

## **Biology Teachers' Perception of Impact of Continuous Professional Development Programs in 12-Year Basic Schools in the Kirehe District, Rwanda**

Nepomuscene Hategekimana<sup>1</sup>, & Gatarira Pierre Cobes<sup>2</sup>

### **Abstract**

Continuous professional development (CPD) is crucial for enhancing the teaching profession. Biology teachers have gained knowledge, skills and competencies through CPD programs to improve learning outcomes. This study examined the perceptions of biology teachers regarding CPD programs in 12YBES of Kirehe district, focusing on their views, the barriers they face, and possible solutions. It, therefore, aimed to provide the biology teachers' perception towards CPD programs, barriers and remedies. A mixed methods approach was applied, involving 20 head teachers and 46 biology teachers from 12YBES. Data were collected using questionnaires, interviews and secondary sources, and analyzed using SPSS. The findings revealed that 94% of biology teachers perceived that CPD programs strengthened their teaching methodology and consequently impacted their learners' biology learning outcomes. However, remarkable barriers were identified including shortage of learning aids (61%) and lab equipment (20%). This study highlighted the importance of CPD but not fully utilized, recommending expanded CPD activities across all sectors to improve learning outcomes.

**Keywords** biology teachers' perception, continuous professional development; biology learning outcomes

### **Introduction**

Continuous Professional Development (CPD) has had the impact in improving science learning outcomes including biology subject (Lam, 2015). It aided biology instructors in developing their professional aptitudes, capabilities, and expertise (Martin, 2015). Therefore, Rwanda moved from teacher centered pedagogy to learner centered approach (Ling & Mackenzie, 2015) and implemented CPD programs in 12YBES to improve science teaching and learning results (REB, 2015). This change prompted biology teachers to continuously improve their

abilities and expertise (Darling-Hammond et al., 2009). According to Powell et al. (2010), continuing professional development (CPD) is highly regarded in the United States, Germany, and France for helping biology instructors overcome challenges they have in their line of work and for increasing the bar for skills required at the worldwide level. CPD activities were consequently developed in Zimbabwe, Malawi, and Ghana as a means of achieving the population's objectives and enhancing their requirements via improved educational systems (Opfer & Peder, 2011). The government of Rwanda made the decision to accept CPD initiatives in all educational

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settings (REB, 2015). Thus, this adoption was crucial since it made it easier to assess the Learner Centered Approach, identify potential implementation obstacles, and develop countermeasures (Gersten et al., 2010). In order to close the information gap, this study offers statistics on CPD programs in 12YBES that have never been published before regarding biology learning outcomes. It aims to address the following research questions: (1) How much do biology teachers in secondary schools view the CPD programs? (2) What impact do CPD initiatives have in educational institutions? (3) What problems do biology teachers run into while implementing CPD programs, and how can they fix them?

### **Literature review**

Given that knowledge is shared and used, CPD programs were considered the most effective means for instructors to enhance their skills and knowledge (Bandura, 1977). CPD programs were first implemented in the 1970s in Australia, Canada, the United Kingdom, and New Zealand with the goal of empowering educators to improve student outcomes (Dede et al., 2009). Recognizing the success of these programs, many developing nations, including Tanzania, Zambia, and Rwanda, have embraced CPD programs to improve science teaching outcomes, especially in the field of biology (Desimone et al., 2002; Garet et al., 2008). In this context, Guskey (2002) stated that the CPD program is viewed as an integrated and combined learning environment that blends attitudes, behaviors, and knowledge, which can be demonstrated through actions and experience. Specifically, Rwanda's CPD program focuses on developing higher-order and critical thinking abilities that enhance comprehension and facilitate effective biology instruction. By incorporating more challenging and action-oriented tasks into learning objectives, the

program encourages biology teachers to reflect deeply on their subjects (REB, 2015). It aims to help biology teachers move beyond mere memory and recall to higher-order thinking, promoting deep and enduring learning (Likisa, 2018). According to Hill et al. (2013), the primary goal of the CPD program is to assist biology instructors in transitioning from rote memorization and content recall to applying biology knowledge in practical situations. Consequently, CPD activities foster a well-integrated biology instruction environment, empowering students to become problem solvers in society (Little, 1993). This study aims to understand how biology educators in Rwanda's Kirehe district's Twelve Years Basic Education Schools (12YBES) perceive CPD initiatives.

### **Materials and methods**

In this study, a mixed approach was used since it improved the complementarity between the qualitative and quantitative data, which was necessary for drawing any relevant conclusions. Triangulation was used to confirm the accuracy of the data and create a thorough understanding of the biology teachers' perception towards CPD programs (Powell et al., 2010). Using a questionnaire, conducting an empirical analysis based on quantitative research with biology teachers was the initial strategy. Twenty secondary schools in the Eastern Rwandan region of Kirehe were picked especially. A total of 46 randomly selected biology teachers responded to the questionnaire. The introduction provided the respondents with information about the study's purpose (Kazemi & Hubbard, 2008), and they completed a consent form guaranteeing the privacy and applicability of the findings. To ensure correct responses and efficient time management, the data was gathered using the on-the-spot method (Murad & Abu-Taleb, 1999). According to Carter's (2014) concept, the

second method comprised interviews where a minimum of twenty head teachers were specifically selected. Utilizing the accessible materials at the school's paperwork was the third method. The main goals were to confirm various methods of biology teaching, identify the resources available at each school, and demonstrate or enhance the validity of the information gathered through the questionnaire and interviews.

from surveys and interviews (Carter et al., 2014).

**Results**

In this study, the findings were presented and analyzed using thematic analysis, tables and figures from the data collected from the biology teachers and school leaders for 20 12YBES in Kirehe district, Rwanda.

*Sociodemographic characteristics*

**Table 1: Social demography disaggregated by gender**

	Male		Female		Total	
Biology teachers	28	61%	18	39%	46	70%
Head teachers	18	80%	2	20%	20	30%
Total	46	70%	20	30%	66	100

This study took place during the 2021–2022 school year at ten poorly performing and ten well performed 12YBES in Kirehe district, drew 66 respondents in total,

*Data analysis*

In this study, material from interviews was qualitatively assessed, and data collected via a questionnaire was examined objectively (Cerny & Kaiser, 1977). The numeric data was computed using SPSS, while the qualitative data was assessed using thematic analysis. Before the study was carried out for all schools, the data was examined independently for each school. The data from the accessible resources was supplemented with information

comprising of 46 biology instructors and 20 school leaders from 20 schools. The respondent’s distribution for 10 poorly performed schools was: 23 biology teachers and 10 head teachers and similarly to the other 10 well performed. Participants are displayed in the Table1.

According to the above table, a total of 20 head teachers from 12YBES who took part in this study, 80% (18) of participants were male. Only 20% (2) were female. Again, a total of 46 biology teachers who participated, 61% (28) were males and 39% (18) were female (Table1).

**Table 2 Proportion of respondents indicating they benefited in CPD towards biology learning outcomes**

	Number	Percent
1. Proportion agreeing CPD activities impacted biology learning outcomes	43	94
2. Proportion disagreeing CPD activities impacted biology learning outcomes	3	6

*Benefits in CPD towards improving biology learning outcomes*

The recorded responses from the 46 biology teachers and 20 school leaders were on their agreement to the extent to which they benefited from CPD towards improving biology learning outcomes are summarized in the Table 2.

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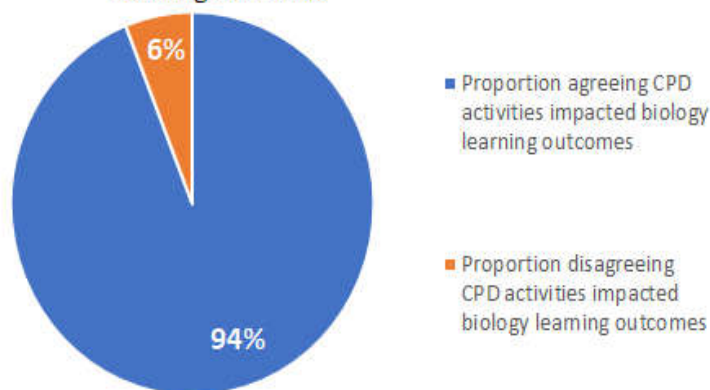
Figure 1, which is a graphic representation of Table 2, shows clearly that only 6% of the sample disagreed that CPD activities impacted biology learning outcomes. This inferred that CPD have significant impact on biology learning outcomes and notably seen that the proportion of respondents that reported satisfaction from CPD activities was very high at 94%, indicating the CPD activities impacted biology learning outcomes.

*Impact of CPD activities towards performance of biology subject*

A total of 46 biology instructors and 20 head teachers participated in this study. Their ratings on the extent to which CPD activities impacted biology learning outcomes are summarized in Table 3.

Various statements were presented to the respondents in order to evaluate the effect of

**Figure 1 Respondents benefiting in CPD towards biology learning outcomes**



CPD on biology performance. The responses were rated on a Likert scale from strongly disagree to strongly agree, with the option "I don't know". The results are as follows: 96% (44) of biology teachers and school leaders agreed that the school conducts CPD for teachers, 98% (45) of biology instructors and head teachers concurred that they frequently participate in CPD at the school, 89% (41) of biology teachers and school leaders agreed that they access online tools and teaching resources for self-study or their capacity

**Table 3 Rating of extent to which CPD activities impacted biology learning outcomes**

	Strongly Disagree	Disagree	Agree	Strongly Disagree	Don't Know
a) The schools undertaken CPD for teachers	0 (0)	2 (4)	4 (9)	40 (87)	0 (0)
b) The head teachers and biology teachers attend CPD at school regularly.	0 (0)	2 (2)	10 (22)	35 (76)	0 (0)
c) Teachers/head teachers accessed online tools and teaching resources for self-study or the capacity building	2 (4)	3 (7)	11 (24)	30 (65)	0 (0)
d) The teachers /head teachers acknowledged monthly plan for CPD at school	3 (7)	5 (11)	13 (28)	24 (52)	1 (2)

Percent in parenthesis

building, 80% (37) of biology teachers and school leaders agreed that they have monthly plan for CPD at school level.

*The barriers of implementing CPD programs towards biology learning outcomes*

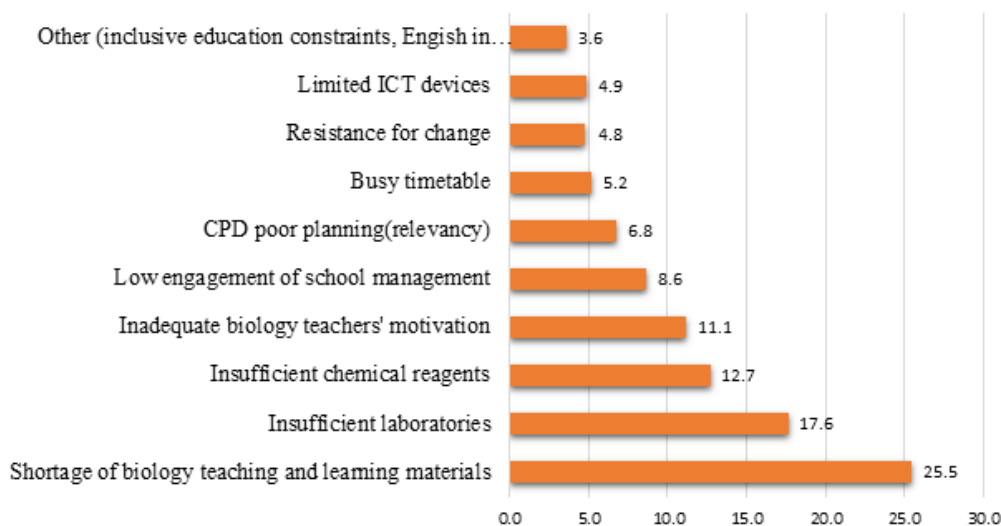
A total of 46 biology teachers and 20 head teachers participated in providing what they perceived as the challenges that hindered CPD activities attended. The responses were displayed in the Figure 2.

that CPD is hindered by inadequate ICT device, 3.6 % pointed out that CPD is hindered by lack knowledge in inclusive education, etc. The barriers mentioned here suggested that CPD still has a number of difficulties when it comes to teaching biology in 12 YBES.

*Strategies to handle the barriers during CPD activities*

This study involved 46 teachers and 20 school leaders to identify the strategies which should

**Figure 2 The barriers during CPD activities towards biology learning outcomes**



The following are the problems that this study outlined for CPD activities related to biology teaching and learning: 25.5% of respondents said that a lack of biology teaching resources impedes CPD, 17.6 % argued that CPD is lowered by insufficient laboratories, 12.7 % ensured that CPD is hindered by insufficient chemical reagents, 11.1 % showed that CPD is stacked by inadequate biology teachers 'motivation, 8.6 % reported that CPD is hindered by low engagement of school management, 6.8 % argued that CPD is hindered by poor planning (lack of relevancy), 5.2 % reported that CPD is hindered by busy timetable for biology teachers, 4.8 % reported that CPD is hindered by resistance for change for some biology teacher's, 4.9% highlighted

be convenient to address the barriers during CPD activities. Since there were only 66 respondents in the research sample, the list in Table 4 is not all-inclusive.

In light of this, when discussing ways to overcome obstacles to CPD activities, every participant in the sample suggested that the most effective strategy be to lessen the workload of subject leaders (SSLs) and mentors based in schools (SBMs). However, 53 out of 66 participants (81.8%) stated that another strategy that could be used is to involve teachers at every level of their professional development. Consequently, 46 out of 66 participants (69.7%) suggested peer learning as an additional strategy for

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**Table 4 Strategies proposed**

Strategies	Frequency	Percentage
Reducing teaching workload for SBMs and SSLs	66	100.0
Engaging teachers at each stage of their professional studies	53	81.8
To recruit school-based mentors well trained	42	63.6
Setting a termly action plan for CPD	56	84.8
Peer learning and peer class observation	46	69.7
Education partnership and collaboration	43	65.5

overcoming obstacles, and Among the 66 participants, 56 (84.8%) believed that the impact of CPD on teaching and learning might be enhanced by developing a termly action plan. Sixty-six percent of respondents said that hiring School Based Mentors (SBMTs) who are qualified to coach was under consideration.

**Discussion**

The study results, they merely entail and reflect on its objectives which embed on digging deeper on biology teachers' perceptions towards CPD programs in improving learning outcomes in 12YBES of Kirehe district, Rwanda.

*Biology teachers' perceptions on the CPD programs in 12YBES and its impact in general*

According to the study's findings from the perspectives of students, biology instructors, and head teachers, 94% of these groups claimed that CPD programs improved biology learning outcomes. These findings are consistent with those of MINEDUC, which claimed that CPD is an easy way to improve science learning outcomes (MINEDUC, 2017). Then, the findings of this research showed that 90.6% of biology teachers and head teachers reported that CPD has significant impact towards students' performance in biology subject, and this is in the same view of Kazemi & Hubbard (2008)

who argued that CPD is the engine for speeding science teaching practice. Consequently, the results of this study showed that students' performance in biology classes and the CPD program were positively correlated (p-value = 2.23e-06), and according to the UNESCO findings which inferred that CPD and learners' performance a positive correlation (UNESCO, 2002). Therefore, this study have shown a positive correlation between CPD activities and teaching biology, where CPD affects positively biology teaching and learning outcomes (p-value: 5.412e-06) and as argued by Cerny & Kaiser (1977) that CPD has had significant effect on biology teacher's classroom practices. It is further revealed that the benefits of CPD activities were recorded at high rate (94%) with a positive relationship for CPD programs and biology learning outcomes (p-value=0.019), and this is in the same view of Hord (2004) who argued that CPD activities have productively empowered teachers towards biology learning outcomes.

*Barriers that hinder CPD activities and strategies to address them*

The results of the study have identified the obstacles that prevent CPD programs from teaching biology to 12YBES students. It was further deduced barriers such as shortage of biology teaching aids was the most dominant regarding to others as it was pointed at the extent of 25.5%. This is in line with the

opinion of Knight (2002), who made a similar argument regarding CPD activities in relation to biology learning objectives in classrooms. Hence, the most effective way to address obstacles during the CPD implementation, according to 100% of biology and head teachers, would be to lessen the workload of school-based mentors and school subject leaders. The next step should be to develop new routines that would enable biology learning aids to be 90.9% asserted locally. This is in line with the REB's (2015) findings, which showed that mentorship programs in schools and the encouragement of the creation of instructional materials were highly valued.

#### *Mitigations*

The study's findings have identified obstacles and suggested the following tactics or fixes:

*Barrier 1:* Inadequate chemical goods (12.7%) and laboratories (17.6%) for science topics, particularly biology, have frequently been noted as relevant difficulties in MINEDUC results (MINEDUC, 2017). *Strategy:* in order to recognize CPD, it was suggested that schools or the ministry of education should work with partners to advocate for changes and seek funding (UNESCO, 2002). It was also seen that improvisation should be highly considered (Odden et al., 2002).

*Barrier 2:* Leadership issues: Low engagement of school leaders and recent surveys tend to support this claim, showing that head teachers were not typically involved in attending CPD programs in schools (Desimone et al., 2002). *Strategy:* It was suggested that engaging school leaders in identifying areas for improvement through careful consideration of their teacher's views and reflection on their classroom practice. According to Guskey (2002) advised that avoiding bad beliefs towards CPD that is applicable to everyone.

*Barrier 3:* Relevance and quality: A lot of schools hire outside trainers and speakers for

Continuing Professional Development (CPD) who only have a cursory awareness of what is expected of staff members in schools or businesses (UNICEF, 2018). There are criticisms over the outsourcing of CPD's superficial training because trainers show up, finish their session, and depart (Yoon et al., 2007). *Strategy:* school leaders must recruit School-based mentors and CPD advisors who are in charge to train and mentor their fellows' teachers instead of bringing in outside speakers and trainers (Gersten et al., 2010).

#### **Conclusions and recommendations**

The study's findings demonstrated that CPD significantly affects biology instruction in 12YBE schools. Most individuals concur that CPD seminars are essential for enhancing the teaching and learning practices within the school community. To ensure that CPD sessions are successfully conducted, the school's management and instructors should make the necessary efforts to remove barriers. The study included suggestions for the public and commercial sectors, educators and school administrators, researchers, and education partners on how to properly and efficiently identify CPD activities.

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