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Integrated Science Teachers' Perception: ICT Integration at Grade 10 in Secondary Schools across East Berbice Corentyne, Guyana, South America

Wazim Rafeek Sharif and Azad Khan
Faculty of Education and Humanities,
University of Guyana, Greater Georgetown, Guyana

Abstract. Modern society has benefited from the rapid advancement of technology, making it necessary to assess the effects of Information Communication Technology (ICT) adoption in the classroom. This study examined secondary school Integrated Science teachers' perception of ICT integration in Grade 10 across East Berbice Corentyne, Guyana. A non-experimental quantitative design was utilised. The sample comprised 30 teachers – 15 males and 15 females that were extracted using the stratified random sampling method. Data were collected via a questionnaire and administered in keeping with the appropriate ethical considerations. The data collected were analysed through descriptive and inferential analysis techniques. The findings revealed that male teachers used ICT tools more than female teachers and that all the teachers surveyed (trained or not) agreed that ICT integration was an effective intervention in the classroom. Furthermore, the younger teachers reported they faced many challenges despite their willingness to integrate ICT, while the older teachers opted to continue using traditional methods and were more reluctant.

Keywords: Information and Communication Technology (ICT), Integrated Science, Perceptions, Teaching Strategy

Introduction

The rapid development of ICT has ushered in substantial improvements in the twenty-first century and influenced modern societal applications and demands. One such area is using "ICT to teach science in secondary schools" (Omar Z., personal communication, May 20, 2023). Recognising the impact of ICT on daily life and the work environment, education ministries are attempting to rebuild their science curricula and classrooms to bridge the technological gap between learning and teaching science at the secondary level (Ministry of Education – Guyana, 2019). ICT has become essential in all science teachers' pedagogical practices (OECD, 2021). Teachers employ various teaching strategies with ICT to provide students with critical and creative thinking skills to become independent and socially conscious productive citizens in a nation influenced by science and technology (OECD, 2021). This reorganisation operation necessitates the efficient integration of technologies into the existing school surroundings to provide learners with subject-specific knowledge, encourage active learning, and increase professional efficiency (Aslan & Zhu, 2018; Tomei, 2005).

Guyana established an 'ICT Professional Development Strategy for Teachers' in 2011 to complete ICT integration into the education system (Ministry of Education, Guyana, 2008). Later, the Ministry included Science, Technology, Engineering, and Mathematics (STEM) to strengthen the strategy's integration of information and communications technology (ICT) in science classrooms (Moore et al., 2012). Extensive training programs were developed and implemented to provide science teachers with basic computer literacy skills, expecting that these skills would allow them to integrate ICT into their science classes successfully. Additionally, the education ministry has installed smart classrooms and laboratories in selected secondary schools nationwide and promised to continue once resources are available (Moore et al., 2012; Ministry of Education - Guyana, 2022).

However, all the above implementations relied heavily on assumptions and theory rather than actual data from science teachers (or any other subject teachers). Furthermore, little research exists exploring the effectiveness or impact of ICT integration in secondary science education in Guyana, let alone teachers' perceptions of ICT integration in secondary science education (Moore et al., 2012). Keengwe et al. (2008), Ahmed (2020) and Udit (personal communication, May 15, 2021) agreed that one of the essential elements influencing effective ICT integration in the classroom is teachers' beliefs and attitudes about technology.

It is perceived that teachers' input is vital since they are the executors of the teaching process. Further, it is believed that teachers' skills, preferences, attitudes, and barriers may also influence curriculum design and the overall integration of ICT into secondary science teaching. Subsequently, this study aims to respond to the following questions:

What relationship exists between:

- Teachers' gender and the extent to which Integrated Science Teachers integrate ICT in their lessons to teach at Grade 10?
- Teachers' age and barriers to using ICT in teaching Integrated Science at the Grade 10 level?
- Teachers' statuses (Trained, Untrained, Trained Graduate, and Untrained Graduate) and their perceptions of ICT integration in teaching Integrated Science at Grade 10?

Literature Review: Theoretical Framework

This study focused on analysing the level of perception of teachers on integrating Information and Communication Technology (ICT) to enhance the teaching of Integrated Science in Grade 10 in five districts of East Berbice Corentyne, Guyana. Two relevant theories will be adopted for this study, one of the theories is the Diffusion of Innovations by Rogers (2003), and the other is Technology Acceptance Model (TAM) by Davis and his colleagues (1989).

Diffusion of Innovation Theory

Rogers's (2003) theory indicated that diffusion of innovation theory is the process by which information is passed on through different mediums and over a long time among the members of a social system. In this, the procedure begins with knowledge as the first medium. This medium represents the features of the decision deliberation Unit by the ICT users to incorporate the technology (Rogers, 2003). Consequently, the program ends with confirmation of the users to accept the technology and make use of the technology accordingly (Rogers, 2003).

Another theory is the TAM theory. The theory consists of several parts. Some characteristics that demonstrate acceptance include; behavioural intention, perceived usefulness and perceived ease of use (Davis et al., 1989). Perceived usefulness is a term used to refer to the capacity at which an individual trusts the advantage of using a specific technology to improve job performance (Davis et al., 1989). In other words, perceived ease of use refers to the importance of technology in being user-friendly for users.

Technology Acceptance Model and ICT in the Classroom

The TAM theory consists of several parts. Some characteristics that demonstrate acceptance include; behavioural intention, perceived usefulness, and perceived ease of use (Davis et al., 1989). Perceived usefulness is a term used to refer to the capacity at which an individual trusts the advantage of using a specific technology to improve job performance (Davis et al., 1989). In other words, perceived ease of use refers to the importance of technology in being user-friendly for users.

Arguably, the TAM theory measures the effectiveness and success of a given technology. This also helps create an understanding of the efficacy of a particular system. TAM theory primarily influences modern statistics systems research (Davis et al., 1989). However, with time, the theory has evolved with more specific variables clarifying how a user can receive a technology over the year.

Therefore, the proposed theoretical framework of Davis and colleagues (1989) and Rogers (2003) explains the factors that correlate with the study's purpose. The features entrenched in the theoretical framework have been precisely intertwined. Thus, the connection between them can successfully be applied in estimating the perception of integrating Information and Communication Technology (ICT) to enhance teaching Integrated Science in Grade 10 in secondary schools in East Berbice Corentyne. This helps in supporting the primary elements, including ease of use, functionality, springiness, openness and incorporation aligned with the research purpose.

Teachers' Gender and the extent to which ICT is Integrated into the Classroom

There is a close correlation between the gender of a teacher and the extent to which Integrated Science Teachers integrate ICT in their lessons to teach Grade 10 students. Numerous studies have been performed to explain the relationship. Barak and colleagues (2016) indicated that female teachers are less likely to integrate ICT into their training than male teachers. Another study by the OECD (2021) indicated that female teachers have poor perceptions of ICT compared to male teachers and are less likely to relate to science and information technology effectively. Hence, their understanding is perceived to be low compared to those of males. Blattner and Fiori (2009) found that ICT integration is a complicated process, precisely in females. In a study involving 1048 subjects, the researchers found that the level of ICT integration among females was 12% less than that of males.

Teachers' Age and Barriers to Using ICT in Teaching

Schoepp (2015) indicated a direct correlation between teachers' age and barriers to using ICT in teaching Integrated Science. The findings of the research indicated that older teachers rarely integrate the use of ICT in their teaching. This is because most aged individuals often lack the competence to practice ICT. To them, ICT is considered a modern technology, and the traditional generation is not conversant with it (Amanatidis, 2023).

Similarly, supporting this assertation, Özden (2017) indicated that teachers might lack effective training. The teacher might not have gone through a curriculum where ICT was compulsory. Ghavifekr and Wan Athirah (2015) supported this claim by indicating that age is critical in enabling ICT integration in schools. This is because teachers who were taught early negatively perceive ICT. In contrast, teachers trained in the modern curriculum recorded increased capacity for ICT integration. This is because a majority of the teachers undergo a sufficient amount of in-service training. Thus, this helps in increasing their competence to practice ICT.

Teachers' Statuses and Perception of ICT Integration in the Classroom

Becta (2014) indicated that the teacher's competence precisely originates from the teacher's training level. Thus, based on whether the teacher is a Trained, Untrained, Trained Graduate, and Untrained Graduate, their level of competence will vary drastically.

Newhouse (2012) found that most teachers were short of knowledge and skills; hence this greatly affected their effort to integrate ICT into training. Thus, it is evident that the higher the teacher's training, the more positive perception they have towards the integration of Information communication technology in their studies and their students' training.

Consequently, Pelgrum (2011) indicated that the majority of the teachers who lacked the knowledge to use computers were unenthusiastic about the changes made by the government to encourage the use of technology in the training of the students. Most individuals are unwilling to accept new and recent technology since they know little about the technologies and their applicability.

Al-Oteawi (2012) indicated that the lack of high-tech competence is a primary hindrance in the acceptance and utilisation of ICT in grade schools. In many countries like Syria, the shortage of technological competence is the primary barrier to integrating ICT in grade schools. Similarly, research by Al-Alwani (2015) conducted in Saudi Arabia indicated that the lack of trained teachers with the required level of competence hinders the adoption of ICT in schools.

Empirica (2016) found a close correlation between teacher's status (Trained, Untrained, Trained Graduate, and Untrained Graduate) and perception of ICT integration in teaching Integrated Science at the Grade Ten level and produced a report on ICT use in European schools. In a survey that involved approximately 27 European countries, the research results indicated that the majority of the teachers that do not integrate ICT into teaching were untrained. Similarly, the untrained graduates indicated that a "lack of skills" is a compelling factor preventing them from using ICT for teaching.

Similar to this assertion, Pelgrum (2013) conducted another worldwide survey. The study's findings involving a national representative sample from 26 countries indicated that teachers lacked knowledge and skills in complex obstacles. Thus, because of the shortage of training, they were unwilling to integrate ICT into their lessons.

Consequently, another research conducted by Balanskat et al. (2016) indicated that teachers' lack of knowledge and skills is a serious obstacle to the utilisation of ICT in primary and secondary schools. The study results indicated that most teachers do not use ICT and media in teaching situations. This is because, despite being graduates, they have very minimal ICT skills. Although some teachers have been trained to use ICT in some instances, unfortunately, they lack the competence to practice ICT. Thus, it is inconclusive that only untrained individuals delay the integration of ICT in schools. However, a group of individuals are trained to use ICT but still lack the competence to practice ICT in schools. Thus, the teachers' lack of competence and negative perception is among the strongest barriers that delay the integration of ICT in Education.

Materials and Methods

This quantitative study comprised a sample of 30 Integrated Science teachers from 17 secondary schools across East Berbice Corentyne, Guyana. The sample was selected using the stratified random sampling method, where gender was the homogenous group.

Data were gathered utilising an online questionnaire which comprised three sections - one retrieved demographics, and the other two were Likert Scale structure comprising probing statements the teachers had to rate based on their level of agreement or disagreement. Each section was originally designed with an intentional and essential diversity of questions in consideration of the research questions as well as the objective of the study (Merriam, 2022). Throughout the designing and execution of the study, the researchers endeavoured to consider various degrees of validity, reliability and other ethical aspects.

Results and Discussion

What relationship exists between teachers' gender and the extent to which ICT is integrated at the Grade Ten level amongst integrated science?

Descriptive Statistics

Table 1 shows the descriptive statistics of the variables for the research question on gender and the extent to which ICT is integrated at the Grade Ten level among Integrated Science teachers. It can be inferred from Table 1 that male teachers always integrate ICT tools in their Integrated Science class as compared to female teachers who do the same but less often. The average mean (4.57) and standard deviation (0.404) revealed that all the Integrated Science teachers surveyed, no matter their gender, always integrated ICT tools in their classes (see Table 1). Similar results were recorded by Rozell and Gardner (2000). They found that 75% of male teachers integrated ICT in their classrooms completely compared to female teachers, only 42% of whom integrated ICT in their classrooms completely (Rozell & Gardner, 2000).

The findings revealed that males use ICT the most (4.93) in remedial classes, while females use ICT (4.40) to record marks and provide feedback to students and parents (see Table 1). In terms of ICT being used the least, the opposite occurred. That is, males, though the mean is high (4.73), used ICT tools the least to record marks and provide feedback to the students and parents, while females used ICT tools the least (4.20) during remedial classes (see Table 1). Overall, the highest mean (4.60) for the individual items was recorded for using videos to explain processes and concepts recommended in the CSEC syllabus and termly schemes. This was followed by using ICT to create PowerPoint presentations to present ideas, teach during remedial classes and record and provide feedback to students and parents, with a mean of 4.57 and a standard deviation of 0.504. The lowest mean (4.53) was recorded for using ICT tools to evaluate lessons with a Standard deviation of 0.507 (see Table 1).

Table 1. The relationship between the gender of Integrated Science teachers and the extent ICT is integrated at Grade Ten

Gender		I use ICT tools to evaluate my lessons.	Inference for mean	I use videos to explain concepts recommended in the CSEC syllabus.	Inference for mean	I create PowerPoint presentations to teach.	Inference for mean	I use ICT tools to teach during remedial classes.	Inference for mean	I use ICT to record marks and provide feedback	Inference for mean	Avg.	Inference for mean
Males	Mean	4.80	Always	4.87	Always	4.80	Always	4.93	Always	4.73	Always	4.83	Always
	Std. Deviation	.414		.352		.414		.258		.458		.225	
	Std. Error of Mean	.107		.091		.107		.067		.118		.058	
	Variance	.171		.124		.171		.067		.210		.051	
Females	Mean	4.27	Very often	4.33	Very often	4.33	Very often	4.20	Very often	4.40	Very often	4.31	Very often
	Std. Deviation	.458		.488		.488		.414		.507		.377	
	Std. Error of Mean	.118		.126		.126		.107		.131		.097	
	Variance	.210		.238		.238		.171		.257		.142	
Total	Mean	4.53	Always	4.60	Always	4.57	Always	4.57	Always	4.57	Always	4.57	Always
	Std. Deviation	.507		.498		.504		.504		.504		.404	
	Std. Error of Mean	.093		.091		.092		.092		.092		.074	
	Variance	.257		.248		.254		.254		.254		.163	

Key: Likert Scale Ratings: 5 – Always, 4 – Very Often, 3 – Sometimes, 2 – Rarely, 1 – Never

Inferential statistics

Table 2. Linear Regression test - Model Summary

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.765[a]	.585	.498	.360
a. Predictors: (Constant), I use ICT to record marks and provide feedback, I use ICT tools to evaluate my lessons, I create PowerPoint presentations to teach, I use videos to explain concepts recommended in the CSEC syllabus, I use ICT tools to teach during remedial classes				
b. Dependent Variable: Gender				

Table 3. Linear Regression test - ANOVA

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	4.386	5	.877	6.760	0.000030
	Residual	3.114	24	.130		
	Total	7.500	29			
a. Dependent Variable: Gender						
b. Predictors: (Constant), I use ICT to record marks and provide feedback, I use ICT tools to evaluate my lessons., I create PowerPoint presentations to teach, I use videos to explain concepts recommended in the CSEC syllabus, I use ICT tools to teach during remedial classes						

The model summary (Table 2) shows that all the variables combined have a direct association or a strong positive correlation (R=0.765) with the gender of the teacher. This confirms that the extent ICT tools are used in the classroom is highly dependent on the gender of the teacher (see Table 1). The female teachers surveyed agreed that they use ICT tools very often in class compared to their male counterparts, who always use the same (see Table 1). Basargekar and Singhavi (2017) justified this, saying that female teachers, unlike their male counterparts, are often not exposed to ICT training and experience, which often leads to limited use.

Moreover, this was further confirmed when a more profound analysis was done. The R-square value (0.585) indicates that the collection of the ICT tools variables combined accounts for a 58.5% variation in the model. The remaining 41.5% is unexplained variation (see Table 2).

The ANOVA test shows a regression model that describes the relationship between teachers' gender and the extent to which ICT tools are used in the classroom, unveiling a p-value of 0.000030 (see Table 3). This value is less than the significance level of 0.05. Therefore, the null hypothesis that there is no relationship between the gender of Integrated Science teachers and the extent ICT tools are integrated into Grade 10 is rejected, and the conclusion is that there is a relationship between the two variables. These findings coincide with those of Basargekar and Singhavi (2017), BECTA (2004), Mansfield (2019) and Todman (2000). They found that gender has a major influence on the level to which ICT tools are used in class and teaching. The studies identified that most female teachers face difficulties embracing technology compared to their male counterparts, who embrace it wholly.

What relationship exists between Teachers' age and barriers to using ICT in teaching Integrated Science at the Grade 10 level?

Descriptive Statistics

Table 4 revealed that the participants, regardless of age, reacted negatively towards the statements presented to them: Strongly Disagree (SD) and Disagree (D). For the individual

item variables, the means for younger teachers (Ages 20 – 29), 1.00, 1.27, 1.20, 1.33, and 1.27, respectively, revealed their strong disagreement and the barriers limiting them from effectively integrating ICT into their classroom (see Table 4). Teachers within the age range of 30 -39 share the same motive as the younger teachers; they strongly disagree that enough training and professional development are provided for teachers to use ICT (1.42), assistance is given to resolve technical issues (1.17), and sufficient time is given for them to learn and implement ICT tools (1.25).

Table 4. Relationships that exist between Integrated Science Teachers' age and the barriers to using ICT tools in teaching at Grade Ten

Age		The Ministry of Education provided sufficient ICT tools for teachers to use while teaching.	Inference of mean	The ICT facilities at my school are easily accessible and functioning well.	Inference of mean	There is adequate training and professional development provided for teachers about ICT use in teaching.	Inference of mean	I am given sufficient time to learn and be comfortable using ICT in teaching.	Inference of mean	My school provides technical support to teachers who are faced with ICT difficulties.	Inference of mean	Avg	Inference of mean
20-29	Mean	1.00	SD	1.27	SD	1.20	SD	1.33	SD	1.27	D	1.21	SD
	Std. Deviation	.000		.458		.414		.488		.507		.270	
	Std. Error of Mean	.000		.118		.107		.126		.131		.069	
	Variance	.000		.210		.171		.238		.257		.073	
30-39	Mean	1.83	D	1.58	D	1.42	SD	1.25	SD	1.17	SD	1.45	SD
	Std. Deviation	.389		.515		.515		.452		.389		.258	
	Std. Error of Mean	.112		.149		.149		.131		.112		.074	
	Variance	.152		.265		.265		.205		.152		.066	
40-49	Mean	2.00	D	2.00	D	2.00	D	1.67	D	2.00	D	1.93	D
	Std. Deviation	.000		.000		.000		.577		.000		.115	
	Std. Error of Mean	.000		.000		.000		.333		.000		.067	
	Variance	.000		.000		.000		.333		.000		.013	
Total	Mean	1.43	SD	1.47	SD	1.37	SD	1.33	SD	1.30	SD	1.38	SD
	Std. Deviation	.504		.507		.490		.479		.490		.285	
	Std. Error of Mean	.092		.093		.089		.088		.089		.052	
	Variance	.254		.257		.240		.230		.240		.081	

Key: Likert Scale Ratings: 4 – Strongly Agree (SA), 3 – Agree (A), 2 – Disagree (D), 1 - Strongly Disagree (SD)

However, their level of disagreement decreased when asked if the Ministry of Education provided sufficient ICT tools for teachers (1.83) and if ICT tools are easily accessible and functioning at their school (1.58). In addition to the decreased level of disagreement, the means (2.00, 2.00, 2.00, 1.67 and 2.00, respectively) for the older teachers (Age 40 – 49) showed that they disagree with the item variables, which means that the barriers exist but not to the extent of not integrating ICT tools (see Table 4).

Though the varying means of disagreement for the individual variable items, the average of the means (1.21 and 1.45, respectively) for the young teachers (20-29) and the middle-aged teachers (30-39) unveiled strong disagreement, while the older teachers (40-49) also disagreed but was not as strong as the other two age categories (see Table 4). Garner

(2008) and Giordano (2007) justified this trend by saying that the younger generations are excited and willing to integrate ICT into their lessons and, as a result, will encounter barriers that will limit them. Hence their strong disagreement. However, older teachers with experience tend to stick to using the traditional method and refrain as much as possible from integrating ICT tools. Hence, they will not encounter many barriers (Lenkaitis, 2020; Giordano, 2007). This justification and the findings from this study indicate a significant relationship between teachers' age and the barrier that limits them from integrating ICT in their Integrated Science classes.

Inferential statistics

A linear regression test was done to confirm a significant relationship between the teachers' age and the barrier that limits them from integrating ICT in their Integrated Science class (see Tables 5 and 6). Table 5 - the model summary, shows that all the combined variables are associated with teachers' age at 0.890, which is a strong positive correlation, therefore depicting that the teachers' ages are related to barriers to using ICT in teaching.

Table 5. Linear Regression Test - Model Summary

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.890[a]	.792	.748	.339
a. Predictors: (Constant), My school provides technical support to teachers facing ICT difficulties. The Ministry of Education provided sufficient ICT tools for teachers to use while teaching; there is adequate training and professional development provided for teachers about ICT use in teaching; the ICT facilities at my school are easily accessible and functioning well., I am given sufficient time to learn and be comfortable using ICT in teaching.				
b. Dependent Variable: Age				

Table 6. Linear Regression Test - ANOVA

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	10.449	5	2.090	18.228	$1.7706e^{-7}$
	Residual	2.751	24	.115		
	Total	13.200	29			
a. Dependent Variable: Age						
b. Predictors: (Constant), My school provides technical support to teachers facing ICT difficulties. The Ministry of Education provided sufficient ICT tools for teachers to use while teaching; there is adequate training and professional development provided for teachers about ICT use in teaching; the ICT facilities at my school are easily accessible and functioning well., I am given sufficient time to learn and be comfortable using ICT in teaching.						

Additionally, the ANOVA test shows the regression model where the p-value, $1.7706e^{-7}$, is less than the significance level (0.05) (see Table 6). Therefore, the null hypothesis states that no relationship exists between teachers' age and barriers to using ICT in teaching Integrated Science at the Grade 10 level is rejected. The alternative hypothesis that states a relationship is accepted.

Locally, this was confirmed by the Ministry of Education – Guyana (2022) when they said

> 'You will not find the older teachers using many ICT tools in their classroom because they were not taught so while attending the Teachers' Training College- Cyril Potter's College of Education (CPCE). They are accustomed to the traditional method and will avoid/ not encounter many ICT barriers. However, for the younger people, CPCE made

it mandatory for teachers to use ICT in their lessons so they will encounter barriers more than the older folks.'

This finding is in agreement with Giordano (2008), Lenkaitis (2020), Minisrty of Education – Guyana (2022) and Wong and Li (2008), who rejected a similar hypothesis and justified the rejection by saying that the older teachers were not taught to use ICT during their teacher training program as such they do not integrate ICT much in their lessons. Hence, they do not encounter many barriers. However, technology has taken over the world, especially in the education system. As such, teacher training programs incorporate ICT tools and make it mandatory for teachers to do the same in their lessons as part of their assessment. As such, they will encounter more barriers limiting them from completely integrating ICT into their classrooms.

What relationship exists between a teacher's status (Trained, Untrained, Trained Graduate, and Untrained Graduate) and perception of ICT integration in teaching Integrated Science at the Grade Ten level?

Descriptive Statistics

Table 7 depicts the mean, standard deviation, standard error of the mean and variance for the individual item variables and the total. It can be inferred that all the teachers surveyed, regardless of their status, perceived ICT integration in the classroom as positive. In detail, the means for the individual item variable for trained teachers (3.69, 3.94, 3.81, 3.88, 3.81, respectively) and Trained Graduate teachers (4.00, 3.87, 3.87, 4.00, 3.75, respectively) revealed that the teachers strongly agreed that ICT integration in their class was indeed a progressive step (see Table 7). Table 3 also revealed that Untrained Graduate teachers agreed that ICT integration was a good intervention in the classroom. However, the overall mean (3.13) illustrates that their agreement was not as strong as the two other groups.

Table 7. The relationship that exists between Integrated Science Teachers' status and their perception towards ICT integration at Grade Ten

Status		The use of ICT as an instructional tool motivates students to learn.	Inference of mean	Using ICT helps me improve my teaching skills and strategies with updated materials.	Inference of mean	Using ICT makes education delivery more accessible and more interesting for students.	Inference of mean	Using ICT positively impacts the relationship between my students and me.	Inference of mean	ICT facilitates collaborative work among students and enhances their performance.	Inference of mean	Avg	Inference of mean
Trained	Mean	3.69	SA	3.94	SA	3.81	SA	3.88	SA	3.81	SA	3.82	SA
	Std. Deviation	.479		.250		.403		.342		.403		.161	
	Std. Error of Mean	.120		.063		.101		.085		.101		.040	
	Variance	.229		.063		.163		.117		.162		.026	
Trained Graduate	Mean	4.00	SA	3.87	SA	3.87	SA	4.00	SA	3.75	SA	3.90	SA
	Std. Deviation	.000		.354		.354		.000		.463		.107	
	Std. Error of Mean	.000		.125		.125		.000		.164		.038	
	Variance	.000		.125		.125		.000		.214		.011	
Untrained Graduate	Mean	3.17	A	3.00	A	3.17	A	3.17	A	3.17	A	3.13	A
	Std. Deviation	.408		.000		.408		.408		.408		.163	
	Std. Error of Mean	.167		.000		.167		.167		.167		.067	
	Variance	.167		.000		.167		.167		.167		.027	
Total	Mean	3.67	SA	3.73	SA	3.70	SA	3.77	SA	3.67	SA	3.71	SA
	Std. Deviation	.479		.450		.466		.430		.479		.327	
	Std. Error of Mean	.088		.082		.085		.079		.088		.059	
	Variance	.230		.202		.217		.185		.230		.107	

Key: Likert Scale rating: 4 – Strongly Agree (SA), 3 – Agree (A), 2 – Disagree (D), 1 Strongly Disagree (SD)

Based on statistical calculations from Table 7, the average of the means (3.71) and standard deviation (0.327) unveiled that all the Integrated Science teachers surveyed had a very positive perception of ICT integration in their Grade Ten class. The Trained and Trained Graduate teachers had a stronger positive perception of ICT integration. This was justified by the Ministry of Education – Guyana (2022) said that "during CPCE [teacher training program], teachers were taught the necessary skills needed to integrate technology in their class effectively compared to the Untrained Graduates who only possess a degree in the content area and not the methodology aspect of teaching". These varying means and standard deviations initiate a conclusion that there is a significant relationship between Integrated Science teacher status and their perception of ICT integration in their classroom.

Inferential statistics

To confirm the initial inference, a linear regression test was done. The model summary table shows an R-value of 0.777, indicating a moderately positive correlation between the variables: the teachers' status and their perception of ICT integration in their classroom (see Table 8). In other words, there is a significant relationship between the teachers' status and their perception of ICT integration in their classrooms. Moreover, the R-square is 0.604 (see Table 8). This infers that the collective perception variables of ICT integration in teaching Integrated Science at Grade Ten accounted for 60.4% of the variation in the model (Frost et al., 2020).

Table 8. Linear Regression Test - Model Summary

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.777[a]	.604	.522	.555
b. Predictors: (Constant), ICT facilitates collaborative work among students and enhances their performance; using ICT makes education delivery more accessible and more interesting for students; the use of ICT as an instructional tool motivates students to learn; using ICT positively impacts the relationship between my students and me, Using ICT helps me improve my teaching skills and strategies with updated materials.				
a. Dependent Variable: Status				

Table 9. Linear Regression Test - ANOVA

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.284	5	2.257	7.336	.000[b]
	Residual	7.383	24	.308		
	Total	18.667	29			
a. Dependent Variable: Status						
b. Predictors: (Constant), ICT facilitates collaborative work among students and enhances their performance; using ICT makes education delivery more accessible and more interesting for students; the use of ICT as an instructional tool motivates students to learn; using ICT positively impacts the relationship between my students and me, Using ICT helps me improve my teaching skills and strategies with updated materials.						

To confirm this significance, a linear regression test was conducted (see Table 9). The ANOVA linear regression test produced a p-value of 0.000269, lower than the 0.05 significance level (see Table 9). Hence, the null hypothesis, that is, there is no relationship between Integrated Science teachers' status and the perception of ICT integration in teaching at Grade Ten, was rejected. Thus, the alternative hypothesis was accepted, indicating a relationship between the two variables. Becta (2014) indicated that teachers' competence precisely originates from their level of training. Thus, based on whether the teacher is a Trained, Trained Graduate, or Untrained Graduate, his/her level of competence and perception will vary drastically. Khedaroo (2022) emphasised that with the present

technological advancement, teachers who undergo the teacher training program at the Cyril Potter College of Education (CPCE) are taught basic ICT skills to implement in their classroom (Kamanie Khedaroo, personal communication, October 28, 2022). As these teachers advance to the University level to complete their Bachelor's Degree in Education, they are exposed to more ICT-integrated courses, stimulating their minds and encouraging them to integrate ICT in the classroom (Kamanie Khedaroo, personal communication, October 28, 2022).

Similar sentiments were expressed by another senior educational officer in Guyana:

> "Teachers who pursue Degrees other than the BEd (Bachelor of Education) are knowledgeable in the content area but not the methodology area. Hence their affinity to using ICT tools in the classroom is somewhat less than that of the teachers who went through college [CPCE] prior to completing the BEd [Bachelor of Education]." (S. Bhajan, personal communication, May 12, 2023).

The findings of Akman, (2018), Empirica (2016), Becta, (2014), and Pelgrum, (2011) are in line with this research. Their research found that teachers who undergo teacher training are more likely to perceive ICT integration positively than teachers who do not.

On the flip slide, Balanskat et al. (2016) said that there are instances where teachers have been trained to integrate ICT into their lessons, but unfortunately, they choose not to do so. Thus, it is inconclusive that only untrained individuals deviate from integrating ICT in schools. However, a group of individuals are trained in ICT who either still lack the competence to practice ICT in schools or simply choose not to implement ICT in their lessons.

Conclusion

The findings (p-value = 0.000030) revealed a significant relationship between the teachers' age and the barrier limiting them from integrating ICT in their Integrated Science class. It was revealed that the participants, regardless of age, reacted negatively, revealing their strong disagreement and the barriers limiting them from effectively integrating ICT into their classroom.

Additionally, by answering the research questions, it was witnessed that gender somehow influenced how Integrated Science teachers perceived the integration of ICT. This is where female teachers were less effectively related to the integration of ICT than their male counterparts. Hence, their comprehension is minimal than to those of males. More so, the age of the teachers influenced the level at which the integration of ICT was perceived. According to the research findings, older teachers rarely use ICT in their classrooms since older teachers lack the expertise to apply ICT and use traditional methods. This is because ICT is perceived as modern technology, and traditional individuals are not familiar with the technology.

Moreover, the teachers' status had a significant relationship with the conciliation of ICT in the classroom. All the teachers surveyed agreed that ICT integration was a good intervention in Grade Ten to teach Integrated Science. However, though the positivity, Trained and Trained Graduate teachers were more in favour of the intervention because they strongly agreed compared to their fellow Untrain Graduate colleagues who merely agreed.

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