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RESEARCH ARTICLE

INFLUENCE OF TEACHER COLLABORATION ON THE LEARNERS' ACADEMIC ACHIEVEMENT IN CHEMISTRY IN PUBLIC DAY ORDINARY LEVEL SECONDARY SCHOOLS IN RWANDA A CASE OF RUHANGO DISTRICT

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Abstract

Teachers are the key actors in guaranteeing effective teaching and learning processes. This study examined the influence of teacher collaboration on learners' academic achievement in chemistry in public day ordinary secondary schools in Rwanda, Ruhango District. The specific objectives were: to determine the influence of peer coaching among teachers on learners' academic achievement in chemistry, to determine the influence of team teaching on learners' academic achievement in chemistry, and to determine the influence of professional dialogues among teachers on learners' academic achievement in chemistry. The study will be important for the government, education policymakers, school managers, and development partners in education, among others. The study adopted a cross-sectional survey design and targeted 936 individuals including 57 headteachers, 57 deputy headteachers, and 822 teachers from selected schools in Ruhango district. A sample size of 281 respondents was selected using simple random sampling to choose teachers. Headteachers and deputy headteachers were selected using purposive sampling. Data was collected using questionnaires for teachers and interviews for headteachers and deputy headteachers. The collected data were edited, coded, and entered into IBM SPSS Version 26 for analysis. Descriptive statistical tools such as mean, frequency, and percentages were computed while inferential statistics involved correlation analysis. Pearson correlation coefficient and beta coefficients were calculated. The findings were presented in tables. The research findings proved that teacher collaboration affects learners' achievement in chemistry. The research findings show teachers engage in team teaching (55.9%), peer coaching (54.4%), and professional dialogue (50.7%). Respondents notably confirmed that students' performance in chemistry had improved in chemistry assessments due to collaborative teaching strategies (52.4). Findings confirm a strong positive correlation ranging from 0.77 to 0.846 between teacher collaboration and learners' achievement in Chemistry. This suggests that as teachers collaborate more effectively through methods like team teaching, peer coaching, and professional dialogue, students' academic performance in Chemistry improves significantly. Therefore, the

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researcher concludes that structured and frequent collaboration among teachers is a key factor in boosting student achievement in science subjects. Schools that prioritize teacher collaboration can expect better syllabus coverage, improved student engagement, and higher completion rates in Chemistry. In light of these findings, regular, targeted workshops, seminars, and peer coaching sessions should be organized to provide teachers with both the theoretical knowledge and practical skills necessary for effective collaboration. Such professional development activities would allow teachers to exchange best practices, develop new teaching strategies, and support each other in creating a more engaging learning environment for students. Further research could be done on the effect of teacher collaboration on learner Engagement, longitudinal study on the impact of teacher collaboration on learners' Achievement in secondary schools, and the role of teacher collaboration in enhancing learners' achievement across different subjects in secondary education.

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Introduction:-

This introduction chapter includes the study's background, statement of the problem, research objectives and questions, significance of the research, scope, limitations, delimitations, and research organisation.

Education, particularly in science and technical fields, is essential for developing skilled professionals that drive economic growth (Agola, 2016). Achieving quality education requires teamwork and commitment to utilizing available resources effectively (UNESCO, 2017). Given the constant changes in the teaching profession, teachers must remain lifelong learners (Grosemans et al., 2015). However, challenges like lack of motivation, insufficient resources, and inadequate teacher development affect student performance in chemistry, which remains low, particularly in Nigerian secondary schools (Nja, 2019).

Globally, teacher collaboration has been shown to enhance learning outcomes. In Belgium, it improves instructional practices and professional learning (Vangrieken et al., 2017), while Singapore's professional learning communities foster continuous teacher development (Ng, 2015). Finland allows teachers to collaborate on curriculum design, positively impacting student achievement (Webb et al., 2019). Japan's "Lesson Study" and Brazil's Aliança Institute also highlight the value of teacher networks in improving education quality (Takahashi & McDougal, 2016; Barreto, 2018). These practices align with international education goals like the Sustainable Development Goals (UNESCO, 2017).

In Africa, teacher collaboration has similarly improved student performance. Kenya's Tusome program enhanced literacy through teacher collaboration (Piper et al., 2016), and Uganda's School-Based Teacher Development (SbTD) program has also improved teaching methods (Hardman et al., 2015). In Rwanda, teacher collaboration is a key component of the Continuous Professional Development (CPD) framework, leading to better classroom practices and learning outcomes (Bourdon et al., 2018).

Chemistry, crucial for Rwanda's technological advancement, faces significant challenges in schools. Factors such as a lack of motivation, inadequate teaching materials, and ineffective teaching strategies limit student performance (Uwizeyimana et al., 2018). MINEDUC emphasizes collaborative teaching practices in the Competence-Based Curriculum (CBC) to foster critical thinking and creativity (MINEDUC, 2017). Collaboration among teachers allows them to share resources and strategies, mitigating resource shortages and enhancing chemistry education (Byusa et al., 2020).Despite these efforts, performance in chemistry remains low in districts like Ruhango, where only 71.2% of students passed chemistry in the 2023 national exams, compared to the national average of 86.97% (Gretchenn, 2020). Teacher collaboration through team teaching, peer coaching, and professional dialogues is essential for addressing these challenges and improving chemistry outcomes, contributing to Rwanda's Vision 2050 for a knowledge-based economy.

This study examined the influence of teacher collaboration on learners' academic achievement in chemistry in public ordinary level secondary schools in Rwanda, Ruhango District

The following specific objectives guided this study:
1. To examine the influence of teacher team teaching on learners' academic achievement in chemistry in public ordinary level secondary in Rwanda
2. To assess the influence of peer coaching among teachers on learners' academic achievement in chemistry in public ordinary level secondary schools in Rwanda.
3. To analyze the influence of professional dialogues among chemistry teachers on learners' academic achievement in chemistry in public ordinary level secondary schools in Rwanda.

Literature Review:-

Theoretical Literature

It reviewed the existing theoretical literature; it described key concepts of the study and reviewed the existing studies on the influence of teacher collaboration on students' academic performance in public day ordinary level secondary schools in Rwanda.

Teacher Collaboration and Student Learning Outcomes

Teacher collaboration is a key factor in improving student learning outcomes, as highlighted by numerous educational studies. Bryk et al. (2015) emphasize that fostering a collaborative environment among teachers enhances instructional strategies and boosts student performance. By working together, teachers share materials, methodologies, and best practices, which fosters the development of innovative teaching approaches that cater to students' diverse needs. A collaborative atmosphere also helps build a supportive educational environment, improving the overall quality of education.

Research consistently supports the positive impact of teacher collaboration. Liu and Tsai (2017) argue that collaboration between experienced and novice teachers offers valuable opportunities for exchanging teaching beliefs, methods, and strategies. Voogt et al. (2015) describe collaboration as an ongoing process of improvement, continuously reshaping teaching practices. Effective communication and the sharing of ideas are essential components of this process (Hargreaves & O'Connor, 2017).

Collaboration directly contributes to improved student outcomes. Studies by De Jong et al. (2019) and Darling-Hammond et al. (2017) demonstrate that teacher collaboration fosters problem-solving and shared learning, which in turn boosts student achievement. Reeves et al. (2017) found that teamwork among teachers is a strong predictor of student success, highlighting the importance of collective efforts in enhancing education.

However, effective teacher collaboration faces challenges, particularly in Rwanda. According to Uwizeyimana (2020), a lack of resources and insufficient time for collaboration hinder educators' ability to work together. Cultural barriers and low trust among teachers also impede collaboration (Habineza, 2019). Addressing these challenges requires allocating time for cooperative planning, improving leadership, and fostering mutual respect among educators (Ndayambaje&Nyirahabimana, 2021). By doing so, teacher collaboration can significantly improve student performance and educational outcomes.

Theoretical Framework

The Social Interdependence Theory emphasizes how goals shape interactions and influence outcomes. Developed by Deutsch and later refined by Johnson and Johnson, it identifies three forms of interdependence: individualism (no interdependence), competition (negative interdependence), and cooperation (positive interdependence). Positive interdependence occurs when individuals work together to achieve shared goals, ensuring group success relies on each member's contribution (Roseth, Johnson, & Johnson, 2020). This fosters teamwork and shared accountability, particularly in educational settings, where collaboration among educators enhances learning outcomes. Tjosvold, Sun, and Wan (2021) highlight that fostering positive interdependence among teachers, especially chemistry instructors, can improve collaboration. Through cooperative lesson planning, sharing effective teaching strategies, and providing constructive feedback, teachers create a supportive professional environment. This shared responsibility and accountability ultimately contribute to both individual and departmental success, while boosting student achievement.

Conceptual Framework

This helps make sense of the connections between concepts. The conceptual framework for this study clarified the relationships between and effects on students' academic progress in chemistry from teacher cooperation strategies such as team teaching, professional dialogues, and peer coaching.

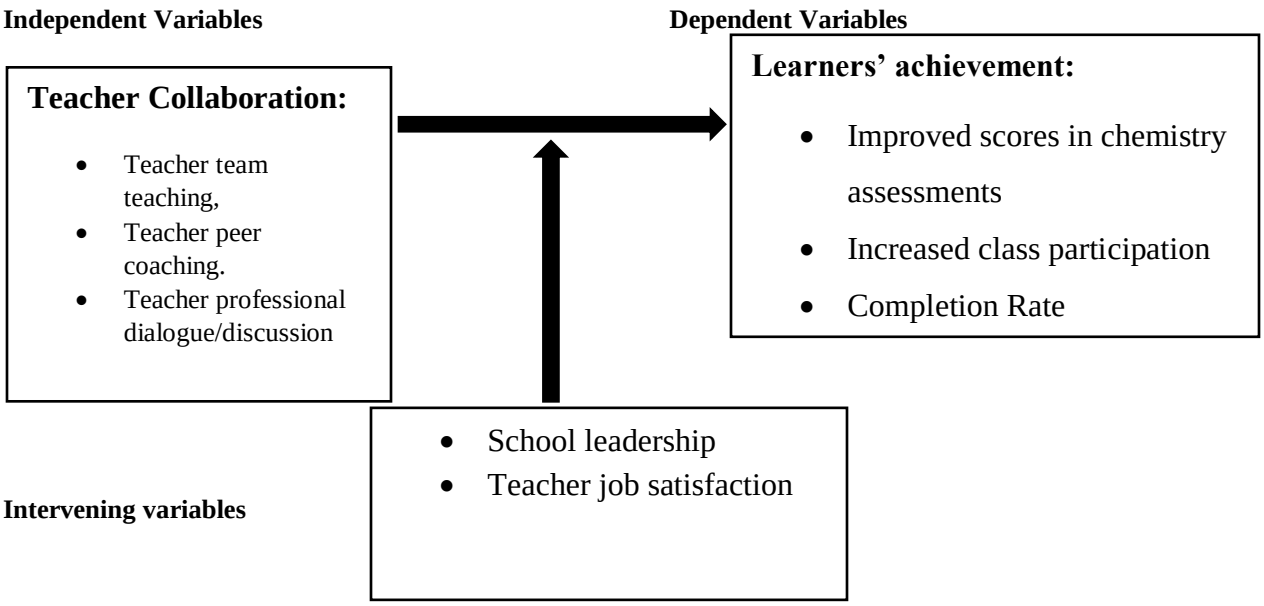

Figure 2.1:- Conceptual Framework.
Source: Researcher (2024)

Research Methodology:-

Research Design

In this study, cross-sectional survey method was used to investigate the influence of teacher collaboration on learners' academic achievement in the chemistry subject within Rwanda's secondary education system. Cross-sectional surveys are suitable for gathering information from a large number of respondents at a single point in time, providing insights into opinions, attitudes, and perceptions across different stakeholder groups (Babbie & Mouton, 2019).

Target Population

The target population comprised 114 school leaders (57 headteachers and 57 deputy headteachers), and 822 teachers, totaling 936 from Ruhango public secondary schools.

Sample Design

Simple random sampling was applied to select teachers, providing each teacher an equal opportunity to participate and thus ensuring a representative sample. Purposive sampling was used to select headteachers and deputy headteachers, targeting individuals with specific roles and insights relevant to school leadership and collaboration.

Sample Size

Determining the sample size is crucial for ensuring that the study's findings are reliable and accurately represent the population. To achieve this, Yamane's formula for sample size calculation is employed: $n = \frac{N}{1+N\,(e)^2}$, where n represents the sample size, N denotes the population size, and e signifies the margin of error desired, set at 5%, the total population comprises 936 respondents including 57 deputy headteachers, 57 headteachers, and 822 teachers. Using this formula, the sample size is calculated to ensure a representative and statistically valid sample for the study. The specific calculation is as follows: $n = \frac{936}{1+936\,(0.05)^2} = 280.23$

This calculation provides a robust sample size that accurately reflects the population's characteristics. Therefore, the sample size was approximately 281 respondents. The sample included 17 headteachers, and 17 deputy headteachers that were selected using purposive sampling and teachers using simple random sampling technique.

Table 3.1:- The distribution of Sample Size.

No	Type of Respondents	Target Population	Sample size
1	Teachers from sampled Schools	822	247
2	Headteachers	57	17
3	Deputy Headteachers	57	17
Total		936	281

Source: Ruhango District (2024)

Sampling Techniques

To thoroughly investigate the influence of teacher collaboration on learners' achievement in Rwanda's day ordinary level secondary schools, a combination of purposive and simple random sampling methods was employed. Purposive sampling was utilized to select head teachers and deputy head teachers, given their pivotal roles and unique insights into school leadership and management, which are essential for this study. Conversely, simple random sampling was applied to select teachers, guaranteeing that each teacher has an equal probability of being chosen, thus ensuring a representative sample.

Research Findings and Discussions:-

Demographic Characteristics

The study sought to establish the demographic characteristics of respondents such as gender, age, experience, education, and position held by respondents on the project.

Gender Profile

Gender was categorized into male and female and the findings are summarised in Table 4.1

Table 4.1:- Gender Profile.

Items	Headteacher	Deputy headteacher	Teachers	Frequency	Percentage
Women	5	9	110	124	44.1
Men	12	8	137	157	55.9

Source: Primary Data (2024)

Results presented in Table 4.2 explained the proportion of women in comparison with respondents. In this regard, the female participants were 44.1% of respondents and 55.9% of respondents were male respondents. Gender is essential for understanding how gender dynamics may influence participation, engagement, and outcomes in educational settings, particularly in teaching practices and student achievement.

Age of Respondents

The study established the age of headteachers, deputy headteachers, and teachers. Findings on the age of the mentioned categories of respondents are summarised in Table 4.3

Table 4.2:- Age of Respondents.

Items	Headteacher	Deputy headteacher	Teachers	Frequency	Percentage
21 to 30 Years	0	2	95	97	34.5
31 to 40 Years	7	10	109	126	44.8
41 to 50 Years	9	4	30	43	15.3
Above 51 Years	1	2	12	15	5.4

Source: Primary Data (2024)

Results presented in Table 4.3 demonstrated the age of various groups of respondents to the research. Therefore, 97 (34.5%) of respondents were 21 to 30 years old; 126 (44.8%) of respondents were 31 to 40 years old, 43 (15.3%) were 41 to 50 years old, and 15 (5.4%) were above 51 years old. By using appropriate questions to identify the age

demographic of the study's participants, using age brackets for convenience and consistency, potentially gained a lot of valuable detail during the analysis.

Working Experience

The researcher collected information on headteachers, deputy headteachers, and teachers to determine how the working experience of respondents affects the level of teacher collaboration within public day secondary schools in Ruhango District, Rwanda.

Table 4.3:- Respondents' working experience.

Working Experience	Headteachers		Deputy Headteachers		Teachers		Total	
	F	%	F	%	F	%	F	%
Between one and five years	3	17.6	8	47.1	61	24.7	72	25.6
Between six and 10 years	5	29.4	4	23.5	119	48.2	128	45.6
Between 11 and 15 years	8	47.1	5	29.4	44	17.8	57	20.3
Above 15 years	1	5.9	0	0.0	23	9.3	24	8.5

Source: Primary Data (2024)

Results presented in Table 4.4 indicate that 72 (25.6%) respondents had 1-5 years of work experience, 128 (45.6%) respondents had 6-10 years of work experience, 57 (20.3%) respondents had 11-15 years of work experience, and 24 (8.5%) respondents had more than 15 years of experience. Personal experience is important in research for several reasons. This diversity in experience levels suggests that a broad spectrum of teaching methods and perspectives is present within the respondent pool. Experienced teachers may provide deeper insights into the long-term impacts of educational practices, such as team teaching and peer coaching, and how these strategies evolve. On the other hand, less experienced teachers might be more open to adopting new methods or adjusting their teaching approaches to suit modern educational demands.

Educational Level

The researcher collected information on the educational level of headteachers, deputy headteachers, and teachers to determine how the working education profile affects collaboration. Demographic characteristics on the educational level of headteachers, deputy headteachers, and teachers are presented in Table 4.5

Table 4.4:- Education Level.

Education Level	Headteachers		Deputy Headteachers		Teachers		Total	
	F	%	F	%	F	%	F	%
Diploma (A1)	0	0.0	0	0.0	81	32.8	81	28.8
Bachelor's Degree (A0)	15	88.2	16	94.1	143	57.9	174	62
Masters	2	11.8	1	5.9	6	2.4	9	3.2
Others	0	0.0	0	0.0	17	6.9	17	6

Source: Primary Data (2024)

Table 4.5 shows that 28.8% of respondents hold diplomas, 62% have bachelor's degrees, 3.2% have master's degrees, and 6% hold other certifications. This variation in qualifications highlights the presence of highly educated individuals in public institutions. Understanding these qualifications was essential for this research to assess how teachers' academic backgrounds influence student achievement in chemistry. The diversity in qualifications suggests that most teachers have attained higher education, particularly at the bachelor's level, bringing varying levels of pedagogical skills that directly impact the quality of chemistry instruction and student outcomes. Teachers with bachelor's and master's degrees are likely to have stronger content knowledge and better teaching methodologies, which can improve student engagement and academic performance (Bailey et al., 2017). On the other hand, diploma holders, while still valuable, might require additional professional development to reach the same level of instructional expertise as their degree-holding colleagues.

Presentation of Findings

4.2.1 To Examine the Influence of Team Teaching on Learners' Academic Achievement in Chemistry in Public Day Ordinary Level Secondary Schools in Rwanda.

The researcher sought the opinions of teachers, deputy headteachers, and headteachers regarding the influence of team teaching on learners' academic achievement in chemistry as summarized in Table 4.6

Table 4.5:- Teachers' Opinions on Team Teaching and Learners' Academic Achievement in Chemistry.

Statements	SD	D	N	A	SA	Mean	Std. Dev
I regularly participate in team teaching with my colleagues	33	40	36	53	85	1.9	0.7
Teacher team teaching has led to improved student engagement in chemistry lessons and coverage of the syllabus.	41	34	41	61	70	1.7	0.55
Students' scores in chemistry assessments have improved due to the diverse instructional strategies offered by teacher team teaching	49	44	52	42	60	1.6	0.25
The completion rate of students has improved due to teacher team teaching practices	53	42	33	45	74	1.8	0.55

Source: Primary data, 2024

From Table 4.6, 55.9% of teachers reported participating in team teaching with colleagues, while 29.5% disagreed, and 14.5% were neutral. Additionally, 53.1% agreed that team teaching improved student engagement in chemistry lessons and syllabus coverage, while 30.5% disagreed, and 16.1% were neutral. Regarding improved student scores due to diverse teaching strategies, 41.3% agreed, 37.5% disagreed, and 20.9% remained neutral. Lastly, 48.1% of teachers agreed that team teaching enhanced student completion rates, with 38.7% disagreeing, and 13.9% neutral. The mean for all assessed educational practices was above 2.5, indicating general agreement, with a low standard deviation showing data consistency. Team teaching allows teachers to specialize in content they excel in, leading to better content delivery and positively impacting student performance.

Influence of Teacher Peer Coaching on Learners' Academic Achievement in Chemistry in Public Day Ordinary Level Secondary Schools in Rwanda.

The researcher sought the opinions of teachers, deputy headteachers, and headteachers regarding the influence of teacher peer coaching on learners' academic achievement in chemistry in public day ordinary level secondary schools in Rwanda as presented in Table 4.7

Table 4.6:- Peer Coaching on Learners' Academic Achievement.

Statements	SD	D	N	A	SA	Mean	Std. Dev
Teacher Peer coaching sessions are regularly scheduled and attended and have significantly contributed to my professional development.	46	37	29	61	74	4.9	1.6
Teacher peer coaching sessions are constructive and help improve teaching practices and students' participation.	50	35	32	53	77	4.9	1.6
Students' chemistry assessment scores have improved as a result of teacher peer coaching.	38	53	32	49	75	4.9	1.4
Teacher Peer coaching has led to an increased students' completion rate	43	37	41	60	66	4.9	1.1

Source: Primary data (2024)

Table 4.7 reveals that 54.4% of teachers agreed that peer coaching sessions are constructive and improve teaching practices and student participation, while 33.8% disagreed and 11.8% were neutral. Additionally, 52.4% agreed that peer coaching enhances teaching practices and student engagement, with 34.7% disagreeing and 12.9% neutral. Regarding chemistry assessment scores, 50.1% agreed that peer coaching improves student performance, while 37% disagreed and 12.9% were neutral. Lastly, 51.2% of teachers agreed that peer coaching boosts student completion rates. With a mean above 2.5 and a low standard deviation, these findings suggest broad teacher support for peer coaching, confirming its positive impact on student performance in secondary schools.

Influence of Professional Dialogues among Chemistry Teachers on Learners' Outcomes in Chemistry in Public Secondary Schools in Rwanda.

The study established the influence of professional dialogues on learners' outcomes in chemistry.

Table 4.7:- The Effects of Professional Dialogues and Discussions among Chemistry Teachers on Learners' Outcomes in Chemistry in Rwandan Public Ordinary Level Secondary Schools.

Statements	SD	D	N	A	SA	Mean	Std. Dev
Professional dialogue and discussions are a regular	48	39	35	55	70	4.9	1.24

part of our school culture.							
Engaging in professional dialogue has improved my teaching practices and increased students' participation in class.	19	12	28	91	97	4.9	3.68
There is a positive impact on students' chemistry assessment scores due to professional discussions.	11	19	28	69	120	4.9	4.05
The completion rate of students has improved due to professional dialogue and discussions	20	35	22	73	97	4.9	3.04

Source: Primary data (2024)

Table 4.8 shows that 50.7% of teachers agreed that professional dialogue is integral to their school culture, while 35.3% disagreed, and 14% were neutral. Professional dialogue allows teachers to reflect on content and teaching strategies, enhancing subject knowledge and effectiveness. For example, discussions on complex chemistry topics improve teaching methods. Additionally, 76% of teachers agreed that these dialogues enhance their teaching and student engagement, with 12.8% disagreeing and 11.2% neutral. This indicates that most teachers recognize the value of professional dialogue in improving teaching practices and fostering better classroom engagement.

Students' Academic Achievement in Chemistry Subject

This study collected data on students' academic achievement in chemistry.

Table 4.8:- The Students' Academic Achievement in Chemistry Subject in Chemistry in Rwandan Public Ordinary Level Secondary.

Statements	SD	D	N	A	SA	Mean	Std. Dev
The Overall performance of my students in chemistry assessments has improved due to collaborative teaching strategies.	48	41	28	70	60	4.9	1.4
The completion rate of chemistry assignments has increased due to the collaborative efforts in teaching and assessment.	28	37	0	84	98	4.9	3.6
The quality of the chemistry assignments submitted by my students reflects their understanding and mastery of the subject matter.	31	41	40	79	56	4.9	1.6
I believe that my students are well prepared for advanced studies in chemistry based on their current academic performance.	36	35	1	73	102	4.9	3.4

Source: Primary data, 2024

Table 4.9 shows that 52.4% of teachers agreed that collaborative teaching strategies have improved students' performance in chemistry assessments, while 36.4% disagreed and 11.2% were neutral. Additionally, 73.6% agreed that assignment completion rates have increased due to collaboration, with 26.4% disagreeing. Furthermore, 54.6% of teachers felt that students' submitted assignments reflected their understanding, while 29.2% disagreed and 16.2% were neutral. Finally, 71% of teachers believed students were well-prepared for advanced chemistry studies, with 28.6% disagreeing. Collaborative teaching enables teachers to address students' challenges by developing strategies for improving performance.

Correlation Between Teacher Collaboration and Learners' Achievement in Chemistry in Public Day Secondary Schools.

Table 4.9:- Correlation of Teacher Collaboration and Learners' Achievement in Chemistry in Public Day Secondary Schools.

		Team teaching	Peer coaching	Teacher professional dialogue/discussion	Learners' achievement
Team teaching	Pearson Correlation	1	.75**	.72**	.80**
	Sig. (2-tailed)		.000	.000	.000
	N	281	281	281	281
Peer coaching	Pearson Correlation	.75**	1	.70**	.77**
	Sig. (2-tailed)	.000		.000	.000
	N	281	281	281	281

Teacher professional dialogue/discussion	Pearson Correlation	.72**	.70**	1	.846**
	Sig. (2-tailed)	.000	.000		.000
	N	281	281	281	281
Learners' achievement	Pearson Correlation	.80**	.77**	.846**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	281	281	281	281

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Primary Data (2024)

From Table 4.10, Pearson correlation coefficient teacher collaboration indicators including team teaching, peer coaching, and teacher professional dialogue/ discussion that influence learners' achievements are 0.80, 0.77, and 0.846 respectively. It implies that team teaching and professional dialogue had the highest association with learners' achievement while peer coaching had the least association with learners' achievement. All the educational practices related to teacher collaboration had a positive association with learners' achievement.

These findings indeed are a confirmation that teacher collaboration is very crucial and contributes to the achievement of students in chemistry.

Regression Analysis

To determine the magnitude of change in learners' achievement due to the application of teacher collaboration in secondary schools, the researcher conducted regression analysis. The findings were summarized in three tables namely model summary, ANOVA, and coefficient tables.

Table 4.10:- Model Summary.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	**.85[a]**	**.7248**	**.715**	**.42**

Source: Primary data (2024)

Table 4.11 shows that the R squared is 0.7248. In this case, 72.2% of the variance in learners' achievement is explained by teacher collaboration in the model including team teaching, peer coaching, and professional dialogue. 0.715 is the R Square adjusted for the number of predictors in the model, providing a more accurate estimate when more variables are added. 0.42 represents the average distance that the observed values fall from the regression line. This is an indication that teacher collaboration is of great importance in learners' achievement.

Anova

To ascertain the appropriateness of the linear model in analyzing the relationship between teacher collaboration in secondary education and learners' achievement in Chemistry, the ANOVA table was presented.

Table 4.11:- Anova.

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	45.300	3	15.100	344.385	.001[a]
	Residual	17.200	243	0.071		
	Total	62.500	246			

Source: Primary data, 2024

From Table 4.12, the value of calculated F statistics is 35.78 which is very high with a significance value of 0.001 implying that the model used in this research to determine the relationship between teacher collaboration and learners' achievement is appropriate.

Table 4.12:- Beta Coefficients.

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.129	.269		.480	.637

Team teaching	.307	.415	.307	.741	.039
Peer coaching	.385	.303	.363	1.272	.001
Professional dialogue	.846	.584	.798	1.449	.027

a. Dependent Variable: Learners' Achievement

Source: Primary data (2024)

Table 4.13 shows that the beta coefficients for team teaching, peer coaching, and professional dialogue are 0.307, 0.385, and 0.846, respectively. This means a 1% increase in teacher collaboration leads to a 30.7%, 38.5%, and 84.6% improvement in student achievement, assuming other factors remain constant. The significance values for these predictors are less than 0.05, confirming that the positive effects are significant. The results demonstrate a strong positive relationship between teacher collaboration and student achievement in public secondary schools. These findings align with Abagi (2021), who emphasized the importance of fostering collaborative cultures among teachers to improve teaching practices. Additionally, the study supports the works of Goddard et al. (2017) and Prenger et al. (2019), which highlight the role of collaborative environments in fostering innovative teaching and enhancing student learning outcomes.

Conclusions And Recommendations:-

Conclusions:-

This study has demonstrated that teacher collaboration, through practices such as team teaching, peer coaching, and professional dialogue, significantly enhances learners' academic achievement in chemistry in public day ordinary level secondary schools in Rwanda. Collaborative efforts among teachers have been shown to improve instructional quality and foster professional growth. Professional dialogue, in particular, facilitates the exchange of ideas, leading to more effective teaching practices. The effect of these collaborative strategies is evident in learners' achievement, including improved scores in chemistry assessments, increased class participation, and a higher student completion rate.

Recommendations:-

Based on the identified problem and findings regarding teacher collaboration and learners' achievement in Rwanda's public day ordinary level secondary schools, the researcher provides the following:

Schools should establish and strengthen formal structures for teacher collaboration, such as regular team-teaching sessions, peer coaching programs, and professional dialogue platforms. These initiatives would allow teachers to share best practices, enhance their instructional techniques, and collectively solve classroom challenges.

School managers should create strong structures in school to strengthen teacher collaboration

REB should train school leadership (headteachers and deputy headteachers) on how to foster and support teacher collaboration within their institutions. This can be done through leadership programs that emphasize the role of school heads in cultivating collaborative school cultures.

REB should create and implement national guidelines that promote teacher collaboration as a key component of professional practice. These guidelines should include frameworks for team teaching, peer coaching, and professional dialogues, ensuring consistency across all schools.

The Ministry of Education and school administrators should ensure that teachers have access to adequate resources and support for collaboration. This includes time for teachers to engage in team teaching, opportunities for peer observation, and spaces for regular professional discussions.

By implementing these recommendations, schools can strengthen teacher collaboration, which is a key factor in improving learners' achievement in chemistry and other subjects.

Suggestion for Further Studies:-

The researcher recommends that further studies be carried out on the following possible research areas: The effect of teacher collaboration on learner engagement, A longitudinal study on the impact of teacher collaboration on learners' achievement in secondary schools, The role of teacher collaboration in enhancing learners' achievement across

different subjects in secondary education, Investigating the role of school leadership in promoting effective teacher collaboration in secondary schools and Peer coaching as a professional development tool: its impact on teacher performance and confidence in secondary education.