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Teachers' & Students' ICT Competencies and Their Attitudes Towards the Use of Technology in Teaching and Learning -Gauteng Province (South Africa)

Onismus Rufaro Rondozai

(Research & Post Graduate Division / Stafford University, Uganda)

ABSTRACT : With the 4th Industrial Revolution (4IR) sweeping across the globe, South Africa could not be left behind by this digitalization tide. ICT integration programs have been initiated in the education system in Gauteng province by Gauteng Department of Education (GDE) and Non-Governmental Organizations (NGOs) to improve students' outcomes. The research study therefore, aimed at assessing teachers' and students' skills and attitudes towards the use of ICTs in teaching and learning. It relied on online questionnaires that solicited for self-assessments from teachers and students on the use of ICTs. To reduce bias, the same questions were used at multi-levels (i.e. student, teacher and ICT Coordinator levels), so as to get a balanced view of the status quo. The results of the study revealed that teachers and students had strong positive attitudes towards this technology despite some challenges inherent in a program of this magnitude. Therefore, it is recommended that GDE and NGOs take advantage of this interest as a springboard for more focused ICT integration programs, to make school digitalization a reality. The major hiccup identified was that although teachers were very positive about the utilization of ICTs, most of them still lacked adequate technical skills to implement ICT integration effectively. So, it is recommended that GDE and NGOs assist in making ICT teacher development more focused and well-resourced to equip the teachers with advanced ICT skills to help institutionalize ICTs and improve students' learning outcomes.

Keywords: digitalization, Fourth Industrial Revolution (4IR), ICT integration, institutionalize, quantitative research

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1. Introduction

There is no doubt that the 4th Industrial Revolution (4IR) has popularized the use of technology in industry and the education sector (to name a few), indirectly assisted by COVID-19 that forced school stakeholders to communicate and teach remotely using 21 century technology [1]. The information and communication technology (ICT) competencies of teachers and students were no doubt put to test; however, for a worthy cause. 4IR was not imparting South Africa alone, but the whole world, thus creating a global village. The government of South Africa (just like other countries worldwide) embarked on ICT programs in schools to assist in improving students' outcomes, after noting the benefits tied to digitalization. The Department of Education (DoE) [2] drafted policies to guide educational personnel in the implementation of ICT integration

programs in schools such as the Draft White Paper on e-Education [2]. The paper highlights the need for; equitable ICT resource allocation, capacity building (teacher development initiatives), and content access and reliability [2].

This study assessed teachers' and students' ICT competencies and their attitudes towards adoption of technology in teaching and learning. It was the researcher's opinion that attitudes are crucial in the adoption process of technology. Any form of change is likely to threaten the status quo, so a departure from the traditional teaching and learning pedagogies might face resistance from the stakeholders for fear of the unknown. So, for the successful adoption of ICTs in teaching and learning, attitudes of stakeholders and competencies are crucial. Therefore, the study saw the need to assess these aspects/ factors in Gauteng schools and how they impact on ICT integration that was on course.

2. Problem Statement

Gauteng Department of Education (GDE) has been undertaking ICT integration projects in selected schools, mostly the formerly disadvantaged township schools for some time now. The selected schools have been provided with ICT infrastructure and devices for use by teachers and students. The ICT devices included SMART Boards, teacher laptops and student tablets. So, a lot of government funds have been used in the process, thus the province had to forgo other opportunities to make these programs a success since they for-saw some benefit in them. Therefore, there was a need for this study to ascertain the importance of teacher/students' attitudes and skills in the ICT integration matrix in the province to enable successful ICT integration.

3. Objectives

3.1. Identifying teachers' and students' attitudes towards the use of ICTs in teaching and learning.
3.2. Gauging the levels of teachers' and students' ICT skills.
3.3. Identifying how confidence and skills assist to define the success of ICT integration in schools.

4. Research Questions

4.1. What are the teachers' and students' attitudes towards the use of ICTs in teaching and learning in Gauteng province?
4.2. What are the levels of teachers' and students' ICT skills in Gauteng province?
4.3. How do confidence and skills of Gauteng teachers and students assist to define the success of ICT integration in schools?

5. Anticipated Contribution of the Study to the Discipline of ICT in Education

Before one embarks on an ICT integration program, one should ascertain the important elements that should be put in place for successful program initiation. Vast amounts of resources (in the form of ICT infrastructure and devices) can flood the education sector, but the question still remains; does the provision of ICT resources alone guarantee successful ICT integration? Having computer devices is one thing and using them effectively is a different thing. So, the study provided two essential elements that can play a catalytic role in ICT integration, among others, which result in successful ICT integration in teaching and learning, if well planned: Attitudes and skills of key stakeholders. With this knowledge, the department of education can make informed decisions when initiating programs of this nature; teachers' and students' attitudes and skills should be prioritized during the initial planning process. Change management intervention is necessary since it is common knowledge that change can be difficult for one to accept because it is a departure from the traditional routine. Armed with this knowledge on the pre-requisites for ICT integration, the department of education is expected to undertake successful ICT programs that can be institutionalized by schools.

6. Theoretical Framework

Many theories have been developed by researchers to explain how users adopt technology. Theory of Reasoned Action (TRA), developed by Ajzen & Fishbein, [3] has been used in this research study to understand factors that influence adoption of ICT in teaching and learning such as attitude. "Social psychologists attempt, among other things, to explain how and why attitude affects behavior… that is, how and why people's beliefs change the way they act" [4] p1. This study, therefore aimed to study how attitudes and confidence affect adoption of ICTs in schools.

Theory of Reasoned Action

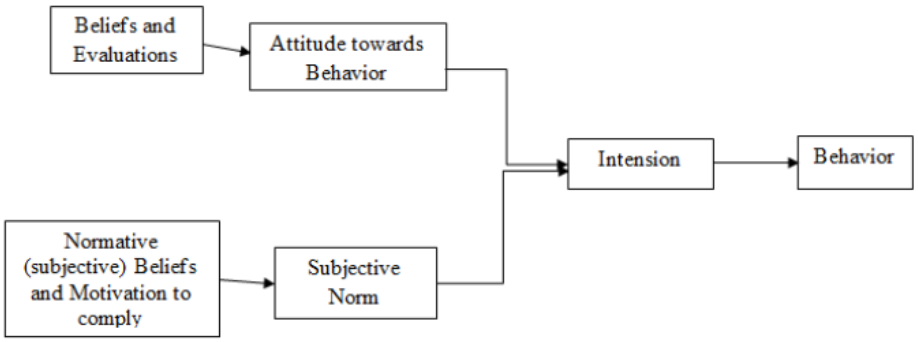

Figure 1: Theory of Reasoned Action- Fishbein & Ajzen (2010)

Theory of Reasoned Action has three main constructs; *behavioral intention, attitude and subjective norm*. Behavioral intention is a measure for "the relative strength of a person's likelihood to perform an anticipated behavior" [4], p3. This includes attitudinal or motivational factors that are an indication of how an individual is performing the intended behavior. Secondly, subjective norm is "a combination of perceived expectations from relevant individuals along with the intention to comply with such expectations" [4] p3. So, when a person's attitude is combined with subjective norms, it then forms the person's behavioral intention. Thus, behavioral intention "is a function of both attitudes toward a behavior and subjective norms toward that behavior, which can then predict the actual behavior" [4] p3. So, this study intended to find out the behavioral intention of teachers when exposed to technology in teaching and learning settings, as a paradigm shift from the usual 'chalk & talk' methodology.

7. Research Design

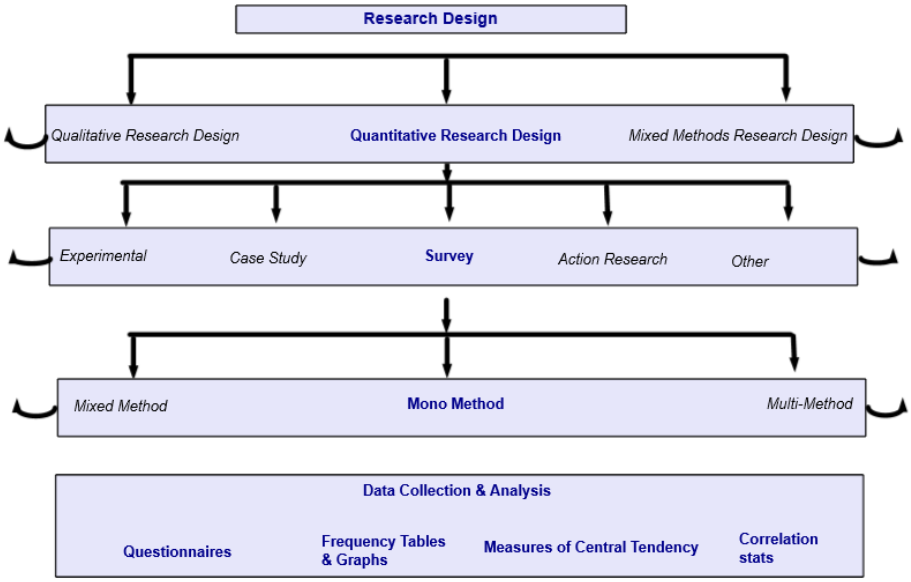

Figure 2: Research Design

Before embarking on the research study, there was a need to design the research plan. Figure 2 summarizes the process by highlighting the major features involved in the study. Firstly, there was a need to decide whether it was going to be a qualitative, quantitative or a mixed research design, basing on the resources at hand. The research design is the foundation of the whole research process [5]. A Quantitative Research Design was used for this research study.

7.1 Quantitative Research Design

Quantitative research involves collecting and analyzing quantifiable data. It measures quantities or amounts, so the results of quantitative research are usually numbers [5]. These numbers are further displayed in tabular and graphic form and then analyzed using statistical tests to get meaning from them.

7.2 Survey Strategy

Experimental, case study, survey and action research are some of the strategies that can be used in a research study. This study used a survey strategy. "This type of research provides a numeric description of attitudes, opinions or trends of a population by studying a sample of that population" [6] p79. Jongbo (2014) [6] p79, emphasizes that "It describes a given state of affairs which exists at a particular time…". During the study, the researcher does not temper or manipulate the elements and responses. In addition, "Survey research observations can be cross-sectional or longitudinal studies. "Cross-sectional means the observations are done at one or more point in time while longitudinal study means the observations are carried out at different points in time" [6] p80. This study was cross-sectional since there was no time to study phenomena over a long period of time and financial constraints were a limitation.

7.3 Choices- Mono Method

The choice to be made refers to data collection techniques that are used in a research. If one chooses a mono method, one combines "either a single quantitative data collection technique, such as questionnaires, with quantitative data analysis procedures or a single qualitative data collection technique, such as in-depth interviews, with qualitative data analysis procedures" [7] p145. The questionnaire was the one deemed suitable in the context of this research study. Other techniques that are at the disposal of the researcher are;

interviews, observations and focus groups, to name a few. This study employed the use of questionnaires to solicit information from respondents.

7.4 Data Collection and Analysis

To get answers to research questions, quantitative data or qualitative information is collected through; questionnaires, observation, interviews, focus groups, to name a few. The data is displayed in tabular and graphic forms, then analyzed using statistical tools such as measures of central tendency, measures of dispersion or correlation, as in this study. As Rajasekar et al. [5] summarizes it by arguing that quantitative research whereby statistical methods are used usually begin with the collection of data, basing on a hypothesis or theory or an experiment then finally, the application of inferential or descriptive statistical methodologies. Using these strategies, the researcher makes meaning of the researched data, thus enabling the interpretation of the message behind the research.

The research design assists in clearly outlining the research process. Having strategized on how the research study would unfold, there was a need to examine related literature, to examine current knowledge on the research topic and finally identifying knowledge gaps.

8. Related Literature

Literature is awash with information on ICT integration that can easily overwhelm a policy-maker since ICT integration is a topical issue in the 21st century. With the 4th Industrial Revolution (4IR) underway, most governments world-wide are in a rush to make the revolution a reality in their countries. This study highlights the related literature, the gaps that exist and how the gaps can be filled using quantitative data collected during this research study. Related literature covers issues on a) the importance of ICTs in teaching and learning b) attitudes towards the use of ICTs in teaching and learning c) teachers'/students' confidence in using ICTs and d) levels of teachers' ICT skills.

8.1 Importance of ICTs in teaching and learning

With the 4th Industrial Revolution driving digital transformation across the globe, there is no doubt that people are now realizing the benefits of using ICTs in various institutions as opposed to the less efficient traditional strategies. The education sector in South Africa is no exception. Savita argues that "as technology becomes more and more embedded in our culture, we must provide our learners with relevant and contemporary experiences that allow them to successfully engage with technology and prepare them for life after school" [8] p37). Preparation of life after school entails providing students with authentic education that relates to the world of work and leisure. According to Ghavifekr & Rosdy, "…using ICT tools and equipment will prepare an active learning environment that is more interesting and effective for both teachers and students" [9] p188 and that "through simulations and gamification high-order thinking skills are developed" [10] p6. ICTs make learning student-centered "… as lesson designed are more engaging and interesting… students are well-behaved and more focused." as opposed to the traditional teacher-centered methodologies of chalk and talk, whereby teachers took the center stage and students were passive listeners. Lowther, et al. 2008; Weert & Tatnall, 2005[10] concur by indicating that ICTs are capable of raising the quality of education and exposing students to real-life situations, thus making education authentic. So, ICTs assist to lessen the teacher's heavy teaching workload, so he/she can concentrate on other essential teaching obligations, whilst students carryout collaborative work related to real-life scenarios, under the supervision of the teacher. In this case the teacher becomes a facilitator of learning rather than being the main actor.

Furthermore, for these benefits to be realized, the initiation process of introducing ICTs in teaching and learning should be well planned. Ghavifekr & Rosdy [9] p189 argue that "If the implementation process of technology integration in schools take place appropriately from the very beginning stage and the continuous maintenance are adequately provided, ICT integration in schools will result in a huge success and benefits for both teachers and students". In other words, proper planning and administration is key to ICT integration.

Additionally, creativity and collaboration, are important ingredients of ICT integration that should be well planned for a successful lesson delivery in the 21st century. According to Muhammad & Choudhary [12] p27, in their study students "acknowledged working collaboratively with their peers in the classroom and integration of technology makes the lessons interesting". Finally, for successful ICT integration to occur, schools should institutionalize ICTs and ensure that they focus on teacher development to impart them with the necessary ICT skills (since teachers play a pivotal role) and improve teacher/student attitudes and motivation towards the use of ICTs in teaching and learning [12].

8.2 Attitudes towards the use of ICTs in teaching and learning

The attitudes of teachers and students to new technology determines the rate of adoption of ICTs in teaching and learning. Mwalongo [13] argues that "there is a clear connection between successful integration of ICT and the affective factors, such as motivation, engagement and general attitude towards the subject …" p16. A teacher with a negative attitude may not likely take ICT integration seriously since it is a departure from the traditional methodologies that one is comfortable with. "So the teachers' perception is important as it forms a tendency which helps them to be favorable or unfavorable towards the usage of the most modern technology…" [14] p20. Therefore, teachers should be motivated (during teacher development sessions) to use technology during lesson preparation and delivery, so as to effect attitude changes. This can be done by demonstrating how ICTs lessen their teaching-loads. If teachers feel that ICTs are not making a positive change in teaching and learning, they will be reluctant to use the technology. However, if teachers have a positive attitude towards ICTs, then ICT integration is bound to succeed [15]. So, since teachers play an important role in ICT integration, they need to have a positive attitude towards the use of modern technology in teaching [14], so as to encourage students to adopt the use of technology in learning as well. Students take teachers as their role models; therefore, teacher attitudes should help mould student behavior.

8.3 Teachers/students' confidence in using ICTs

Teachers and students should feel confident in using technology in teaching and learning, if ICT integration is to succeed because there is "a relationship between self-confidence and using ICT in teaching. When a teacher had self-confidence, he or she would have a positive attitude toward ICT, and would be motivated to use the technology in the classroom" [15] p31. Malongo concurs by arguing that "Teaching using ICT puts demands on teachers as well as students. To effectively implement information and communication technologies (ICT) into the classroom it means that not only students need to be proficient in the various programs and software but also teachers" [13] p16. For teachers to build confidence in the new technology entails attending ICT teacher development sessions and practicing the newly acquired skills with ease.

Schools need to organize ICT training workshops to upskill teachers for them to teach confidently using technology. "As the teacher plays a very essential role in the management of learning, they should possess training in using the most modern technologies in the field of education" [14] p20. Haddad & Draxler concur by adding "People involved in integrating technologies into the teaching/ learning process have to be convinced of the value of the technologies, comfortable with them, and skilled in using them. Therefore, orientation and training for *all concerned staff* in the strategic, technical, and pedagogical dimensions of the process is a necessary condition for success" [16] p15. In addition, Makura encourages institutions to develop policies that assist in compelling teachers to utilize the technology for teaching and learning [17]. This is because attending ICT training workshops is one thing and putting into practice the newly acquired skills is different.

If teachers are skilled to use ICTs in teaching, and feel confident, there is no doubt that this will have an impact on the students' use of technology since teachers are viewed as role models by students. "Thus, teachers who feel more confident in using ICT with their students for teaching and learning indicated that their students currently use ICT more frequently on both dimensions of use" [18] p521. So, teachers' confidence on the use of technology has a ripple effect on students' frequency in using ICTs, according to this study. This is also collaborated by Savita by saying "An interesting finding of this [their] study is that teachers need to develop the competency to set a trustful atmosphere for communication during the teaching learning process" [8] p59.

A teacher therefore, should display some high level of ICT skills in the teaching process to enhance teacher-student rapport.

8.4 Levels of teachers' ICT skills

Teachers' ICT skills are expected to be high to successfully guide the students through the curriculum with the aid of technology. According to Mwalongo "Successful integration… is connected to the proficiency level, in using ICT, of both teachers and learners which in turn connects to the teachers' level of creativity as well as their aptitude as *researchers* when it comes to adopting new pedagogical tools …" [13] p17. Teachers are therefore, expected to be proficient in integrating ICTs in their teaching.

UNESCO's Stages of ICT Integration: For ICT integration to bear fruit, teachers and students' ICT skills and attitudes towards technology should be conducive to teaching and learning. This will determine the level of ICT the school or stakeholders are operating at. So, schools are at different levels of ICT adoption as determined by their collective efforts. According to a UNESCO report (2005) [19], ICT integration can be measured on a continuum of four stages: emerging, applying, infusing and transforming.

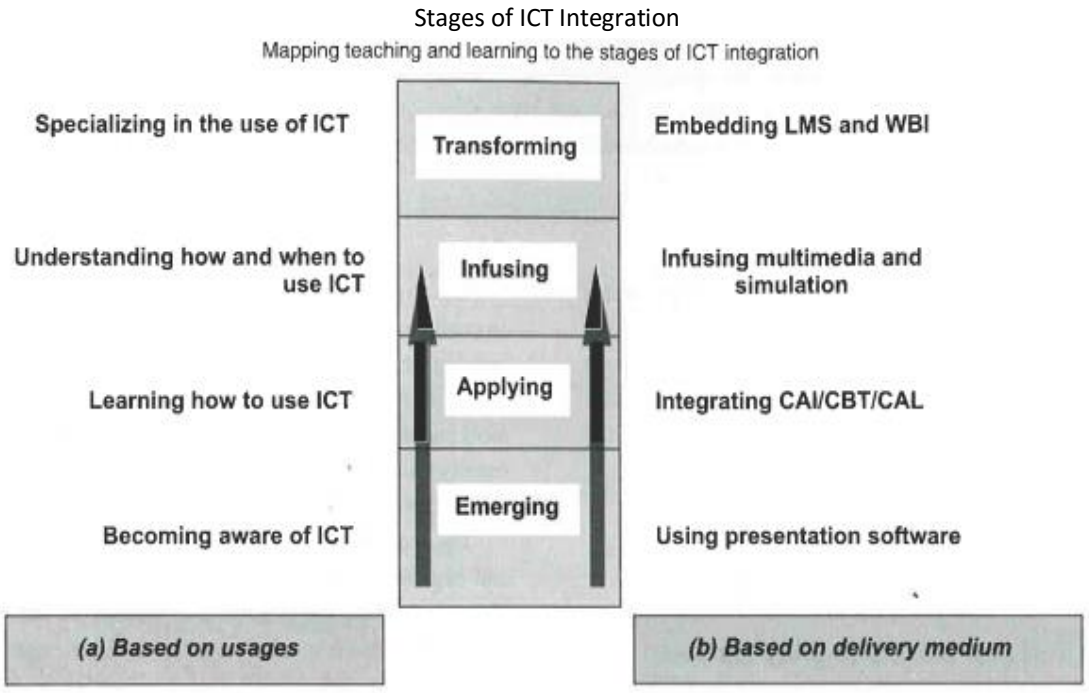

Figure 3: Stages of ICT Integration: UNESCO Bangkok [20]

Emerging stage

According to Wilson-Strydom & Thomson [19], schools at this stage are attempting to transform from the traditional teaching methodologies that were teacher-centred to 21st century digital schools. School digitalisation at this stage is still mild as teachers use ICT devices mostly to display information for students. Wilson-Strydom & Thomson [19] refer to this as 'representational use of ICT device'. In other words, ICT devices seem to be just a replacement of data projectors and have nothing to do with student-teacher, student-student and student-content interaction. With more practice and training for teachers, the school can move on to the applying stage.

Applying stage

At this stage, stakeholders begin to realise the benefits of using ICTs at work. They start to adopt some computer-based teaching and administrative approaches to lessen their teaching load and improve students' outcomes. In these two stages, it is important to note that students would be learning about computers instead of learning with or through computers (Jonassen, Peck & Wilson, 1999 [19]. Learning about computers is a basic skill that does not translate to ICT integration. On the other hand, learning through or with computers entails integrating ICTs into the teaching learning processes. In this case, ICTs are used to improve instruction and assist in the learning process. With more teacher development initiatives, ICT resources and IT support (among other necessities), the school can move on to next level, the infusing stage.

Infusing stage

At infusion stage, teachers are now enthusiastic about technology and start trying out new strategies that are technology enhanced. Infusion entails integrating ICTs in the curriculum by using ICTs in the classroom and administration. At this stage, teachers begin to use computers for *generative* work apart from mere representational use [19]. Finally, teachers drive the school to a transformation stage.

Transforming stage

At the final stage, the school is at full ICT integration level, with school systems fully digitalised. In this situation, students are taught authentic education that is relevant for the students' future roles at home and workplaces. This is only possible if students are imparted relevant digital skills that assist them in solving real life challenges. According to Savita [8] "Those teachers are called 21st century teachers who will possess the technological, pedagogical didactical and social competencies in them and they will shape the personality of their pupils on constructivist level" p59. So, at *transforming stage*, full ICT integration should be a reality.

Teachers and students can actually rate the level of ICT integration of their schools, basing on their ICT interactivity with curriculum content and aim to reach greater heights, resources permitting. There is no adequate literature, if any, rating the teachers and students' ICT skills and the level of ICT of schools in Gauteng province. The only attempts at gauging these skills is through pre and posttests on focused topics, during ICT training workshops. The study gauged the levels of ICT integration of the sampled schools, basing on self-assessments of teachers on various important ICT skills and the responses were compared to those of ICT Coordinators of the schools, to check the degrees of variance that might suggest levels of bias inherent in the research tool. These results help educational planners to organize relevant ICT training programs in schools that match real needs rather than fictitious plans used to gain political mileage.

9. Research Methodology

9.1 Data Collection Techniques

The study was a survey research that used quantitative research techniques. Quantitative techniques involve the use of questionnaires to solicit quantifiable data from respondents, that can be analyzed further using statistical tools to understand patterns of behavior or relationships amongst variables. Online questionnaires were given to 20 students, 5 teachers and an ICT Coordinator of each of the seven sampled schools understudy.

9.2 Sampling Techniques

The population under study comprised 112 ICT public schools in 15 districts. Of these schools, 7 were purposefully selected (non-probability sampling) for the case study. "Non-probability sampling (or non-random sampling) provides a range of alternative techniques to select samples based on your subjective judgement" [7] p226. The aim was to undertake an in-depth study of variables in question using a convenient sample for "...an information-rich case study" [7] p226. The respondents were 5 teachers and 20 students from the sampled schools, who responded to on-line questionnaires.

9.3 Data Presentation Tools

After data has been collected using tools such as the questionnaire, it has to be presented in a clear format for the reader. “Quantitative analysis techniques such as graphs, charts and statistics allow us to do this; helping us to explore, present, describe and examine relationships and trends within our data” [7] p406. Frequency distribution tables and bar graphs were used for data presentation, to illustrate vividly the research findings. These allow for more visual clarity at a glance, by depicting trends and relationships. In addition, graphs can be used to show comparison of different variables to enable further analysis of the data.

9.4 Data Analysis Tools

For data analysis, inferential and descriptive statistical tools were used to analyze the data collected. Pearson’s Correlation Coefficient test was the inferential statistics used to analyze relationships; for example, between teachers and ICT Coordinators opinions on the use of ICTs in teaching and learning. Secondly, measures of dispersion (e.g. standard deviation) and measures of central tendency (e.g. mean and mode) were also used to understand the degrees of teachers’ and students’ competencies in given ICT skills.

10. Data Presentation, Analysis and Interpretation

Teachers’ and students’ ICT skills and attitudes that were captured from the research study are presented using frequency tables and graphs for vivid visual display. For analysis, measures of central tendency and correlation are used.

10.1Teachers’ and Students’ ICT Competency

10.1.1 Students’ degree of competency in given ICT skills

Students were asked to rate their degrees of confidence in using ICT devices. The degree of ICT competency of students is easily measured in a practical assessment or exam situation. Since this was not possible due to strict COVID-19 lockdown restrictions, the study had to make do with self-assessment of the students. Secondly, these competencies are a prerequisite for ICT integration in the 21st century. Authentic learning is also dependent on how students use ICT skills productively to solve real life challenges.

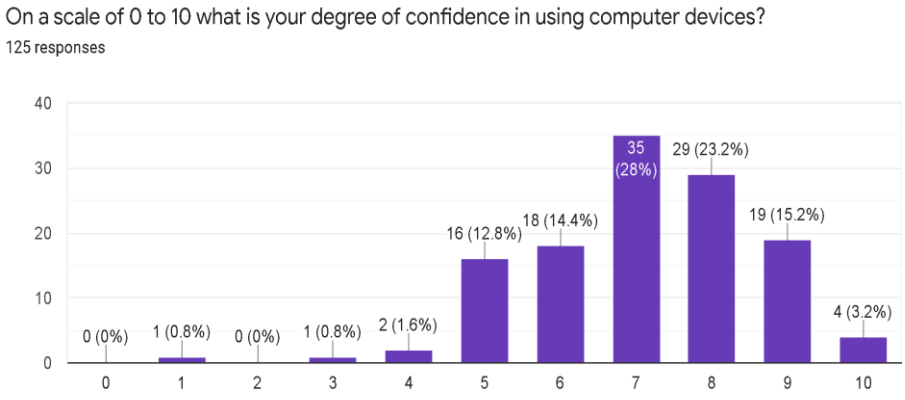

Figure 4: Students’ degree of competency in given ICT skills.

The degree of confidence in the use of ICTs as depicted from the graph shows that generally most students are confident in using computer devices. The bell shape of the graph is between 6 and 9 point levels and the

modal level is 7 out of 10, from 28% of the respondents, indicates that the students have had comfortable exposure to technology, but need to develop more to reach the last stage, the *transforming stage*.

10.1.2 Teachers' levels of ICT Competency

Teachers were asked to indicate their levels of ICT competency in various aspects of computer operations.

Table 1: Teacher Levels of ICT Competency as Barriers

ICT skills	Not at all	%	A little	%	A lot	%
Editing graphic images	6	18.8	19	59.4	7	21.9
Editing an online questionnaire	4	12.5	20	62.5	8	25.0
Editing text online from Internet links	7	21.9	19	59.4	6	18.8
Emailing files (e.g., to students, teachers, SMT	1	3.1	5	15.6	26	81.3
Attaching audio and video clips on presentations	1	3.1	15	46.9	16	50.0
Use of ICT devices such as a SMART Board	0	0.0	9	28.1	23	71.9
Use of learning applications (e.g., simulations)	3	9.4	18	56.3	11	34.4
Use of word processing applications (e.g., MS Word)	1	3.1	4	12.5	27	84.4
Use of spreadsheet applications (e.g., MS Excel)	1	3.1	9	28.1	22	68.8
Use of presentation software (e.g., Microsoft PowerPoint)	1	3.1	5	15.6	26	81.3
Use of Internet safety measures	3	9.4	16	50.0	13	40.6
Installing software on computers	5	15.6	16	50.0	11	34.4

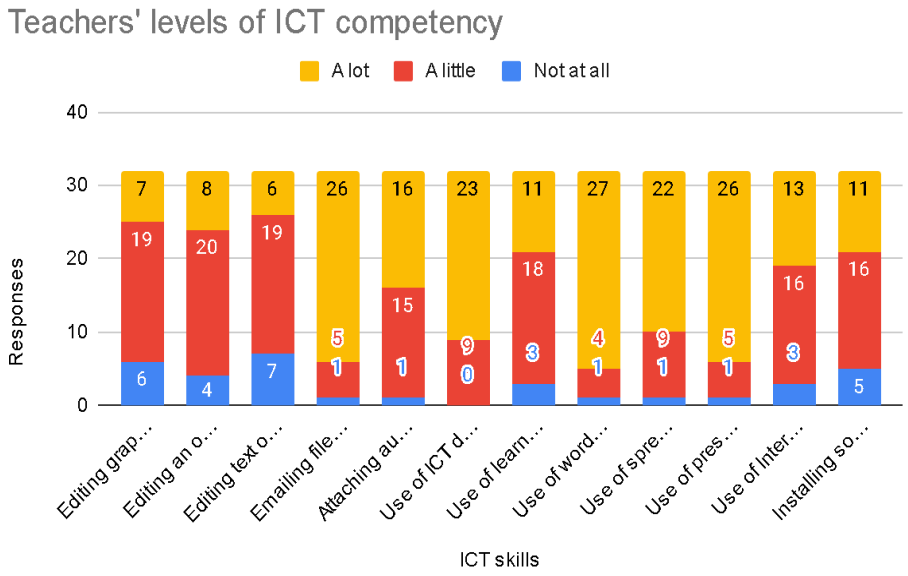

Figure 5: Teacher levels of ICT competency

Teachers indicated their competencies in ICT skills and the following were identified as challenges for the teachers: Editing graphic images, 6 and 19 respondents (25) (78.1%); editing an online questionnaire, 4 and 20 respondents (24) (75%): editing text online from Internet link, 7 and 19 respondents(26) (81.3%); attaching audio and video clips on presentations, 1 and 15 respondents (16) (50%); use of learning applications such as simulations, 3 and 18 (21) (65.6%); use of Internet safety measures, 3 and 16 (19) (59.4%); installing software on computers, 5 and 16 respondents (21) (65.6%).

Skills in which most of the teachers are competent in are: Emailing files (e.g., to students, teachers, SMT) (81%); use of ICT devices such as a SMART Board (72%); use of word processing applications (e.g., MS Word) (84%); use of spreadsheet applications (e.g., MS Excel) (69%) and lastly, use of presentation software (e.g., Microsoft PowerPoint) (81%). Another aspect that was worth assessing was how positive teachers were regarding the use of ICT use in schools.

10.2 Opinions on the use of ICTs in Teaching and Learning

The study recorded the opinions of students, teachers and ICT Coordinators on the importance of ICTs in teaching and learning. This multi-stakeholder approach gives a balanced view of the value attached to ICTs in schools and it reduces biases since the same questions are posed to respondents at multi-levels.

10.2.1 Teachers' opinions on the ICT use of ICTs in teaching and learning- Teachers were asked for their opinions on the value of ICTs in teaching and learning.

Table 2: Teachers' opinions on the use of ICTs in teaching/learning process

Importance of ICTs in teaching/learning (32 respondents)	Strongly Agree	%	Agree	%	Disagree	%	Strongly Disagree	%
Students are motivated to do class tasks	18	56.3	14	43.8	0	0	0	0
ICTs enhance collaborative work	20	62.5	11	34.4	1	3.1	0	0
ICTs enhance student autonomy	17	53.1	14	43.8	1	3.1	0	0

ICTs positively impacts on student achievement	17	53.1	14	43.8	0	0	1	3.1
Generate higher order thinking skills	21	65.6	11	34.4	0	0	0	0
ICTs cater for varied skills levels	15	46.9	15	46.9	2	6.3	0	0
ICTs cater for varied learning styles	17	53.1	13	40.6	1	3.1	1	3.1
Provides easy access to resources	24	75	7	21.9	1	3.1	0	0
Provides students with 21st century skills	23	71.9	9	28.1	0	0	0	0
Students produce more creative work	20	62.5	12	37.5	0	0	0	0
Students easily communicate ideas	21	65.6	11	34.4	0	0	0	0
Enhances research-based teaching/learning	22	68.8	10	31.3	0	0	0	0
Content from the school's website enhances teaching	15	46.9	12	37.5	3	9.4	2	6.3
Internet resources help with lesson prep	27	84.4	4	12.5	0	0	1	3.1
Offline content helps in lesson preparation	27	84.4	4	12.5	0	0	1	3.1
Computer applications assist in preparing presentations	23	71.9	8	25.0	0	0	1	3.1
ICTs help to assess student progress	22	68.8	10	31.3	0	0	0	0
ICTs help to analyze student assessment data	23	71.9	8	25.0	1	3.1	0	0
ICTs assist to communicate with parents/guardians	20	62.5	12	37.5	0	0	0	0
ICTs assist to communicate with colleagues and SMT	28	87.5	4	12.5	0	0	0	0
Total frequency	420		203		10		7	

The modal responses on the Likert scale, 'strongly agree' to the fact that ICTs are helpful in most aspects of the teachers' operations, is the highest, at 420, followed by the response 'agree' at 203, then 'disagree' at 10, and lastly 'strongly disagree' at 7. Another way of looking at the results is that, total modal responses in the affirmative is 623, whereas those in the negative are 17. This is a vast difference confirming that teachers appreciate the use of ICTs to a great extent. If teachers have a positive attitude towards the use of ICTs in class, what is then the attitude of ICT Coordinators towards the use of technology in class, not forgetting that they are the ones spearheading ICT integration issues in school. An ICT Coordinator is a teacher who has been given an additional a task of monitoring ICT integration in a school, from teacher development issues to securing ICT devices and management of the whole ICT integration program, with the aid of an ICT committee.

10.2.2 *ICT Coordinators' opinions on the ICT use of ICTs in teaching and learning-*

The study requested the ICT Coordinators to indicate their opinions on the efficacy of using ICTs in teaching and learning. ICT Coordinators are pivotal to the implementation of the ICT integration program at school level, apart from the SMT and teachers.

Table 3: ICT Coordinators' opinions on the use of ICTs in teaching/learning process

Importance of ICTs in teaching/learning (6 respondents)	*Strongly Agree*	*%*	*Agree*	*%*	*Disagree*	*%*	*Strongly Disagree*	*%*
ICTs enhance collaborative work	4	66.7	2	33.3	0	0	0	0
ICTs enhance student autonomy	4	66.7	2	33.3	0	0	0	0
ICTs positively impacts on student achievement	4	66.7	2	33.3	0	0	0	0
Generate higher order thinking skills	3	50.0	3	50.0	0	0	0	0
ICTs cater for varied skills levels	4	66.7	2	33.3	0	0	0	0
ICTs cater for varied learning styles	5	83.3	0	0	1	16.7	0	0
Provides easy access to resources	5	83.3	1	16.7	0	0	0	0
Students produce more creative work	3	50.0	3	50.0	0	0	0	0
Students easily communicate ideas	4	66.7	2	33.3	0	0	0	0
Enhances research-based teaching/learning	4	66.7	2	33.3	0	0	0	0
Content from the school's website enhances teaching	4	66.7	1	16.7	0	0	1	16.7
Internet resources help with lesson prep	4	66.7	2	33.3	0	0	0	0
Offline content helps in lesson preparation	4	66.7	2	33.3	0	0	0	0
Computer applications assist in preparing presentations	4	66.7	2	33.3	0	0	0	0
ICTs help to assess student progress	4	66.7	1	16.7	0	0	1	16.7
ICTs help to analyze student assessment data	4	66.7	1	16.7	1	16.7	0	0
ICTs assist to communicate with parents/guardians	5	83.3	1	16.7	0	0	0	0
ICTs assist to communicate with colleagues and SMT	5	83.3	1	16.7	0	0	0	0
Total modal frequencies	74		30		2		2	

It can be seen from the table that the modal frequency 'strongly agree' to the fact that ICTs are helpful in most aspects of the teachers' operations, is the highest, at 74, followed by the response 'agree' at 30, then 'disagree' at 2, and lastly, 'strongly at 7. The total modal frequencies in the affirmative are 104, whereas those in the negative are 4. Again, this is a vast difference confirming that ICT Coordinators appreciate the use of ICTs to a great extent. This is an encouraging fact since the members who are expected to spearhead ICT integration in schools are positive and optimistic. It was also necessary to reconcile the teachers' and ICT Coordinators' responses on the attitudes towards the use of ICTs using Pearson's Product-Moment Correlation Coefficient, basing on the percentages of those who strongly agreed to the ascertains put forward.

10.2.3 *Comparison of teachers and ICT Coordinators' opinions on the efficacy of ICTs-*

Table 4: Comparison of teachers and ICT Coordinators' opinions on the efficacy of ICTs

Importance of ICTs in teaching/learning- ***Strongly Agree***	***Teachers*** (*x*)	***ICT Coordinators*** (*y*)
ICT Affordances	%	%
ICTs enhance collaborative work	62.50	66.70
ICTs enhance student autonomy	53.10	66.70
ICTs positively impacts on student achievement	53.10	66.70
Generate higher order thinking skills	65.60	50.00
ICTs cater for varied skills levels	46.90	66.70
ICTs cater for varied learning styles	53.10	83.30
Provides easy access to resources	75.00	83.30
Students produce more creative work	62.50	50.00
Students easily communicate ideas	65.60	66.70
Enhances research-based teaching/learning	68.80	66.70
Content from the school's website enhances teaching	46.90	66.70
Internet resources help with lesson prep	84.40	66.70
Offline content helps in lesson preparation	84.40	66.70
Computer applications assist in preparing presentations	71.90	66.70

ICTs help to assess student progress	68.80	66.70
ICTs help to analyze student assessment data	71.90	66.70
ICTs assist to communicate with parents/guardians	62.50	83.30
ICTs assist to communicate with colleagues and SMT	87.50	83.30
Mean	65.8	68.5
SD	12.3	9.7
R^2	0.2	

The Standard Deviation for teachers' percentage responses is 12.3 and that of ICT Coordinators is 9.7 from the mean. This means that the teachers' scores are spread further from the mean than the ICT Coordinators', suggesting that ICT Coordinators are more in agreement that the teachers. The study went further to calculate Pearson Product-Moment Correlation Coefficient of teachers and ICT Coordinators opinions' ratings to check for any deviation in agreement on the use of ICTs in teaching. A Pearson's product moment correlation of 0.2 shows a low positive relationship between the two sets of scores; an indication that although the two groups are not in disagreement (which would be indicated by a negative correlation coefficient), there values do not match perfectly. Both teachers and ICT Coordinators agree to some extend that ICTs are very beneficial in teaching and learning to some extent.

A scatter graph of teachers' and ICT Coordinators' opinion ratings to check the strength of agreement on the use of ICTs in teaching:

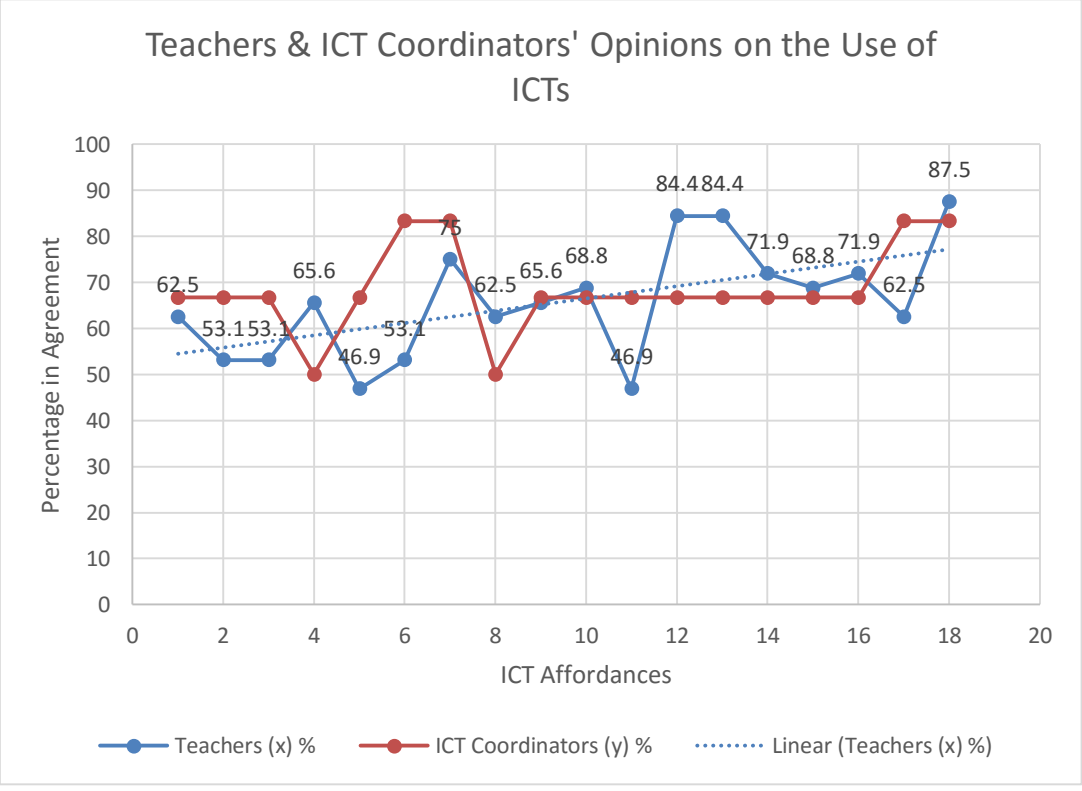

Figure 6: Comparison of teachers and ICT Coordinators who strongly agree to the efficacy of ICTs

The scatter graph shows more vividly the relationship between the two groups' responses of those strongly agreeing that ICTs are beneficial to teaching and learning. For the teachers, the lowest positive response was 46.9% of the respondents, whereas for the ICT Coordinators the lowest percentage for a positive response was 50%. Otherwise for most responses, the affirmative responses were way above 50% of the respondents, with teachers going as far as 87.5% and ICT Coordinators 83.3%. This confirms that teachers and ICT Coordinators agree to some extend to the assertion that ICTs are beneficial to teaching and learning in all the aspects under discussion. The bottom line is that they all strongly agree to the positives brought about by the use of ICTs. The comparison was meant to check how the two groups varied in their agreement. It was also necessary to check the attitudes of the beneficiaries of this program, the students, because it would be improper for the study to focus on teachers and other stakeholders and leave out the ultimate beneficiaries of the ICT programs.

10.2.4 *Students' opinions on the use of ICTs in teaching/learning process-*

Students were also asked for their opinions on the importance of ICTs in learning processes. Table 5 shows their responses.

Table: 5: Students' opinions on using ICTs

Importance of ICTs in teaching/learning	*Strongly Agree*	*%*	*Agree*	*%*	*Disagree*	*%*	*Strongly Disagree*	*%*
Computers make learning fun	101	80.2	25	19.8	0	0	0	0
Computers prepare students for work	97	77.0	28	22.2	1	0.8	0	0
Computers provide vast sources of info	94	74.6	32	25.4	0	0	0	0
Students' concentration in class activities improves	73	57.9	45	35.7	6	4.8	2	1.6
Computers enhance independent learning	82	65.1	40	31.7	4	3.2	0	0
Students recall info more easily	96	76.2	26	20.6	4	3.2	0	0
Classroom environment improves-conducive	86	68.3	32	25.4	6	4.8	2	1.6
Individual and group tasks are made easier	95	75.4	28	22.2	2	1.6	1	0.8
Makes students critical thinkers	92	73.0	28	22.2	6	4.8	0	0
Motivates students to learn	99	78.6	24	19.0	3	2.4	0	0
Encourages collaborative work	94	74.6	29	23.0	3	2.4	0	0
Improves students' attainment/achievement	95	75.4	29	23.0	2	1.6	0	0
Total frequency	1104		366		37		5	

The cumulative modal responses that 'strongly agree' to the fact that ICTs are helpful in most aspects of the students' learning processes, are the highest, at 1104, followed by the response 'agree' at 366, then 'disagree' at 37, and lastly, 'strongly disagree at 5. The total cumulative modal responses in the affirmative are1470, whereas those in the negative are 42. So, the negative responses in this case are only 2.9% of the positive

responses. Again, this is a tremendous difference confirming that students appreciate the use of ICTs to a great extent.

11 Discussion

The digital transformation looks promising for Gauteng province as indicated by the study of teachers and students' ICT competencies and attitudes towards ICT. Among other players (such as the Department of Education and School Management Team), the success of ICT integration hinges on its acceptance and adoption by teachers and students. Therefore, the study was interested in assessing ICT skills of teachers and students in Gauteng province and their attitudes towards the use of technology in teaching and learning.

Measuring accurately the state of ICT skills in education is not easy using a survey method since it can be prone to biases unless some measures are put in the instruments to reduce the level of bias, like the questionnaires that were administered at multi-level in this study. The best method would be to administer a practical assessment or a pre-test and post-test on stakeholders' skills and how they affect ICT integration in a school, on a longitudinal study. Since this study was not a longitudinal study, time was not adequate for this exercise, worse with the complications of the COVID-19 regulations that were a hindrance to research work. A separate study can be conducted to focus on this aspect in future. However, to get a feel of the current state of teachers' and students' ICT skills and attitudes, the study recorded the opinions of students, teachers and ICT Coordinators on these important elements of ICT integration in teaching and learning. This multi-stakeholder approach gives a balanced view of the value attached to ICTs in Gauteng schools and it reduces biases since the same questions are posed to respondents at multi-level. To capture the respondents' opinions more accurately, a four-point Likert scale was used, with 'Strongly agree- Agree- Disagree- Strongly disagree.

11.1 Levels of ICT Competency

11.1.2 *Teacher Levels of ICT Competency*- Teachers should have high confidence in using ICTs, so that they can transfer the skills to the students with ease. However, most teachers have not yet reached the ideal level of confidence, according to this study. The following were identified as challenges for the majority of the teachers (Fig 5): editing graphic images; editing an online questionnaire; editing text online from an internet link; attaching audio and video clips on presentations; use of learning applications such as simulations; use of Internet safety measures; installing software on computers. Skills in which most of the teachers are competent in are: Emailing files (e.g., to students, teachers, SMT); use of ICT devices such as a SMART Board; use of word processing applications (e.g., MS Word); use of spreadsheet applications (e.g., MS Excel) and lastly; use of presentation software (e.g., Microsoft PowerPoint). If the levels of ICT for teachers are low, this manifests as barriers for ICT integration since students will be disadvantaged to a great extent. If teachers lack competence and confidence in using ICTs in teaching, then ICT integration remains a pipe dream. At least the teachers are not struggling to cope with all the ICT skills. What they need is upskilling in the areas they lack, so that they feel confident in supporting their students. Otherwise, it would be a disaster when they face the more ICT competent students during an ICT supported lesson.

If teachers are incompetent in key aspects of ICT, students (the digital natives) are likely to be frustrated in using ICTs. According to Laskova [21], "the term 'digital natives' is sometimes equated with the new generation of learners to be born into the technology-oriented world and having elaborate technology skills" p2. A teacher's competency should be above that of the digital natives, if there is to be harmony in class. Students who are more competent are likely to frustrate the teacher into reversing to the traditional techniques that are not ICT driven, thereby negating the school goals. These present as additional barriers for the students since teachers play a pivotal role in the ICT integration process. Apart from teacher incompetency in using ICTs, both teachers and students can be frustrated if the computer devices they are using in class such as SMART Boards and tablets are malfunctioning because of technical faults. Students' ICT competency is also of importance for ICT integration to succeed.

11.1.3 *Students' degree of competency*- The degree of ICT competency of students is not easily measured unless it is a practical assessment. Since this was not possible, the study had to make do with self-assessment of the students. These competencies are a prerequisite for ICT integration in the 21st century. Authentic learning is also dependent on how students use ICT skills productively to solve real life challenges. The degree of confidence in the use of ICTs as depicted from the graph (Fig 4) shows that Gauteng schools are at the 'infusing stage' in the development of ICTs according to UNESCO stages of ICT integration [20]. The bell shape of the graph is between 6 and 9 point levels and indicates that the students have had comfortable exposure to technology, but need to develop more to reach the last stage, the *transforming stage*. The modal level was 7 out of 10, from 28% of the respondents. So, it seems there is not much variance in the levels that were assessed by the two stakeholders on the levels of ICT competency and implementation in Gauteng public schools (Fig 4 and 5). Therefore, there is a need to encourage teachers to attend ICT teacher development training workshops to refine these skills and transfer them to their students in class. This is collaborated by Draft White Paper on e-Education [2]. "Support in the form of incentives will encourage teachers, managers and administrators to integrate technology into their daily activities and areas of responsibility… The Department of Education will … ascertain possibilities for subsidies and special loans to encourage teachers to purchase computers for personal use" p19. This will no doubt enhance ICT integration in education. Another factor that can also assist us in gauging the impact of ICTs in schools is by checking whether there are any positive attitudes towards ICT use in schools.

11.2 **Opinions on the use of ICTs in Teaching and Learning**

11.2.2 *Teachers' opinions on the use of ICTs in teaching/learning process*- Sampled teachers were asked the efficacy of ICTs in ICT integration. They felt that ICTs are helpful in various aspects of the teachers' work to a great extent (Table 2). This is collaborated by Mathur (2012) [8] p38 in their study which noted that teachers had favorable attitudes towards teaching with ICT devices. In ICT integration programs, it is important that teachers display positive attitude to the use of technology for teaching and learning. Qasem & Nathappa [14] concur with this assertion by saying "… the teachers' perception is important as it forms a tendency which helps them to be favorable or unfavorable towards the usage of the most modern technology in the field of education in future when they go out for teaching" p20. Teachers are the main players in ICT integration since they are the ones that are expected to implement the suggested ICT integration strategies when teaching the students, who are the beneficiaries of the digital transformation. So, if the Department of Education and school authorities do not get the buy-in from them, all these efforts are in vain. Apart from the teachers' attitudes towards the use of ICTs, the study was interested in the attitudes of the ICT Coordinators as well since they are the ones that are expected to coordinate ICT integration activities at school level in conjunction with the SMT.

11.2.3 *ICT Coordinators' opinions on the use of ICTs in teaching and learning*-

ICT Coordinators were asked their opinions on the efficacy of using ICTs in the teaching and learning process. According to Table 3, ICT Coordinators were also of the opinion that ICTs assist teachers in various aspects of their teaching, to a great extent. This is an encouraging fact since the members who are expected to spearhead ICT integration in schools are positive and optimistic. Interestingly, their response had some notable agreement with that of the teachers on the degree of efficacy of ICTs.

11.2.4 *Comparison of Teachers and ICT Coordinators' opinions on the efficacy of ICTs in teaching and learning*-

The study was interested in finding out whether teachers and ICT Coordinators were in agreement on the worth of ICTs in teaching and learning. This multi-level assessment helps to identify bias if some degree of variance is noticed when two groups are evaluating the same aspect. To check the relationship between the opinions of these two groups, a scatter (Fig 6) and Pearson's correlation coefficient (Table 4) were computed

to check how far they agreed that ICTs were important in teaching and learning. On the scatter graph (Fig 6), although there were some outliers, the line of best fit indicated how the two sets of data related. Pearson's product moment correlation of r = 0.2 collaborated this, showing a low, but positive relationship between the two sets of scores; an indication that although the values do not match perfectly, the two groups are not in disagreement. Disagreement would be indicated by a negative correlation coefficient (r = 0 up to -0.1). Therefore, the two groups are in agreement (to some extend) to the fact that they both *'strongly agree'* to the fact that ICTs are beneficial to teaching and learning in the 21st century. Additionally, the scatter graph collaborated this assertion vividly. A point to note is that teachers and ICT Coordinators were all in agreement that ICTs are beneficial to teaching and learning. What was debatable in this case was how agreeable were they to the fact that ICTs are beneficial to a great extent (i.e. the degree of agreeability).

Apart from the two sets of data being in agreement, most of the responses on the various ICT affordances were strongly recommended by more than half of the respondents. This is an indication that both teachers and ICT Coordinators generally have high hopes for ICT use in teaching and learning, all things being equal. With this positive attitude displayed by these stakeholders, adoption of technology should be less of a challenge because positivity and subjective norms "can then predict the actual behavior" [4] p3. It was also necessary to check the attitudes of the ultimate beneficiaries of this program, the students, because it would be an anomaly if the program was to focus on the teachers and other stakeholders and leave out the beneficiaries.

11.2.5 *Students' opinions on the use of ICTs in teaching/learning process*- Gauteng students are positive to a great extend the fact that ICTs are important in a learning process (Table 5). This is collaborated by Hurley & Vosburg (1997) [22] whose research noted that "student attitudes toward technology and learning attitudes toward emerging technology are positive and significantly correlated" p48. Savita [8] also argues that "…it is widely recognized that learners are motivated and purposefully engaged in the learning process when concepts and skills are underpinned with technology and sound pedagogy" p38. Therefore, if the ultimate beneficiaries have a positive attitude towards the use of ICTs in this 21st century, teachers are not expected to face much resistance from the students. This in turn impacts the ICT integration initiatives positively. Therefore, the ground is fertile for ICT integration programs to succeed in Gauteng province if adequate financial and human resources are invested in the program and properly managed.

12 Implications of the Study

12.1 Since Gauteng teachers have positive attitudes towards the use of ICTs in teaching, it is important for the Department of Education (DoE) and School Management Teams (SMTs) to take advantage of this important factor as a springboard for vigorous ICT integration efforts before the fire is put off. Barrios [23] concludes that "The constant and marked changes in the contemporary world mean that teachers must develop new competencies to provide an adequate response to social ever-increasing demands" p1. So, teachers as agents of change should be equal to challenge.

12.2 Although the study noted the positive attitudes of teachers towards ICTs, it was clear from the study that teachers lack some essential ICT skills needed for effective ICT integration such as the use of learning applications (e.g. simulations, editing graphic images, use of Internet safety measures and installing software on computers). According to Savita [8], the digital age has changed how young people communicate, network, access information, seek assistance and learn since they are digital citizens now with access to devices such as computers, television and mobile phones. Therefore, there is a need for well-planned ICT teacher development training workshops to equip teachers with ICT skills to make them relevant. Ad-hoc workshops to impact computer skills to teachers in the hope that they integrate ICTs in teaching is a misnomer.

12.3 One's attitude towards the use of technology can be negatively affected if the computer devices continuously breakdown, thereby frustrating the user. Therefore, ICT devices should be fit for purpose and user-friendly.

13 Recommendations

13.1 Although the study noted that most of the teachers are self-motivated to use ICT in teaching, it is recommended that the Department of Education (DoE) and the School Management Team (SMT) among other players come up with various incentives for teachers who are implementing the newly acquired skills, so as to keep the fire burning. Awarding recognized ICT certificates, sponsoring outstanding staff members to undertake advanced ICT integration courses and offering some cash rewards will not do any harm for the teachers' intrinsic and extrinsic motivation, to name a few strategies.

13.2 Teachers who excel in ICT integration initiatives can be called upon to lead their colleagues as Champion teachers- and the title should be tied to some monetary incentive, so that it holds water.

13.3 Since we are in the 4th Industrial Revolution (4IR) in which digital transformation is the key term, there is no harm in making the Champion-teacher (or whatever terminology fits well) a promotional post (just like a Head of Department (HoD)) if ICT integration is to be taken seriously. There is no doubt that 4IR is here to stay, so ignoring it does not let it vanish.

13.4 The Department of Education (DoE) and the School Management Teams (SMTs) should resource schools at a faster pace, to enable teachers and students to have adequate ICT resources for authentic teaching and learning to take place.

13.5 Schools should have information technology (IT) technicians to service the ICT devices to avoid frustrations when they malfunction when the class is in progress, thereby humiliating the innocent novice teacher.

14 Conclusion

The study noted that teachers and students were positive about how ICTs transform teaching and learning in the 21st century. With a positive mindset and skills to integrate ICTs in teaching and learning, there is no doubt that schools in Gauteng province are conducive for authentic education, all things being equal. Most teachers and students are ready for the digital transformation, attitude wise. However, the study noted that most teachers did not have adequate technical IT skills as a basis for effective ICT integration. This inhibits the use of ICT devices in teaching and learning. What is important therefore, is for the responsible authorities to play their part by resourcing the schools with appropriate ICT infrastructure and devices and well planned and coordinated ICT teacher development initiatives to make ICT integration a reality. Institutionalizing ICTs is the way to go during the 4th Industrial Revolution, but it comes with a price (progressive policy development, provision of resources and teacher development) that should not derail the 4IR that is already in motion.

15 References

[1] B.A.J. Egede, Student teachers' readiness to use information and communication Technology (ICT) to teach: Exploring the influence of Gender. *Academia Letters*, 2021, Article 491. https://doi.org/10.20935/AL491.

[2] Education Department. *Draft white paper on e_education:Transforming and learning through information and communication technologies (ICTs) (*Pretoria: Department of Education, 2003).

[3] M. Fishbein, and I. Ajzen, *Predicting and changing behaviour- The reasoned action approach,.* (New York: Taylor and Francis Group, 2010).

[4] O.L.S. Otieno, Theory of reasoned action as an underpinning to technological innovation adoption studies. *World Journal of Computer Application and Technology*, 2016, 1-7.

[5] S.P. Rajasekar, and R. Verma, *Research Methodology*. (Archers & Elevators Publishing House, 2013).

[6] B.M. Asenahabi, Basics of research design: A guide to selecting appropriate research design. *International Journal of Contemporary Applied Researches* 6, no. 5 (2019), 76-89.

[7] M.L. Saunders, P. Lewis, and A. Thornhill, *Research methods for business students* (4th Edition.). (England: Prentice Hall, 2009).

[8] D. Savita, Attitude of teacher trainees towards ICT teaching, in G. Angadi, (Ed.), *UGC Sponsored National Conference on Information Technology in Education-2015 (ICTE-2015)* (New Delhi: A.P.H. Publishing Corporation, 2016).

[9] Ghavifekr, S. and W.A.W. Rosdy, Teaching and learning with technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science (IJRES)* , 2015, 175-191.

[10] R. Dlamini, Information and communication technology pedagogical affordances in education: A critical review of literature. *ResearchGate*, 2018, 1-14.

[11] J. Shan Fu, ICT in Education: A critical literature review and its implications. *International Journal of Education and Development using Information and Communication Technology (IJEDICT), Vol. 9*(Issue 1), 2013, 112-125.

[12] U.F. Muhammad, and Z.J. Choudhary, Attitude of students towards e-learning: A study of English language learners at Taif university English language centre. *NUML Journal of Critical Enquiry, 10*(11), 2012, 17-31.

[13] A. Mwalongo, Teachers' perceptions about ICT for teaching, professional development, administration, and personal use. *International Journal of Education using Information and Communication Technology. (IJEDICT), Vol. 7*(Issue 3), 2011, 36-49.

[14] A.A.A. Qasem, and V. Nathappa. Teachers' perception towards ICT integration: professional development through blended learning. *Main issues of pedagogy and psychology* 4.2 (2016), 20-26.

[15] S. Kler, ICT integration in teaching and learning: Empowerment of education with technology. *Issues and Ideas in Education* 2.2 (2014), 255-271.

[16] W.D. Haddad, and A. Draxler, The dynamics of technologies for education. *Technologies for education: Potentials, Parameters, and prospects,* 2002, 2-17.

[17] A. Makura, Students' perceptions of the use of ICT in a higher education teaching and learning context: The case of a South university. *Mediterranean Journal of Social Sciences, 5*(11), 2014.

[18] R.B. Jamieson-Proctor, ICT integration and teachers' confidence in using ICT for teaching and learning in Queensland state schools. *Australasian Journal of Educational Technology*, 2006.

[19] M. Wilson-Strydom, J. Thomson, and C. Hodgkinson-Williams, Understanding ICT integration in South African classrooms: research information and communication technologies. *Sabinet African Journals, 23*(1), (2005),71-85. Retrieved from www.journals.co.za/content/persed/23/1/EJC87344

[20] W.K. Ng., F. Miao, and M. Lee, Capacity-building for ICT integration in education. *Digital Review of Asia Pacific*, *2010*, 67-76.

[21] K. Laskova, 21st century teaching and learning with technology: a critical commentary. Academia Letters, 2021:2.

[22] A. Isman, F.A. Abanmy, H.B. Hussein, A. Saadany, and M. Abdelrahman. Saudi secondary school teachers' attitudes towards using interactive whiteboard in classrooms. *Turkish Online Journal of Educational Technology-TOJET* 11, (3), 2012, 286- 296.

[23] T. Barrios, Teaching competencies for the 21st century. *Academia Letters*, Article 3183, 2021. https://doi.org/10.20935/AL3183.

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Corresponding Author: Stanford Chabayanzara, Department of Business Management: Gideon Robert University Zambia.

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