both probability and non-probability sampling and the sample size of this study was 187 obtained from 4436 targeted population.

Data Recording and Analysis

Qualitative data was recorded through field notebook and audio recording equipment (telephone) and qualitative data was analyzed through thematic analysis where the content with similar themes were grouped together and presented in a narrative form. Quantitative data was recorded by respondents in the space provided in the questionnaires. The data was processed, coded, and then analyzed by using descriptive analysis with the helper of computer program called Statistical Package for Social Science (SPSS) version 20.

4. Results and Discussion

Rationale of Digital Technological resources in implementing differentiated instruction for teaching and learning in secondary schools

The topic was guided by the research questions namely, "how does the use of digital technology as one of the differentiated instruction improve learning process in public secondary schools in Magu District of Mwanza Region. This objective targeted to discuss out the advantages that students/learners and teachers may benefit from using digital technology in the implementation of differentiated instruction to enrich teaching and learning process in public secondary schools in Magu District of Mwanza, Tanzania. The accompanying question was responded by the District Education Academic Officer of Magu District, Heads of selected public secondary schools through the prepared structured interview, and public secondary school teachers to respond to the questions by filling the questionnaire provided. The public form four secondary school students did Focus Group Discussion with the researcher.

In the study, several factors were considered including the rationale on the use of digital technological resources for a differentiated instruction in teaching and learning process in secondary schools. In this perception teachers were asked to rate the level of agreement on the rationale of the use of digital technological resources in implementation of differentiated instruction to improve teaching and learning process in secondary schools. Table 1 shows the frequency distribution on the response of the teachers on factors for the rationale of the use of digital technological resources for a differentiated instruction in teaching and learning process at secondary schools as the findings are presented below;

Table 1 Teacher's response on the Rationale of the use of Technological for a Differentiated Instruction.

No	Statement	1		2		3		4		5	
		F	P	F	P	F	P	F	P	F	P
1	The use of technology in implementing differentiated instruction to improve teaching and learning fosters creativity to the learners	37	43	39	44	9	10	2	2	-	-
2	Presence and use of media technology increase the earners motivation and readiness into learning	58	67	24	28	4	5	-	-	-	-
3	The use of technology as one of the differentiated instructional approaches to improve learning inspire and facilitates cooperation among students from different location	51	59	26	31	9	10	-	-	-	-
4	Media technology insulates to good performance of students when integrated into teaching and learning as one of the differentiated instructional approach	38	44	44	52	2	2	2	2	-	-
5	The use of media technology inspires readiness and reduce students drop out rate	46	53	28	33	11	12	-	-	2	2

Source: Field Data (2021).
Key: 1-Strongly Agree; 2-Agree; 3-Neutral; 4-Disagree; 5-Strongly Disagree; F-Frequency; P-Percentage

The data in table 1 above indicate the level of agreement among teachers on the rationale of the use of digital technological resources for a differentiated instruction in teaching and learning process in secondary schools where factors such as fostering creativity to the learners, increasing learners motivation and readiness into learning, improving learning inspires and facilitates cooperation among students from different locations, inculcates good performance of students and inspirational to readiness and reducing students' dropout rate. The findings regarding this study on the use of digital technology in implementing differentiated instruction is consistency with theory of Multiple Intelligence by Gardner (1983) in the sense that students/learners require many ways through which they can master their subjects and produce meaningful contents. Considering Gardner, (1983) students as individuals are intellectually stimulated using different activities and social events to reach a specific intelligence. Thus the use of digital technology could easily help students to master their studies, become creative and increase their performance.

The Use of Digital Technology Fosters Creativity and Improves Teaching and Learning Process

This sub theme was generated from the findings of the study as it is shown in the table 1 above. From the findings, 43 percent strongly agreed and 44 percent agreed with the statement, "the use of digital technology in implementing differentiated instruction to improve teaching and learning process fosters creativity to the learners" while 10 percent of teachers were not sure, 2 percent and 0 percent disagreed and strongly disagreed with the statement respectively. This inculcates that; in Magu District, the issue of using digital technology is considered crucial in the implementation of differentiated instruction which could foster creativity to the learners. This was also supported by the statements made by public secondary school teachers from the provided questionnaire where majority mentioned similar theme in different sentences and supported that using digital technology fosters creativity among learners.

The findings also corresponds with research findings' made by Zubaidah, Fuad, Mahanal & Suarsini (2017) on the assessment of the improvement of the creative thinking skills of students and found out that there was a score difference in student's creative thinking skills. Zubaidah et al. (2017) further explained that the students taught by using a differentiated instructional approach especially the use of technology, their creative thinking skills were more improved. But also Pellegrino & Athman (1997) supported the idea that the use of digital technology fosters creativity that the use of technology helps students to move from being knowledge consumers to being knowledge producers. In addition from the study made in public secondary schools in Magu District, the information provided during interview with Head of school A examined the use of such digital technology

and how it fosters creativity to the learners and in this the interviewee was quoted:

> *The use of digital technology gives students/learners the power to design new things and ability to think beyond and manage to produce something new (Interviewee's response, 2021)*

The researcher also prepared an interview schedule with the District Education Academic Officer of Magu District on the same matter. For DEAO, fostering creativity to the learners was highly pointed out and bolded to be the leading advantage of using digital technology in implementation of differentiated instruction to improve teaching and learning at secondary school in Magu District Mwanza Region of Tanzania. In the quote, "Students are becoming more creative by using digital technology" (Interviewee's response, 2021) The explanation from DEAO signifies that the reality that the use of digital technology fosters creativity to the learners. Either the information provided during FGD with form four students of selected schools shows that the use of digital technology in teaching and learning really adds the power to the students' minds and gives them ability to think beyond and become creative especially by being able to translate the theories taught in class into practice and produce good tangible materials. For instance, by doing experiments, integrating media into practical and the like, made them become more creative. One participant from one of the groups at school A, commented, "Computer makes me enjoy when I am studying and the most thing which I like the most is to see the videos with different teachings that make me become creative" (FGD, 2021).

The Use of Media Technology and Increase in the Learner's Motivation and Readiness into Learning

The stated theme was generated from the findings collected during field study on the use of digital technology in implementation of differentiated instruction to improve teaching and learning process in Magu District Mwanza Region, Tanzania. As it can be traced from the table 1, most respondents agreed with the statement that the use of digital technology in teaching and learning increase learner's motivation and readiness into learning. 67 percent of the teachers through filling the provided questionnaires strongly agreed with the statement, 28 percent of teachers agreed with the use of digital technology and its power to increase learner's motivation and readiness for learning, 5 percent of teachers were not sure of the statement, 0 percent of teachers and 0 percent of teachers disagreed and strongly disagreed with the statement respectively.

The findings corresponds with Roslan, Abdullah, & Hajimaming (2014) on the study about the effects of differentiated learning methods in teaching and implementation of differentiatedinstruction approach like the use of digital technology helps the students to develop a strong problem solving approach in dealing with the subject matter and increase motivation to the learners since earners are automatically attracted to engage in learning activities and improve teaching and learning process. But also Burket (2013) positively corresponds to the theme that the use of digital technology increases learners' motivation and readiness into learning from the statement "monitoring the daily activities with engaged teachers in supporting, motivates the subject to take responsibility for learning daily routines."

In addition to that the outlines made by teachers by filing spaces on the rationale of the use of technological resources for a differentiated instruction in teaching and learning process in secondary schools where most of the teachers mentioned sentences with similar theme(s) that the use of digital technology increase learners motivation and readiness into learning.

Moreover from the findings/information collected from the interview with District Education Academic Officer agree with increasing learner's motivation and readiness into learning accredited the use of digital technology in secondary schools from the statement, "The use of digital technology in secondary schools has given students/learners the desire to find out extra things that integrate them in learning" (Interviewee's response, 2021)

The same idea was provided by one of the heads of public secondary schools in Magu District from school 'A' during interview conducted on the rationale of the use of digital technology to increase motivation and readiness among students. The head of school had this to say, "Students get motivated when they use technological devices in their studies. For example using of computers, projectors, television motivates them." (Interviewee's response, 2021*)*

From the given statement, it is true that the use of digital technology increases learners/students' motivation and readiness into learning process as this was also supported by another head of public secondary school from school 'B' and was quoted saying, "Technology is important in our daily life and to the students as it gives them motivation and the desire to find more materials and engage well in their studies" (Interviewee's response, 2021).

In the group of form four public secondary school students in Magu District on the rationale for the use of digital technology resources for a differentiated instruction in teaching and learning process in secondary schools and how it increases motivation and readiness into learning among students, the findings are as indicated below. From the Focus Group Discussion made between researcher and form four students, one participants in group 2 from school 'B' was quoted saying,

> *The use of technology improves teaching and learning process because it enhances motivations to students (FGD, 2021)*

The Use of Digital Technology Aspire Cooperation among Students from Different Location to Improve Learning Process

In connection with this theme, the use of digital technology in implementation of differentiated instruction to improve teaching and learning in public secondary schools in Magu District through, the researcher wanted to know the rationale for using digital technology in implementing differentiated instruction to improve teaching and learning. According to the findings collected from the field using the provided questionnaire to the public secondary school teachers, 59 percent of teachers responded by strongly agreeing with the statement that the use of digital technology hugely aspires cooperation among students from different locations. As table 1 reveals, 31 percent of teachers agreed with the statement, 10 percent of teachers were not sure if using digital technology can aspire students into positive cooperation while 0 percent of teachers did not agree and 0 percent strongly disagreed with the statement that the use of technological resources have nothing to do with aspiration to students' cooperation from different locations.

These findings agree with Crowder (2011) in the study on differentiated instruction that using technology strengthens the relationship between student-student and teacher-student relationships which facilitate cooperative learning. He further adds, 'technology can engage students in real world activities for example in sciences field, electronics probes allow students to collect precise weather or chemical reaction data and digitally trace trends and answer hypothesis (Crowder, 2011). The idea is also supported by Ismail & Allaq (2019) that technology as one of the differentiated instructional approach helps students work in collaboration, either with students' groups or with teachers to accomplish projects and improve learning process outcomes.

From the interview conducted to the District Education Academic Officer on the same study about the rationale for the use of technological resources for a differentiated instruction in teaching and learning process in public secondary schools, the DEAO was quoted saying, "The use of digital technology in studying in secondary schools makes communication easy among students from different schools" (Interviewee's response, 2021)

The statement supports directly the theme that digital technologies have to do with cooperation among students from different locations. The DEAO also added, "The use of technology also helps teachers from different schools to share teaching materials for example using WhatsApp, telegram etc." (Interviewee's response, 2021)

From the two given quotes by DEAO, it is clear that the use of digital technology aspire cooperation in teaching and learning process in implementation of differentiated instruction to improve teaching and learning process at public secondary schools in Magu District.

Moreover, the information provided during interview conducted to the head of the school 'B' on the rationale for the use of technological resources, cooperation and good communication were highly pointed out. The head of school contributed that one of the rationale for using digital technology in implementation of differentiated instruction is facilitation of cooperation and communication among students/learners that automatically improves teaching and learning. The head of school 'B' was quoted saying, "Technology is important in the sense that it gives learners opportunity to communicate from different locations and this communication enables them to cooperate and share studying materials" (Interviewee's response, 2021)

The Focus Group Discussion as conducted to form four secondary school students on the same study about the rationale of the use of digital technology in implementation of differentiated instruction to improve teaching and learning at public secondary schools in Magu District revealed that several students from different visited secondary schools shared that the use of technology has impacts to the students as they bring themselves together in learning. One participant from group 1 in secondary school 'B' was quoted saying, "Through using technology in studying can facilitate sharing of subject material between students from different schools." (FGD, 2021).

From the above given statement, the particular student positively agrees with other respondents concerning this study and specifically this sub-theme that the use of digital technology aspires cooperation among students in secondary schools.

The finding obtained from the field accordance with the research objectives. In this chapter data were presented through two types of data such as Quantitative data were presented by using tables and charts and qualitative data information was presented through explanations using quotations.

5. Conclusion and Recommendations

The findings posited that among the important justifications for the use of technological resources in teaching and learning process are improvement in teaching and learning through creativity to the learners, increase learners motivation and readiness into learning, facilitation of cooperation among students from different locations, inculcate good performance and controls student drop out among others. The findings convinced the researcher to conclude that the effective use of digital technology in implementation of differentiated instruction have a greater chance to improve teaching and learning process in public secondary schools in Magu District, Mwanza Region, Tanzania. Also, the ministry of education should prepare good policies and curriculum that allow and support for the use of digital technology in schools to implement differentiated instruction that automatically improves teaching and learning process at secondary schools.

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