THE STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS OF TECHNOLOGY REALITIES IN INTEGRATED BASIC SCIENCE EDUCATION IN THE PANDEMIC AND THE PROSPECTIVE POST PANDEMIC ERA

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Abstract
The 21st century necessitates the teaching and learning of integrated Basic Science instead of the compartmentalized sciences. In the COVID-19 pandemic and the post-pandemic era, such teaching and learning of integrated Basic Science ought to be done in consonance with the National Science Teaching Association (NSTA) recommendation of the Next Generation Science Standard (NGSS) of teaching with technology and reflective thinking. What are the Strengths, Weakness, Opportunity and Threats (SWOT) of adopting the NGSS of NSTA? 240 literate adults were accidentally sampled from Oyo township (M=124; F = 116; Means age = 31 years). A survey type of descriptive design was adopted for the study. Two research questions and five null hypotheses guided the research. Validated self-constructed tool: Integrated basic science education: The SWOT of Technology Realities in the Pandemic and Post-Pandemic Era Scale (ISTRAS, R = 0.78) was used for data collection, frequency counts and percentages, t-test and ANOVA were the analysis tools. Majority adhered that technology has more strengths and opportunities than weaknesses and threats for teaching and learning Integrated Basic Science in the pandemic and post-pandemic era, the perception was significant (N=240, Mean= 76.06, SD= 5.93, df=239, t=42.17, p<.05). *Gender, field of specialty and educational qualifications did not significantly influence the decision reached but age* ($F_{(236, 3)}$= 7.915, p<.05) *significantly influenced the SWOT of technology realities on Integrated basic science education. Technology therefore should be adopted in teaching and learning of Integrated Basic Science in the pandemic and post-pandemic era.*

Keywords: Integrated basic science; SWOT of Technology realities; COVID-19 era.

Introduction
Basic science education is the kind of educational programme integrated in curricular approach to expose the pupils in basic education classes to the holistic nature of science instead of fragmented or disjointed sciences in Biology, Chemistry, Physics, Environmental studies, Earth science and mathematics. The national basic educational curriculum which is a similitude and a semblance of the Finnish curriculum with integrated and incorporated scientific concepts from the physical, mathematical, biological, chemical and geological sciences is richly planned and developed. It illuminates the conglomeration of the physio-chemical, biological and the socio-economical conceptual nature of science while integrating the process and the products aspects of science at the basic educational level. When science is taught at the basic educational level in integrated perspectives, the pupils irrespective of whether at the senior secondary level or not stream to science, social-sciences, arts or commercial classes would have been adept in the scientific method of conducting scientific investigation with adequate knowledge, skills and requisite attitudes towards scientific studies (Olagunju & Adesina, 2017; Adebiyi, 2019)., The objectives of the integrated basic science curriculum are appropriately stated in the three main domains of educational objectives of pupils' knowledge development, scientific skills and attitudes acquisition.

Teaching and learning integrated basic science (the methodology) as well as the formative and summative evaluation ought to be done technologically and with reflective thinking in consonance with the recommendation of the Next Generation Science Standard (NGSS) of National Science Teaching Association (NSTA) (NSTA, 2012, 2020; Heitin, 2015).

However, the methodology of the most basic education including integrated basic science remains appalling, didactic, conventional and non-heuristic in nature. This form of instruction mars the actual nature of scientific knowledge of enquiry and construction of ideas which are the precursors to scientific attitudinal disposition and skills development (Olagunju, Bolaji & Adesina, 2013; Okebukola, 2013; Adebiyi, 2019). The conventional instructional strategy has presented scientific ideas, knowledge, facts, concepts, hypotheses, theories, laws and scientific principles as merely rote experiences which are to be crammed, committed to memory for subsequent regurgitation for tests, assignments, projects and examinations requisite for promotion and certification. The conventional, didactic instructional strategy maimed scientific products through unscientific processes of knowledge generation in "gberulistic and sokalistic" pattern which produces sharp and highly intelligent minds, prudent in knowledge transmission but severely deficient in hand manipulation of natural materials for the production of technological gadgets that are instrumentals for national development and integration (Bilesanmi-Awoderu, 2012; Adebiyi, 2019).

In the 21st century especially at the insurgence of COVID-19 pandemic, there is a reality of virtual, technological aided instructions for effective and efficient teaching and learning of Integrated Basic Science. Technology serves as a go-in-between the teachers (instructional facilitators) and the learners (instructional constructers) to enhance, enrich, enable and empower both the facilitators and the instructional constructers which makes learning a more relatively- permanent change in learners' behavior owing to experience cum practice and not to "gberulistic and sokalistic" approach of scientific knowledge transmission (Olagunju & Oduwaiye, 2014; Afolabi, Afolabi & Adesina, 2018; Adesina, 2019). Technology enthuse and motivate learners' interest and positive disposition to learning, it allows repetitive, untiring and unrestrained access to teaching and learning. It makes learning real with hands-on, mind-on instructional strategy, technology provides Immediate Knowledge of Results (IKOR) which serves both the formative and the summative forms of instructional evaluation for sustainable and enhanced instructional process. The question to ask now is whether technology use in teaching and learning integrated basic science education has any weakness.

Despite the numerous strengths of technology use in the teaching and learning of integrated Basic Science, that is: Technology increases students' attention in Integrated science education; Technology improves the students' retention of Integrated basic science education (Raimi & Adesina, 2019; Adesina, 2019; Keefe, 2020; Geiger & Dawson, 2020; Gudmundsdottier & Hathaway, 2020); Technology provides Immediate Knowledge of Results (IKOR) in Integrated Basic Science; Technology enhances repetitive, untiring students' access to integrated basic science education; Technology enthuses students' positive attitude towards integrated basic science education and many other strengths of technological use in integrated Basic Science (Adebiyi, 2019; Adesina, 2019; Zolfaghari, Austin & Kosko, 2020; Sadler, Friedrichsen, Zangori & Like, 2020), there are perceived weaknesses of technology use in integrated Basic Science; among the weaknesses are: Technology cannot be used for all contents of Integrated basic science education; Technology makes learning Integrated basic science education too mechanical (Ojebisi, 2017; Raimi, Bolaji & Adesina, 2016; Hartshorne, Baumgartner, Rakowski, Mouza & Ferdiki;

2020; Henriksen, Creely, & Henderson, 2020).; Technology cannot enhance the attainment of all the goals and objectives of Integrated basic science education; Technology cannot allow effective evaluation and assessment of students' performance in Integrated basic science education; Technology cannot be used for learning Basic science education without the human teachers (Adesina, 2015; A-husban & Alshorman, 2020).

What of the opportunities of technology realities in the 21st century in this pandemic and the post-pandemic era? Some perceived opportunities in technological use in integrated Basic science are: Technology provides students access to unlimited information on Integrated basic science education; Technology allows unrestrained exploration in Integrated Science Education; Technology enhances students-facilitator collaboration outside the school hours; Technology builds extensive learning community which is impossible in conventional Integrated basic science education; Technology develops the psychomotor skills of the learners in Integrated basic science education and many others too numerous to enlist here (Adebiyi, 2019; Adesina, 2019; Hartshorne *et al.*, 2020).

Nevertheless, technology realities in the 21st century especially in the pandemic and post-pandemic era would equally generate some threats which make some educational stakeholders apathetic and indifferent about the novel, innovative COVID_19 compelled instructional strategies in integrated Basic science. Some of these perceived threats are: Technology causes unemployment of Integrated Basic Science teacher; Technology reduces teachers to ordinary instructional facilitators; Technology makes the students know better than the teachers in integrated basic science education; Technology makes the learners to be self-dependent and uncontrollable by the Integrated Basic Science teachers; Technology impairs Integrated Science teachers' creativity and innovation and many pre-conceived threats of technology use in integrated basic science education (Ojebisi, 2017; Afolabi, Afolabi & Adesina, 2018; Adebiyi, 2019; Henriksen *et al.*, 2020). These threats make many educational stakeholders recalcitrant, obstinate and unsupportive to the technology realities in integrated basic science education during the pandemic and post-pandemic era. Thus, there is utmost need to investigate the truism of integrated basic science education: the strengths, weaknesses, opportunities and threats of technology realities in the COVID-19 era. Furthermore, there are extenuating and explanatory characteristics of people which can make or mar their perceptions of issue or matter at a point in time, such as their gender, field of specialty, level of education and age grade, these socio-demographical variables have strong influencing capabilities on the view, perception and conception of individuals on particular phenomenon.

Among the variables identified by Afolabi, Afolabi and Adesina (2018) to moderate the perceptions of technological use are gender, teachers' years of teaching experience, area of specialization. Gomez-Garcia; Hossein-Mohand; Trujillo-Torres and Hossein-Mohand (2020) identified the incidence of age variables, teachers' teaching experience and gender as factors probable in affecting the training and use of ICT in teaching perceptions of Melilla's (Spain) Mathematics teachers out of which age and teaching experience were found significant. Jannah; Prasojo and Jerusalem (2020) found teachers' competence which is a strong nexus to their level of education (academic qualification) to be a dictating factor to elementary teachers' perceptions of digital technology-based learning in the 21st century. Chua and Jamil (2015) investigated the effect of specialization variations on Technological Pedagogical Content Knowledge (TPACK) among Malaysians TVET instructors, the results revealed that field of specialization is not a tenable factor influencing technological use and perception in schools. Ma, Chan and Teh (2020) identified that age differentiated adults technological use perspectives in favour of the youths. Stadden (2020) found age factor as determination of use and attitude in bridging technology to the matured classrooms in the UK Universities. A similar result was reported by Fleming, Mason and Paxton (2018) that older people tend to be less engaged with digital technology than their younger counterparts.

With the inconclusiveness and dearth of literature on the impacts of gender, field of specialty, level of education and age on perception of technology opportunities, weaknesses, opportunities and threats in education, this study thus included as moderator variables of integrated basic science education: The Strength, Weaknesses, Opportunities and threats of technology realities in the pandemic and post-pandemic.

Statement of the Problem and Purpose of the Study

Evidence in research abounds that disjointed and compartmentalized sciences hamper the knowledge, skills and pupils' attitudinal disposition towards sciences at basic educational level and that integrated basic science education enhances pupils' creativity and innovativeness in life. Studies equally have reported of the need of the exegesis of technology realities in integrated science education, the recommendation of the National Science Teaching Association (NSTA) in America of the Next Generation Science Standard (NGSS) that science and allied subjects be taught with technology and reflective thinking is another compelling issue which many schools and academic institutions are loitering in adopting. The COVID-19 compelled institutional lockdown is another undeniable phenomenon that shutdown world widely all institutions including the academic establishments. Efforts to continue, maintain and sustain efficiency and effectiveness which are dizzy in the 21st century and becomes aggravated at the surge of the pandemic, COVID-19 brings about the technology realities. This study thus investigated the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the prospective post-pandemic era vis-à-vis the extenuating and militating factors of gender, field of specialty, level of education and age groups.

Research Questions

The following questions were raised and answered in the course of the study:

(i) What are the levels of Strengths, Weaknesses, Opportunities and the Threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era?

(ii) Do the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era differ based on gender, field of specialty, levels of education and age groups?

Hypotheses

The following hypotheses were formed and tested at 0.05 level of significance:

Ho_1: There is no significant strengths, weaknesses, opportunities and threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era.

Ho_2: There is no significant gender differences in the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era.

Ho_3: There is no significant differential effects of field of specialty in the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era.

Ho_4: There is no significant differential effects of levels of education in the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era.

Ho_5: There is no significant effect of age groups in the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era.

Methodology

The study adopted descriptive survey design. All the variables of the study, the dependent (integrated basic science education) and the independent (the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities, gender, field of specialty, level of education and age groups) are already available in the field, instruments were designed to tap the data for empirical analysis (Kerlinger & Lee, 2000; Hevner & Chatterjee, 2010; Neilson, Levenberg & Rheams, 2018). All the literate adults living in Oyo township constitutes the population of the study. Accidental sampling technique was adopted to select 280 literate adults in the field of science (70 each from the four Local Government Areas in Oyo township) as sample for the study. The samples were selected among individuals from the four Local Government Areas of Oyo state.

A self-constructed and validated instrument titled 'Integrated Science Education: The Strengths, Weaknesses, Opportunities and Threats of Technology Realities in the Pandemic and Post-Pandemic Era Scale (ISTRAS)' was used for data collection. The instrument has two sections, Section A has the four major socio-demographic attributes of the respondents, their Gender, Field of Specialty, Levels of Education and Age groups. The Section B contains the four universe of constructs- Strengths, Weaknesses, Opportunities and Threats of technology realities were identified and eight items both positive and negative were raised on each of the construct to make 32 items. The items were constructed in Four Likert Scale type of Strongly Agree, Agree, Disagree and Strongly Disagree format. The positively worded items on the scales were scored 4, 3, 2 and 1 for Strongly Agree, Agree, Disagree and Strongly Disagree respectively while the reverse in the case for the negatively worded items. The 32-item scale was given to experts in Test and Measurement as well as those in Psychometrics, their critiques and comments were logically incorporated into the final draft of the instrument to enhance the tool face, content and construct validity. The valid tool was trial-tested at Akinyele Local Government Area of Oyo state on 30 elite adult respondents, their responses were coded and subjected to Cronbach's Alpha reliability statistics which yielded 0.78 making the tool both valid and reliable.

The Integrated Science Education: The Strengths, Weaknesses, Opportunities and Threats of Technology Realities in the Pandemic and Post-Pandemic Era Scale (ISTRAS) was administered on 280 elite adults in Oyo township. Two hundred and forty (240) of the administered instruments were appropriately filled and returned for data collection and analysis constituting about 85.71 percentage of returns. The socio-demographic attributes of the respondents were presented in tables of frequency counts and percentages. Also, frequency counts, percentages mean and standard deviation were used to answer the research questions while parametric statistics of t-test and Analysis of Variance (ANOVA) were adopted to test the stated hypotheses. Scheffe post-hoc test was used to indicate the direction of significant differences in ANOVA.

Results

Table 1: Respondents distribution by gender, field of specialty, levels of education and age-groups

Variables	Frequency	Percentage (%)
Gender		
Male	124	51.67
Female	116	48.33
Total	240	100.00
Field of Specialty		
Science	112	46.67
Non-science	128	53.33
Total	240	100.00
Level of Education		
School Certificate	28	11.67
NCE	83	34.58
OND	36	15.00
HND	27	11.25
First Degree	57	23.75
Second Degree	7	2.92
Third Degree	02	0.83
Total	240	100.00
Age- groups		
Below 20 Years	23	9.58
20 – 29 Years	60	25.00
30 – 39 Years	85	35.42
40 Years & above	72	30.00
Total	240	100.00

Table 1 shows that 124 (51.67%) of the respondents were male while the remaining 116 (48.33%) were female, 112 (46.67%) were Science specialty while 128 (53.33%) were of non-science specialty, 28 (11.67%) have school certificate, 83 (34.58%) NCE, 36 (15.00%) with OND, 27 (11.25%) with HND, 57 (23.75%) have first degree, 7 (2.92%) have masters' degree while the remaining 2 (0.83%) have doctoral degree. Majority of the respondents have Nigerian Certificate in Education. Additionally, 23 (9.58%) were below 20 years of age, 60 (25.00%) are 20 29 years, 85 (35.42%) are 30 -39 years while the remaining 72 (30.00%) are 40 years and above. Majority of the respondents are in the age bracket of 30-39 years.

Answers to Research Questions

Research question 1: What are the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era?

Table 2a: Responses on the strengths of technology realities in integrated basic science education in the COVID-10 era

S/N	Statement	A (%)	D (%)	Mean	SD	Decision
1.	Technology increases students' attention in Integrated basic science education.	207 (86.25)	33 (13.75)	3,62	4.19	A
2.	Technology improves the students' retention of Integrated basic science education.	212 (88.33)	28 (11.67)	3.81	4.03	A
3.	Technology provides Immediate Knowledge of Results (IKOR) in Integrated basic science education.	228 (95.0)	12 (5.0)	3.59	2.72	A
4.	Technology enhances repetitive, untiring students' access to Integrated basic science education.	215 (89.58)	25 (10.42)	3.27	3.05	A
5.	Technology enthuses students' positive attitude towards Integrated basic science education.	197 (82.08)	43 (17.92)	3.05	4.72	A
6.	Technology do not aid students' learning of Integrated basic science education.	62 (25.83)	178 (15.83)	1.73	7.41	D
7.	Technology abuses the mind of the students in Integrated basic science education.	59 (24.58)	181 (75.42)	1.47	6,93	D
	Grand mean = 2.93					

Table 2a revealed that majority agreed with the strengths of technology realities in integrated basic science education in the pandemic and the prospective post-pandemic era with the mean value of 2.93.

Table 2b: Responses on the weaknesses of technology realities in integrated basic science education in the pandemic and the post-pandemic era

S/N	Statement	A (%)	D (%)	Mean	SD	Decision
8.	Technology cannot be used for all contents of Integrated basic science education.	83 (34.58)	157 (65.42)	1.72	6,83	D
9.	Technology makes learning Integrated basic science education too mechanical.	102 (42.5)	138 (57.5)	1.95	5.99	D
10.	Technology cannot enhance the attainment of all the goals and objectives of Integrated basic science education.	47 (19.58)	193 (80.42)	1.28	6.17	D
11.	Technology cannot allow effective evaluation and assessment of students' performance in Integrated basic science education.	51 (21.25)	189 (78.75)	1.63	6.07	D
12.	Technology cannot be used for learning Basic science education without the human teachers.	82 (34.17)	158 (65.83)	1.82	5.95	D
13.	Technology can be effectively used for all the contents of Integrated basic science education.	179 (74.58)	61 (25.42)	3.29	3.49	A
14.	Technology can adequately be employed to attain the goals and all the educational objectives of Integrated basic science education.	185 (77.08)	55 (22.92)	3.33	3.29	A
	Grand mean = 2.15					

From Table 2b, majority disagreed that the technology realities has weaknesses in the pandemic and the prospective post-pandemic era with the grand mean of 2.15.

Table 2c: Responses on the opportunities of technology realities in integrated basic science education in the pandemic and the post-pandemic era

S/N	STATEMENT	A (%)	D (%)	Mean	SD	Decision
15.	Technology provides students access to unlimited information on Integrated basic science education.	162 (67.5)	78 (32.5)	3.17	3.27	A
16.	Technology allows unrestrained exploration in Integrated basic science education.	177 (73.75)	63 (26.25)	3.47	3.06	A
17.	Technology enhances students-facilitator collaboration outside the school hours.	181 (75.42)	59 (24.58)	3.62	2.95	A
18.	Technology builds extensive learning community impossible in conventional Integrated basic science education.	195 (81.25)	45 (18.75)	3.69	2.72	A
19.	Technology develops the psychomotor skills of the learners in Integrated basic science education.	183 (76.25)	57 (23.75)	3.58	2.96	A
20.	Technology do not provide enough opportunity for students in Integrated basic science education.	73 (30.42)	167 (69.58)	1.71	6/79	D
21.	Technology cannot be used to build extensive learning community in Integrated basic science education.	52 (21.67)	188 (78.33)	1.93	6.31	D
	Grand mean = 3.02					

Table 2c revealed that majority agreed that technology realities in integrated basic science has high opportunities in the pandemic and the prospective post-pandemic era with a grand mean of 3.02.

Table 2d: Responses on the threats of technology realities in integrated basic science education in the pandemic and the post-pandemic era

S/N	STATEMENT	A (%)	D (%)	Mean	SD	Decision
22.	Technology causes unemployment of Integrated Basic Science teacher.	127 (52.92)	113 (47.08)	2.38	4.82	A
23.	Technology reduces teachers to ordinary instructional facilitators.	159 (66.25)	81 (33.75)	3.37	3.21	A
24.	Technology makes the students know better than the teachers in Integrated basic science education.	193 (80.42)	47 (19.58)	3.71	2.94	A
25.	Technology makes the learners to be self-dependent and uncontrollable by the Integrated Basic Science teachers.	187 (77.92)	53 (22.08)	3.63	3.59	A
26.	Technology impairs Integrated Basic Science teachers' creativity and innovation.	175 (72.92)	65 (27.08)	3.47	3.83	A
27.	Technology increases recruitment of teachers for Integrated basic science education.	49 (20.0)	191 (80.0)	1.48	7.03	D
28.	Technology creates more jobs in Integrated basic science education.	42 (17.5)	198 (82.5)	1.29	7.52	D
	Grand mean = 2.76					
	Overall Grand Mean= 2.92					

Table 2d indicated that the majority have the threats of technology realities in integrated basic science in pandemic and the prospective post-pandemic era with the grand mean of 2.76. The overall grand mean of the Strengths, Weaknesses, Opportunities and Threats

(SWOT) of technology realities in integrated basic science education in the pandemic and the prospective post-pandemic era is 2.92

Hypotheses Testing

Ho_1: There is no significant strengths, weaknesses, opportunities and threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era.

Table 3: T-test analysis of the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities

Variable	Frequency	Mean	SD	df	T	Sig.	Decision
(SWOT) of technology realities	240	76.06	5.93	239	42.17	0.006	*S

From Table 3, there is significant strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era (N=240, Mean= 76.06, SD= 5.93, df=239, t=42.17, p<.05). Therefore, the null hypotheses that says there is no significant strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era is not held.

Ho_2: There is no significant gender differences in the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era.

Table 4: t-test analysis of gender differences of the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities

(SWOT) of Technology Realities	Frequency	Mean	SD	Df	T	Sig.	Decision
Male	124	75.89	7.15	238	1.73	0.240	NS
Female	116	76.27	6.22				

Table 4 indicates that there is no significant gender differences in the perception of respondents on the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era (t=1.73, df=238, p>05). Therefore, the null hypothesis that says there is no significant gender differences in the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era is accepted.

Ho_3: There is no significant differential effects of field of specialty in the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era.

Table 5: t-test analysis of field of specialty differences of the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities

(SWOT) of Technology Realities	Frequency	Mean	SD	df	T	Sig.	Decision
Science	112	78.01	5.84	238	0.93	0.500	NS
Non-science	128	76.95	7.36				

Table 5 shows that there is no significant field of specialty differences in the perception of respondents on the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era (t=0.93, df=238, p>05). Therefore, the null hypothesis that says there is no significant field of specialty differences in the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era is accepted.

Ho_4: There is no significant differential effects of levels of education in the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era'

Table 6: Analysis of Variance of differential effects of levels of education in the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.	Decision
Treatment	35339.466	233	151.671	2.052	0.100	NS
Between	443.484	6	73.914			
Total	35782.950	239				

From Table 6, the Analysis of Variance reveals that there is no significant differential in the perception of respondents on effects of levels of education in the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era ($F_{(233,\ 6)}$=2.052, p>.05). Therefore, the hypothesis that says there is no significant differential effects of levels of education in the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era is not rejected.

Ho_5: There is no significant effect of age groups in the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era.

Table 7: Analysis of Variance of differential effects of age groups in the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities

Source of variation	Sum of squares	df	Mean Square	F	Sig.	Decision
Treatment	1744277.42	236	7391.006	7.915	0.005	*S
Between	2801.392	3	933.797			
Total	1747078.81	239				

Table 7 reveals that that there is significant differential effects in the perception of respondents on age groups in the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era ($F_{(236,\ 3)}$= 7.915, p<.05). Therefore, the hypothesis that says there is no significant differential effects of age groups in the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era is not accepted.

To know the direction of the difference in differential effect of age groups, Scheffe Posthoc test was conducted in Table 7.1.

Table 7.1: Scheffe posthoc test on differential effect of age groups on the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities

Schools of Affiliation	N	Mean
Below 20 Years	23	79.17
20 – 29 Years	60	87.05
30 – 39 Years	85	77.39
40 Years & above	72	68.52
Sig.		.010

Table 7.1 indicated that the respondents in age group 20-29 years had the highest mean score in the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era (87.05) followed by those in 20 years and below age group (79.17), followed by those in 30-39 years age group (77.39) while the 40 years and above had the least mean score in the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era (68.52).

Discussion

From the answered research question, it was revealed that the opportunities and strengths in technology realities in the 21st century especially during the pandemic and the post-pandemic era are stronger than the threats as well as the weaknesses of the technology realities. This can be explained in line with the ubiquitous nature that technology has been in the society and the exigency recommended by the National Science Teaching Association (NSTA) of America that the Next Generation Science Standard (NGSS) should be teaching and learning science with technology and reflective thinking (NSTA, 2012; 2020; Heitin, 2013; Olagunju & Adesina, 2017; Raimi & Adesina, 2019).

The tested hypotheses revealed that there are significant strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era, this is owing to the fact that people are already accustomed to the use of technology in day-to-day communication, transactions, commercial ventures, banking and many other important services. The field of education can never be left behind as the exigency of the pandemic lockdown the educational activities, the more stringent compelling force on the need and requirements of technology realities in integrated basic science teaching and learning. This finding further buttressed the recommendation of the NSTA of the NGSS that science and allied subjects be taught with technology and reflective thinking (NSTA, 2020). The findings equally find supports in Afolabi, Afolabi and Adesina (2018), Adebiyi (2019), Adesin (2019), Raimi and Adesina (2019), Keefe (2020) Geiger and Dawson (2020), Gudmundsdottier and Hathaway (2020), Zolfaghari, Austin and Kosko (2020), Sadler, Friedrichsen, Zangori and Like (2020) that technology realities are indispensable in science teaching and learning in the 21st century and that the pandemic of COVID-19 has compelled its exigency and necessity at this dispensation.

Furthermore, the tested hypotheses indicated that the differential effects of gender, field of specialty and levels of education did not significantly influence the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era. These can be translated to mean that the demand of technology realities in the 21st century especially in the pandemic and the prospective post-pandemic era transcend the extenuating and militating forces of the gender, field of specialty and levels of education of the respondents. These findings are in consonance with Chua and Jamil (2015); Afolabi, Afolabi and Adesina (2018) reports that gender, field of specialty and level of education did not significantly influence the use and perception of technology in education. The result that levels of education had no significant perception on integrated basic science education, the strengths, weaknesses, opportunities and threats was contrast to Jannah; Prasojo and Jerusalem (2020) finding that teachers' competence which is a strong nexus to their level of education (academic qualification) to be a dictating factor to elementary teachers' perceptions of digital technology-based learning in the 21st century.

Conversely to the preceding results, the respondents' age factor significantly influences the strengths, weaknesses, opportunities and the threats (SWOT) of technology realities in integrated basic science education in the pandemic and the post-pandemic era. This result indicated that the Next Generation Science Standard (NGSS) really is technologically inclined as the younger minds have more proclivity and propensity on technology realities in the 21st century, most especially in the pandemic and the post-pandemic era. The finding is corroborated by Stadden (2020) that age factor is a determinant of use and attitude in bringing technology to the matured classrooms in the UK Universities. A similar result was also reported by Fleming, Mason and Paxton (2018) that older people tend to be less engaged with digital technology than their younger counterparts.

Conclusion

Precisely, the realities of technology in the 21st century most especially in the pandemic and the post-pandemic era cannot be jettisoned. The Next Generation Science Standard (NGSS) of the National Science Teaching Association (NSTA) of teaching and learning science with technology and reflective thinking has come to stay. The strengths as well as the educational opportunities of technology realities in integrated basic science education cannot be overemphasized, it outweighs the weaknesses and the seemingly threats of the technology realities. Therefore, it is concluded that technology be adopted in teaching and learning of integrated basic science education for efficiency, effectiveness and that the pupils may learn better in the pandemic and the post-pandemic era.

Recommendations

From the answered research questions and the tested hypotheses, the following recommendations were made:

(i) Teachers should utilize technology in the teaching and learning of Integrated Basic Science to tap the strengths and opportunities of the novel and innovative instructional strategy in the curricular implementation of the subject.,

(ii) Curriculum planners and other educational stakeholders should be reoriented in tune of the Next Generation Science Standard (NGSS) of National Science Teaching Association (NSTA) that science and allied subjects be taught with technology and reflective thinking so that there should be integrated basic science curricular revision and development to accommodate the exigency of technology as one of the methodologies of the subject;

(iii) Government and Non-Governmental Organizations should conduct professional teachers' development programme on technology realities in teaching and learning of integrated basic science education to alley the threats and weaknesses of technology realities in the pandemic and post-pandemic era.

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