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Usability of Electronic Instructional Tools in the Physics Classroom

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Abstract

Information Communication Technology (ICT) is becoming valuable tools to help improve education, especially during teaching and learning of Science, Technology, Engineering, and Mathematics (STEM) subjects. In this regard, we conducted this study to explore the usability of ICT tools in Physics taught courses. To collect data, we used classroom observation protocol for undergraduate STEM to assess how teachers and learners spend time on classroom activities among day and boarding schools and urban and rural schools. We also surveyed physics teachers after a short workshop on the use of PhET simulations and YouTube videos for teaching optics to reveal their workability and usefulness. As a result, we found that teachers in the day schools guide and assign more work to their learners, allow them to work in groups more than those in boarding schools. Similarly, learners in rural schools spend much time working in groups more than their colleagues in urban schools. However, teachers in urban schools spend much time guiding their learners than teachers in rural schools. Teachers use more of textbooks among various instructional tools. Teachers were not aware of and used to PhET simulations and YouTube videos in physics class; however, after the workshop, they conceived them as convenient electronic instructional tools that can accelerate the active learning of Optics. Since these resources are free to access and easy to use, we highly recommend teachers to use them in their daily teaching and learning activities.

Keywords: electronic instructional tools, YouTube videos, PhET simulations, active learning of optics, Rwandan physics classroom

BACKGROUND OF THE STUDY

In order to guarantee access to basic education, the Government of Rwanda adopted Twelve Year Basic Education (12YBE) since the year 2012 (Rwanda Ministry of Education, 2013). This policy boosted the enrolment rate in upper secondary education from 181,916 students in 2012 to 209,840 students in 2017 (National Institute of Statistics of Rwanda, 2018). Such big enrolments were arrived at because of the uniqueness in the implementation of Twelve Year Basic Education such as (i) being fully day schools, (ii) involvement of the community in massive school construction, (iii) government subsidies in terms of capitation grant and school feeding among others.

Moreover, while primary school leavers used to get limited chances for further studies due to factors like (i) limited boarding school capacities; (ii) limited affordance to boarding fees, and (iii) absence of secondary schools in many remote rural areas, with 12YBE, the transition rate from primary to secondary education exponentially increased.

Whereas secondary school boarders may detain the chance to have more time for after class self-study, boarding, and day schools, the same curriculum, and their candidates are subjected to the same national assessments. Another slight difference between boarding and day schools resides into school facilities and staffing. The present study was set, therefore, to evaluate the time spent on learners' and teachers' practices, considering the location and types of schools.

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Contribution to the literature

- This paper informs about Rwandan teacher flexibility and usability of PhET simulations and YouTube Videos towards physics classrooms, an area not yet tacked by the existing literature. It shades light into how the Rwandan classroom looks like and informs the extent to which the new curriculum is being implemented.
- The present paper discusses how differently teachers from rural schools or working in day schools alongside those from urban schools or working in boarding schools spend their time teaching physics. Therefore, it enriches the current literature, which was low in this matter.
- This study stimulates and motivates physics teachers to use PhET simulations and YouTube Videos as teaching resources. Therefore, it serves as a paramount impact on students as they will be able to learn with useful teaching resources.

Then, it extends to investigating teachers' insights on the use of dynamic methods as well as instructional tools.

LITERATURE REVIEW

Active learning happens when a learner is considered capable of learning him/herself by being served with all required instructions by the teacher through hands-on activities. For instance, according to Alarcon et al. (2010), active learning incorporates conceptual questions and hands-on activities to allow learners to apply acquired concepts into their daily activities as well as understand the nature. The study done in optics (Ndihokubwayo et al., 2020), has found that Rwandan students have misconceptions related to light phenomena such as why the sky is blue and not violet, why we see things, and why the sunset or sunrise is red. These misconceptions take source from teachers who are still prioritizing passive learning (Byusa et al., 2020), where teachers present knowledge more than they guide students while students only listen to teachers and take notes. Thus, more effective instructional tools and active strategies are needed.

In their study of the location of schools, Echazarra and Radinger (2019) reported that students in urban schools scored 31 points higher than rural schools in the area of Optics. Optics as a part of physics is one of many exciting concepts with a lot of natural phenomena needed to accelerate advanced technologies. Therefore, useful electronic instructional tools such as YouTube videos and computer simulations are required to raise student interest and understanding.

Much of the studies have proven that both conventional hands-on activities and computer-based activities raise learning gains (Ekmekci & Gulacar, 2015). The review of attitude on technological use done by Njiku et al. (2019) has found that teachers are highly integrating technology in education, and the liking construct from students has shown off. During the photoelectric phenomenon study (Taşlidere, 2015), there was a learning improvement to students who learned using simulations than those who did not use them. The study showed that the students' learning achievement significantly increased along the whole cycle of the 5E instructional model. These simulations also show their impact on raising not only performance but also students' motivation and interest to learn physics (Civelek et al., 2014). During the use of Computer simulation (Kibirige & Tsamago, 2019), students were motivated, and after learning, their achievement and conceptual understanding were improved and accelerated, respectively. Similar to simulations, teaching videos have contributed to learning progress and raising students' interest. In the Chou (2017) study, the 3D video instruction has statistically improved learning performance across natural sciences. In this study, students testified that it was fun, exciting, and interactive to learn through such instruction, and they were able to master the content.

While the mode of schooling, day and boarding, affects the performance of students in favor of boarding schools (Angstone et al., 2015), however, their investigation was limited in the current literature. In this regard, we designed this study to investigate the location and type of school variables after observing various classes using the Classroom Observation Protocol for Undergraduate STEM (COPUS). To strengthen this analysis, we practiced and manipulated computer simulations and watched YouTube videos with physics teachers. We observed, recorded, and shared their behaviors and insights about the workability and usefulness of these electronic instructional tools in this study. This study informs the similar classroom practices and variability among rural and urban schools as well as day and boarding schools to acquaint policymakers to take the right action. This study does benefit not only Rwandan teachers but also motivates other teachers from the rest of the world to adapt to the electronic resources in teaching Physics to teach their students actively.

In this study, we have answered the following questions:

i. How do the location and types of schools differ among observed classes?

ii. How do Physics teachers conceive the use of instructional tools in view to improve the active learning of optics in Rwandan secondary schools?

Table 1. Analysis table

	Location of school		Type of school		
Classroom code	Rural	Urban	Day	Boarding	Number of observations
C1	0	1	0	1	18
C2	0	1	0	1	6
C3	0	1	0	1	4
C4	0	1	1	0	5
C5	1	0	0	1	6
C6	1	0	1	0	4
C7	1	0	1	0	3
C8	1	0	0	1	8
C9	1	0	1	0	5
Total	5	4	4	5	59

Table 2. Percentage of Teacher and Students' activities (merged codes)

	All Observations	Type of School		Location of school	
Observations		Day	Boarding	Rural	Urban
Learners collapsed codes					
Receiving	49.9%	39.1%	54.0%	39.6%	57.6%
Talking to Class	50.6%	45.4%	52.6%	45.5%	54.4%
Working	26.1%	33.1%	23.5%	34.8%	19.7%
Other (Lear)	1.1%	0.4%	1.3%	1.4%	0.9%
Teacher collapsed codes					
Presenting	87.0%	66.5%	94.8%	74.3%	96.6%
Guiding	83.9%	85.8%	83.2%	82.6%	84.9%
Admin	0.3%	0.8%	0.1%	0.3%	0.3%
Other (Teac)	1.1%	1.8%	0.9%	1.0%	1.2%

METHODS

We used two approaches—classroom observation and teachers' survey—to carry out this research. Following our research questions, we used COPUS to answer the first research question and teachers' survey to answer the second research question. Smith et al. (2013) designed COPUS to track students' and teachers' activities in a classroom where the data are reordered in 2 minutes time interval and are analyzed in terms of the percentage of activities done or time spent by both teachers and students. Using this protocol, we observed 59 lessons from nine teachers during geometric and physical optics teaching within three months. We have analyzed the differences between time spent on classroom activities by teachers and students in rural and urban schools and day and boarding schools. We used descriptive statistics (percentages) to quantify the time spent and inferential statistics (an independent sample t-test) to weigh the significance of observed time spent percentages on various activities across our variables. Since three observations are the minimum and four observations are ideal, we have only considered teachers whom we observed at least three times. We recorded the location of the school (rural or urban) and type of school (day or boarding) under corresponding columns (see Table 1). Thus, out of nine observed teachers, five schools are from rural, while four are from urban areas, and four schools are day while five are boarding schools. C1 to C9 symbolizes the number of classrooms visited or individual teachers. Note that this should differ from the number of observations as one class was observed many times.

From 25 students and teacher's codes (Smith et al., 2013), we merged them into eight categories as the COPUS developers suggested (Smith et al., 2014). The overall observed activities performed by the teacher were rated at 87.0% of presenting, 83.9% of guiding, 0.3% of administration, and 1.1% of other (see Table 2). While observed how students spend time on different activities, receiving was rated at 49.9%, talking to a class at 50.6%, working at 26.1%, and others at 1.1%.

The data of classroom observation gave us a room to conduct a workshop on electronic tools as an intervention and survey teachers on their intuition about these tools. Therefore, to answer the second research question, we employed a questionnaire survey and focus group discussion. We used teachers' questionnaire to reveal the teachers' awareness and perception about active learning and instructional tools. In contrast, we used the focus group discussion to explore and evaluate teachers' opinions on the usability of these instructional tools. Before these surveys, we conducted a full day (9:00 am - 5:00 pm) workshop with physics teachers. We invited nine teachers, and five were present at the workshop site. We met them in Kayonza as a middle place between teachers from an urban and rural area—depending on our study site, and we met on Saturday to avoid disturbance of their daily work. We first distributed a questionnaire asking them if they have ever heard of or used PhET simulations or YouTube videos,

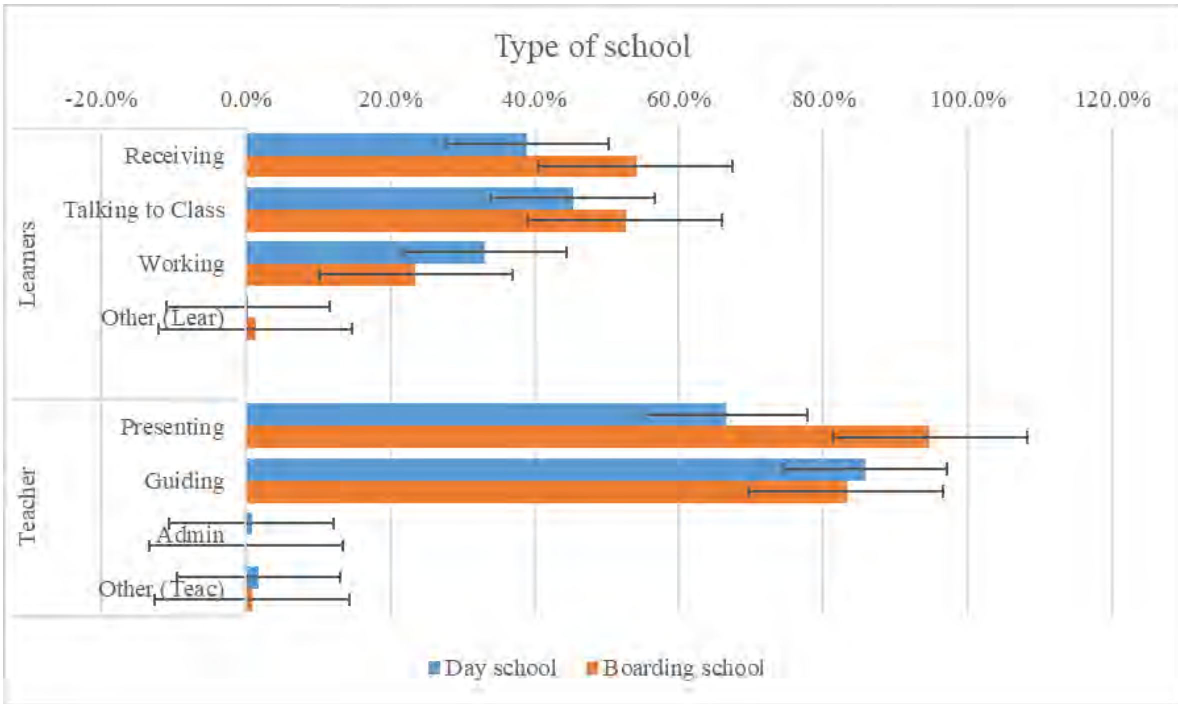

Figure 1. Percent of time intervals graph: Teacher and learners time spent in comparison to the type of school

which instructional tools they use, and how they understand active learning. During the workshop, we used computers and the internet to access to PhET simulations and YouTube videos. Together with teachers, we assessed the University of Colorado Boulder's website and got PhET simulations. We selected simulations related to optics such as photoelectric effect, geometric optics, and bending of light (https://phet.colorado.edu/en/simulation/bending-light), played, installed java, and downloaded them.

We let teachers manipulate simulations with possible details and adjustments. We visited the YouTube website, browsed some videos related to light phenomena (https://youtu.be/_Yli-yvNy-k), downloaded, and watched them. After showing and manipulating how to use PhET Simulations and YouTube Videos in physics class, we then conducted the focus group discussion with teachers, where we asked them how they view the effectiveness of these electronic tools as well as their perceptions about their usability. To analyze data, we used both thematic and narrative analysis (Orodho et al., 2016), excellent and quick methods for analyzing a verbal communication of an interview, and a transcript of a qualitative-based questionnaire and a focus group discussion. We then presented the data in the form of descriptive and direct quotes. We gave specific codes to each teacher who responded to ensure his/her anonymity. For instance, 2UD is the teacher from school two, which is urban (U) and day (D) school, while 5RB is the teacher from school five, a rural (R), and boarding (B) school.

RESULTS

Observed Teacher and Students Time Spent on Activities Alongside the Type and Location of the School

The type of school shows a big difference between a teacher and student activities time spent (Figure 1). Specifically, using an independent sample t-test, this difference was statistically different in presenting and receiving information (at $p<.05$). For instance, while learners were observed receiving information by listening to the teacher (54.0% of a 2-minutes interval), teachers in boarding schools were found using the lecture method, writing on the board, and demonstrating graphically (as the presenting takes 94.8% of a 2-minutes interval) during teaching than their colleagues in day schools. Counter wise, teachers in day schools guided learners (85.8% of 2-minutes time interval) than teachers at boarding schools do. Besides, students at boarding schools were encouraged to ask questions (as talking to class took 52.6% of 2-minutes time interval). However, students at day schools were given more tasks to do (33.1% of 2-minutes time interval) than students at boarding schools (23.5% of 2-minutes time interval).

In the location of schools, we also found differences among observed classes (Figure 2). However, an independent sample t-test (at $p<.05$) shows that this difference was only statistically different during teacher presenting information, and leaners working on assigned tasks and receiving information from the teacher. For instance, presenting (on the side of teacher) takes 96.6% and 74.3% of 2-minutes time interval in

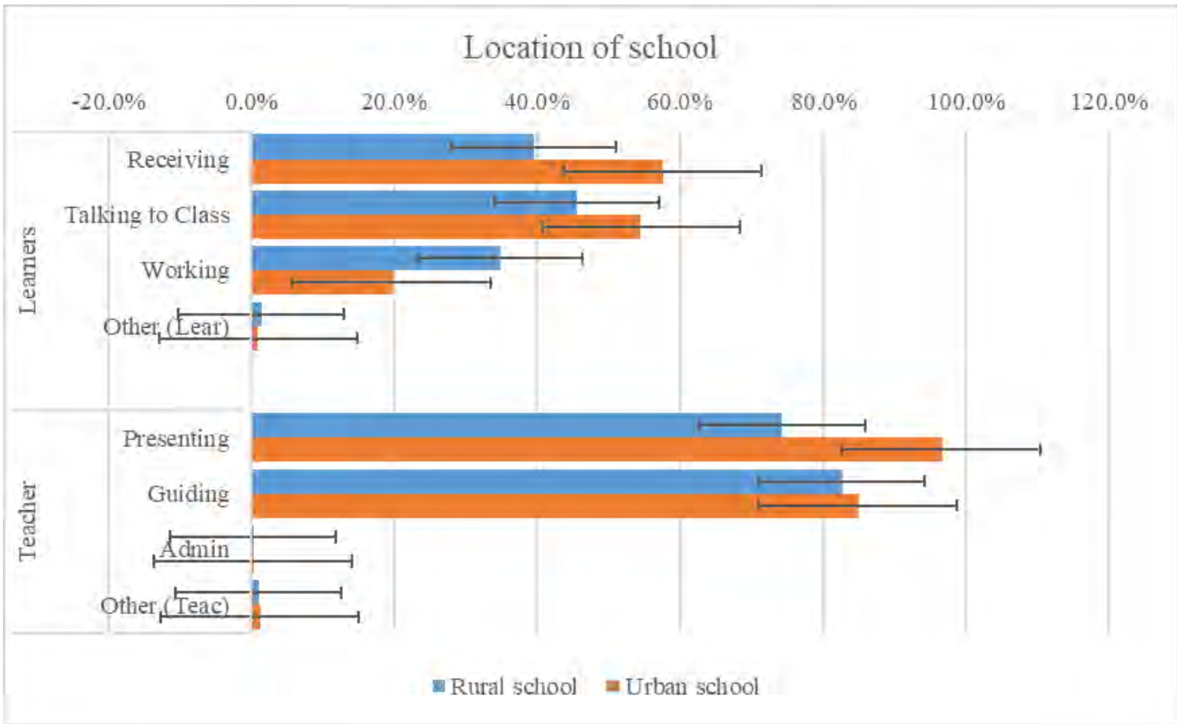

Figure 2. Percent of time intervals graph: Teacher and learners time spent in comparison to the location of the school

urban and day school, respectively, while receiving (on the side of learners) takes 57.6% and 39.6% of 2-minutes time interval in urban and day school, respectively. These results show that lecturing and passive leaning are more observed in urban schools. However, students at urban schools are guided (84.9% of 2-minutes time interval) and given time to talk to class (54.4% of 2-minutes time interval) than their colleagues in rural schools. In contrast, although teachers in urban schools spend time guiding, their learners show a little time (19.7% of 2-minutes time interval) spent on working on assigned tasks.

Surveyed Teachers on the Use of Instructional Tools in View to Improve the Active Learning

Due to the use of instructional tools to improve active learning, we have categorized teachers' views in six categories. These are (i) teachers' conception of active learning, (ii) teachers' awareness of PhET simulations and YouTube videos, (iii) teachers' usability of PhET simulations and YouTube videos, (iv) teachers' conception of the role of instructional tools on the students' learning, (v) teachers' level of use of various instructional tools, and (vi) teachers' views on the usability of PhET simulations and YouTube videos after the workshop.

Teachers' conception of active learning

In the questionnaire we provided, we asked teachers to describe what active learning is. Teachers gave various explanations in different formats. Some teachers defined it; others outlined elements they think active learning may comprise, while others talked about its advantages and disadvantages. For instance, one teacher (5RB) defined active learning as "a method where students participate in their learning and teacher helps them to discover the new and add more starting from what they already know." Teacher 4UD outlined, "active learning comprises library research, laboratory experiment, and researching by the internet." Teacher 6RD said, "active learning is the best for me, but it depends on the areas the learners stay. The learners come to school without school materials such as notebooks, mathematical sets, and calculators, it is bad behavior, and this makes them not participating fully in their learning process. The core problem is that they are poor in the English language."

Teachers' awareness of PhET simulations and YouTube videos

When asked teachers what they know about computer simulation and YouTube videos, they seem not to distinguish them. In other words, except one teacher who said he uses computer simulations and one uses YouTube videos, others were not aware of these instructional tools and tended to confuse them. For instance, for the one who said he knows and uses computer simulations (2UD), he well defined them as "a program, a tool representing something that cannot be seen in real life, an example of a black hole." This teacher does not mention that also simple observation may be observed through computer simulation and went far, giving an example of a problematic object for

Table 3. Instructional tools awareness and usage

s/n	Instructional tools	I know it (Yes or No)					I use it (%)					Average (%)
		Teacher code					Teacher code					
		2UD	4UD	5RB	6RD	7RB	2UD	4UD	5RB	6RD	7RB	
1	Conventional laboratory	Yes	No	Yes	Yes	Yes	30	0	10	50	70	32
2	Improvised laboratory	Yes	No	Yes	Yes	Yes	5	0	20	50	80	31
3	Computer simulation	Yes	No	Yes	Yes	No	10	0	40	50	0	20
4	YouTube videos	Yes	Yes	Yes	Yes	Yes	20	10	60	50	60	40
5	Google sites	Yes	Yes	Yes	Yes	Yes	10	30	70	50	50	42
6	Textbooks	Yes	Yes	Yes	Yes	Yes	100	40	50	60	80	66
7	Drawing	Yes	Yes	Yes	No	Yes	0	40	90	0	0	26
8	Charts	Yes	Yes	Yes	Yes	Yes	0	10	80	40	70	40
9	Other …………………..	-	-	-	-	-	-	-	-	-	-	-
Yes		8	6	9	7	8						
No		0	4	1	3	2						

observation. However, as long as he said it is a program, he knows the meaning of computer simulation. Contrary, among the teachers who do not use computer simulations, apart from those who wrote that they do not know or never used them, one teacher 6RB wrote a definition of active learning.

"Active learning is a method used by showing a video of a given lesson to the students where the teacher shows learners experiment or another working principle." Although the teacher describes how and for what should be done; however, simulation should be manipulated as hands-on and not just as watching a YouTube video, YouTube can be self-played. The teacher continues to define a YouTube video as "a method where the students and teacher look at a given video to understand the uses of a given object." The teacher explains one of the purposes of the YouTube videos; however, he does not mention its source as we may have different sources of the videos. The teacher 6RD said from where they watch YouTube videos. "I know it, this is a type of instructional tool by using computer room, but I do not use it frequently in teaching and learning processes," he said. The teacher, 2UD, who uses computer simulation, also clarified the difference between computer simulation and YouTube videos. "Colleagues record videos and share them with YouTube; an example is to present how refrigerator work, and this is not a software program; rather, it is a video."

Teachers' usability of PhET simulations and YouTube videos

In terms of how they may use computer simulations and YouTube videos, two teachers displayed different views. Teacher 5RB said (a case of computer simulation), "having a given a video on my computer, I use a projector to show the learners how things work and the working principles of given devices." In the case of YouTube videos, he continues to say, "I take the learners in a computer lab, and they search video from YouTube to understand the uses of something." This teacher quietly confuses simulation and a video. Teacher 2UD said, "to use computer simulation; you have to first install a program according to the topic needed while for YouTube videos, you can play it directly when you are online or download the video and then play it later."

Teachers' conception of the role of instructional tools on the students' learning

After getting teachers' awareness about the instructional tools, we asked them how these tools could improve their students' learning. Their views met on active learning. While teacher 2UD said that computer simulation helps the teacher to display abstract concepts and makes life easy, teacher 7RB noted that it allows learners to relate the content with real-life applications. Similarly, while teacher 4UD said that YouTube videos might help students better understand as they see well what is taught and never forget what they watched, teacher 6RD said that students love such trending technology.

Teachers' level of use of various instructional tools

We finally requested them to rate the usability of the various instructional tools in their teaching activity (Table 3).

From Table 3, we can see that textbooks are the most instructional tools used by most of the teachers (66%), while computer' simulated instructional tools are the least used by teachers (20%). Most of the teachers who said they do not know a particular instructional tool; they also do not use it; however, some of them know them but do not use them. For instance, teacher 2UD was aware of drawing and charts, but he does not use them.

Teachers' views on the usability of PhET simulations and YouTube videos after the workshop

In the group discussion conducted in the workshop on the use of PhET simulations and YouTube videos, teachers displayed their feelings about how useful and functional the PhET simulations and YouTube videos are. They also revealed how they might be during their daily teaching activity as well as helpful to their learners' learning. We mainly manipulated and discussed bending light, color vision, geometric optics, photoelectric, wave interference, and radio wave simulations. For instance, the bending light simulation shows how light travels straightforward in a less dense medium like air and bends toward the normal in a denser medium such as water. In this simulation, the refractive index of media is changeable, and various shapes such as rectangle, triangle, or prism glasses are provided so that the light spectrum can be even analyzed. The geometric optics shows how a thin lens forms the image of an object. From this simulation, aperture, lens medium, and the position of the object can be adjusted, allowing the analysis of different properties of the produced image.

After watching and manipulating the PhET simulations, we asked teachers about the easiness and usability of PhET simulations; teachers appreciated them and decided to use them in the future. Teacher 6RD said, "these are amazing tools that can help learners well understand the content, I will use them in my class from coming Monday. I have seen that, as long as we have a computer, nothing else is needed". Teacher 5RB said, "I personally never saw and used these simulations, I only use YouTube videos, so these are excellent instructional tools to use and make students well understand what we teach. For instance, this helps the learner to match the formulae he/she learned and take a look at the simulated charts. If we say we will change the refractive index, he/she just observes the change and match it with the formula he/she learned, so this is connecting observation with the theory. About their usability and manipulation, this is very easy for a person who uses a computer". Teacher 2UD said, "For me, there are no many difficulties of using them since I always use these computer programs. About improving the learners' learning, of course, there is a big difference. Since simulation provides an audio-visual way of demonstration, it makes learners love and master the content."

For a case of YouTube videos, most responded teachers know them and how to get them, although few of them use these videos in their teaching activities. Teacher 4UD said, "YouTube videos are without a doubt helpful for students' advancement of understanding what we teach them and motivate their activeness to stay and focus as well as master the content. If we teachers take the initiative to download videos from YouTube websites related to what we daily teach and show to students, we can reach our instructional objective without putting much effort." Teachers were excited to see how the PhET simulations and YouTube videos can help them teach their class. The future focus maybe would be training them how learners should involve in manipulating these PhET simulations and should be given room for seeking themselves YouTube videos related to what teachers taught or want to show before or after class, respectively.

DISCUSSION

In this study, we investigated how the Rwandan physics classroom looks like from different perspectives. We revealed the awareness of teachers and the easy use of these instructional tools. Although we have too few observations to generalize our findings, we do see differences between our selected variables. We noticed that there is a difference between teachers from rural and urban schools and between day and boarding schools, depending on how they spend time on classroom practices. Teachers from day schools used low presenting category. They also engaged and guided their students than teachers from boarding schools did. Teachers from rural schools used low presenting category. However, they did not guide their students as much as their fellow teachers from urban schools do. In terms of questioning, learners in urban schools had more questions to ask compared to learners from rural schools during our classroom observation. This diversity is caused by the fact that learners from urban areas experience many things than learners from a rural area where most of them do not have radios, television, do not meet with many people, and do not have evening coaching.

In their study of self-efficacy towards career choice, Halim et al. (2018) have found that students in boarding schools developed high self-efficacy and were more interested in pursuing a STEM-related career compared to their colleagues in public schools. They found that the learning opportunities available are the core reasons. Despite the type of schools, a study conducted in Romania (Istrate et al., 2006) also found that there were differences in learning, depending on where students are originated. However, the authors' findings were quite different from our results. They found that the differences between rural and non-rural schools during the performance of trends in international mathematics and science study are due to social-economical related issues and teachers' degree of achievement in executing the school curriculum. Our study showed that it depends on the teacher's instructional strategies. If the schools in rural areas are not equipped with enough and quality resources, the future career choice will be affected due to losing interest in studying science and learning habits.

On the contrary, in their study checking the influence of school location on learners' physics achievement, Achor (2003) found no effect from rural or urban schools associated with physics performance. It shows that when teachers use practical teaching tools and strategies, learners will learn on the same level whether they locate in rural or urban areas. Therefore, it motivates teachers to mind on their teaching and avoids being affected by the location of their work. Ramnarain (2015) showed that there is a need to focus on students from rural areas because most of them are still learning without much practical work, and the linkage between the building of scientific knowledge and practical work was low. Thus, this shows the reputation of hands-on activities, either regular or technology-related activities, as appreciated by teachers in this study.

Teachers appreciated the easy use of electronic tools and decided to use them in their teaching activity in addition to other means such as textbooks. They realized their potential towards enhancing active learning and engaging students, mainly in the optics unit. In the study of guided inquiry laboratory with embedded video, Afriani and Agustin (2019), during learning optics and light, found that students were motivated to learn and understood after being exposed to videos. Computer simulations are essential in improving students' performance and motivate students to like physics. They encourage them to involve in the experiment, make the teaching more attractive, and enhance the learning self-sufficiency (Civelek et al., 2014). They can raise students' conceptual understanding and prompt valid scientific reasoning (Abdullah & Shariff, 2008). PhET simulations affect the performance of students and feelings (Mckagan et al., 2008) and allow learners to explore the challenging content to experiment with real apparatus (Wieman, Adams, et al., 2013). However, they require considerable teacher's guidance to be active and usable. Perkins et al. (2016) examined the use of PhET simulations in both College and high school classrooms in the United States and found they were effective, similar use in both new and experienced teachers but different in their instructional approaches.

Similarly, in the present study, we found that Rwandan physics teachers believe that electronic instructional tools are useful, and their usability among teachers was quite the same. Although teachers are expected skillful in and technological, pedagogical, and content knowledge models of instruction and implementers of these skills in their teaching (Jones & Cuthrell, 2011), however, Rwandan teachers were found not yet using them. A case is where we found teachers claiming that they did not know about computer simulations and have never used them as well as YouTube videos in their teaching activity. Since the YouTube tool is free to access, teachers should allow learners to learn physics on YouTube. They just need an internet connection (Ruiz, 2009) and watch them for free. Amador et al. (2020) have outlined the characteristics of the video to be used. Teachers should select videos that have more complexity but clear, simple, and able to trigger the students' misconceptions.

CONCLUSION

In this study, we were interested in finding out how teacher and learners spend their time in physics class and how Physics teachers conceive the use of electronic tools in view to improve the active learning of optics. Presenting and receiving information were prominent in boarding and urban schools than a day and rural schools. However, these variabilities among teachers observed during classroom teaching and learning were not observed during teachers' views after the workshop. Physics teachers did never know about Colorado University Boulder interactive Physics Education Technology simulations and did not dare to exploit YouTube resources. However, after the workshop, all of them were excited and believed that these PhET and YouTube instructional tools can, no doubt, improve their students' learning. We therefore highly recommend teachers to exploit these free resources to encourage and excite their students while they conceptually understand various physics concepts.

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