Secondary school students' use of smart city related technological innovations in Africa: Nigeria

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Abstract:

The study examines secondary school students' use of smart city related technological innovations in Ibadan, Nigeria. Both primary and secondary data were used in the study. Primary data was collected with the administration of 194 questionnaires in five secondary schools in Ibadan. The data collected were analyzed using frequencies, percentages, and, Chi square. Results show that majority of them know how to use computer and cell phone to browse internet to do their school work, watch video clips, play games, search for location of places, direction to places and distance to places. After using phone/computer some of them said they used to experience tiredness, eye problem, headache, and stress. Without using phone some said they used to feel lonely, unhappy, and anxious. No significant gender difference is found in their perceived health challenges. Significant difference is found in their feelings when they did not use phone.

Keywords: Secondary school students, Smart City, Technological innovations, Ibadan, Nigeria

1.0 Introduction

Observation from the literature shows that Smart City broadly refers to a city that is using new ICTs innovatively and strategically to achieve its aims (Ellie et al, 2013; Yusuf et al, 2021; Wenjing and Patrick, 2021). Also shown in the literature, a Smart City is a city where new technologies are intelligently implemented to provide more efficient, secure, safe and sustainable everyday activities and services (Guido et al, 2014). In this contemporary time the literature revealed that urbanization is evolving with a more efficient space through a combination with ICTs and raising the possibility to provide improved urban services, which can enrich the quality of life of the citizen (Yountaik et al, 2014; Aditya et al, 2015). Other names similar to Smart City in the literature are "Intelligent City", "Pervasive Space", "Knowledge City", and "Ubiquitous City" (Yountaik et al, 2014; Cigu, 2015).

This study examines secondary school students' awareness and use of Smart City related technological innovations in Ibadan, Nigeria. The Smart City related technologies considered in this study include geographical information systems and remote sensing. Others are global positioning systems, internet, computer, and cell phone. Secondary school students are adolescents and as observed in the literature, adolescents generally share certain characteristics that distinguish them from the older generation such as curiosity, rebellion, radicalism, zealousness, ambition etc. These distinguishing characteristics could be harnessed positively to equip them to make contribution to national and international development. Adolescents constitute an important segment of Nigeria's population because the youths are in the majority of the nation's age structure (Akinyemi et al, 2014; IIevbare and IIevbare, 2014). They are the hope and pride of nations in the sense that adolescents would inevitably become national and global leaders with responsibilities including environmental stewardship and sustainability. Among the research questions which the study addresses are: How is secondary school students' awareness of Smart City related technological innovations? How is secondary school students' knowledge of computer, cell phone and internet? How is secondary school students' use of Smart City related technological innovation? Do secondary school students have interest in being trained in smart city related

technological innovation? Do they have challenges in their use of smart city related technological innovations? The hypotheses tested in the study are: (i) there is no significant gender difference in the perceived health challenges experienced by secondary school students after using phone/computer, and (ii) there is no significant difference in the perceived feelings of secondary school students when they did not use phone.

2.0 Method of the study

Data used in the study were from primary and secondary data sources. Primary data was collected with the administration of questionnaires to secondary school students in five (5) senior secondary schools in Ibadan, Oyo State, Nigeria. One hundred and ninety-four (194) questionnaires were administered. The data collected were analyzed using statistical techniques which include frequencies, percentages, descriptive statistics and Chi-Square.

3.0 Findings

3.1 Socio-demographic characteristics of the secondary school students' respondents

Table 2 shows the socio-demographic characteristics of the secondary school students' respondents. The table shows that 51% of the respondents were male while 49% were female. The age distribution of the respondents shows that 56% were between 13 years - 15 years, while 43% were between 16 years – 18 years. The age distribution shows that the age of the students' respondents falls between 13 years and 18 years. The mean age, median age and mode age of the students age was 15 years in each case. The table shows that 36% of the respondents were in Senior Secondary School (SSS) 2, 33% were in Senior Secondary School (SSS) 3, while 31% were in Senior Secondary School (SSS) 1. All the secondary school students interviewed said that their fathers know how to read and write, while 99% of them said that their mother know how to read and write. The table shows the distribution of the highest educational institution attended by the father and mother of the respondents. The table shows that 38% of the respondents' fathers attended university, 20% attended secondary school, and 12% polytechnic. In the case of the highest educational institution attended by their mother, 33% said university, 23% attended secondary school, 14% college of education, and 12% polytechnic. The distribution also shows wide ranges of occupation/profession of the respondents' parents. However, 22% indicated trading as their father's occupation, while 47% indicated it for mothers.

Table 2: Socio-demographic characteristics of the secondary school students' respondents

S/N	Socio-demographic characteristics	Response	% (n = 194)
1	Sex	Male	51.0
		Female	49.0
2	Age	< 10 years	0.0
		10 – 12 years	2.0

		13 – 15 years	56.0
		16 – 18 years	43.0
		> 18 years	0.0
		Mean age	15 year
		Median age	15 year
		Mode age	15 year
3	Class	Senior Secondary School (SSS) 1	31.0
		Senior Secondary School (SSS) 2	36.0
		Senior Secondary School (SSS) 3	33.0
4	How will you rate your academic performance?	Excellent	67.0
		Very Good	21.0
		Good	11.0
		Very Fair	0.0
		Fair	1.0
		Poor	0.0
		Very Poor	1.0
		No response	0.0
5	Does your father know how to read and write?	Yes	100.0
		No	0.0
6	What is the highest educational institution attended by your father?	Primary School	5.0
		Modern School	4.0
		Teacher Training School	6.0
		Technical School	7.0
		Secondary School	20.0
		College of Education	9.0
		Polytechnic	12.0
		University	38.0
		Others please specify	2.0
7	Does your mother know how to read and write?	Yes	99.0
		No	1.0
8	What is the highest educational institution attended by your mother?	Primary School	5.0
		Modern School	3.0
		Teacher Training School	7.0
		Technical School	2.0
		Secondary School	23.0
		College of Education	14.0
		Polytechnic	12.0
		University	33.0
		Others please specify	2.0
9	What is the occupation/profession of your father?	Secretary	1.0
		Contractor	1.0
		Chemist	1.0
		Accountant	2.0
		Civil Servant	10.0
		Driver	2.0

		Plumber	1.0
		Trader/Businessman	22.0
		Lawyer	2.0
		Farmer	1.0
		Teacher	11.0
		Banker	2.0
		Self Employed	1.0
		Event Planner	1.0
		Doctor	5.0
		Engineering	10.0
		Laboratory Scientist	1.0
		Lecturer	2.0
		Marketing	1.0
		Purchaser	1.0
		Fashion Designer	1.0
		Pharmacist	1.0
		Pastor	4.0
		Civil Engineering	1.0
		Policeman	2.0
		Carpentry/Furniture	2.0
		Estate Surveyor	1.0
		Plumber	2.0
		Tailor	1.0
		Transporter	1.0
		Bricklayer	1.0
		Manager	3.0
		Printer	1.0
		Professional Wrestler	1.0
		Social Worker	1.0
		Self Employed	1.0
		Welder	1.0
		Mechanical Engineering	2.0
		Politician	1.0
		Fine Art	1.0
		Computer Operator	1.0
		NURTW Staff	1.0
		Surveyor	1.0
		Others	3.0
10	What is the occupation/profession of your mother?	Trader	47.0
		Teacher	18.0
		Caterer	1.0
		Self Employed	1.0
		Fashion Designer	4.0
		Nurse	2.0
		Hair Dressing	2.0

		Secretary	1.0
		Tailor	2.0
		House wife	1.0
		Civil Servant	6.0
		Doctor	2.0
		Technologist	2.0
		Self Employed	1.0
		Pharmacist	1.0
		Banker	1.0
		Cake Decorating & Catering	1.0
		Journalist	1.0
		Computer Analyst	1.0
		Footballer	1.0
		Manager/Director	1.0
		Accountant	1.0
		Lecturer	1.0
		Medical Personnel	1.0
		Pastor	1.0
		Engineering	1.0
		Banker	1.0
		Marketer	1.0
		Others	3.0

3.2 Secondary school students' knowledge of computer, cell phone and internet

Table 2 shows secondary school students' knowledge of computer, cell phone and internet. The table shows that most (54%) of the respondents said that their parents have computers. Majority of them said that their fathers (92%) and mothers (92%) have cell phones. Majority (83%) of the students interviewed said that they know how to use computer. Majority (81%) of them said that they have been taught how to use computer. When asked whether they have ever used computer, majority (86%) said that they had used computer. When asked what they had used computer to do, their response shows that they had used computer to do school work (55%), to browse the internet (38%), watch video (37%), play games (33%), word processing (21%), and statistical analysis (16%). When asked from whom they learnt how to use computer, most of them (43%) said they learnt how to use computer from school, family (29%), personally on their own (19%), and from friends (16%). In response to whether they have computer, 46% of them said that they have computer.

Majority (94%) of the secondary school students interviewed said that they know how to use cell phone. Majority (74%) also said that they have been taught how to use cell phone. When asked whether they know that some cell phone can browse the internet, 93% of them said that they know that some cell phone can browse the internet. Majority (91%) of them said that they had used cell phone. In response to who taught them how to use cell phone, 52% said personally on their own,

followed by 24% from family, 17% learnt from friends, and 17% from school. When asked what they use cell phone to do, they said to make calls (65%), browse the internet (55%), play games (44%), and to watch videos (40%). Majority (79%) of them said that they have cell phone. When asked how long they had been using cell phone, 22% of them said 1 – 2 years ago, 15% of them said 2 – 3 years ago, 14% of them said more than 5 years ago, while 13% of them said 3 – 4 years. When asked whether they own any internet application accounts, majority (87%) of them said that they own internet application account. Majority (73%) said that they had Facebook account, followed by WhatsApp account (32%), Instagram account (22%), and twitter account (12%). When asked whether their schools have rules and regulations on the use of phones, majority (91%) said that their schools have rules and regulations on the use of phones. Few (26%) said that they ignore their parents' instructions on use of phones. Majority (77%) of them said that they were happy about their parents' instructions on use of phones.

Table 2: How is secondary school students' knowledge of computer, cell phone and internet?

S/N	Questions	Response	% (n = 194)
1	Do your parent have computer?	Yes	54.0
		No	46.0
2	Does your father have cell phone?	Yes	92.0
		No	7.0
3	Does your mother have cell phone?	Yes	92.0
		No	7.0
4	Do you know how to use computer?	Yes	83.0
		No	16.0
5	Have you ever been taught how to use computer?	Yes	81.0
		No	17.0
6	Have you ever used computer?	Yes	86.0
		No	13.0
7	What do you use computer to do?	School Work	55.0
		Play Games	33.0
		Watch Videos	37.0
		Browse the Internet	38.0
		Word Processing	21.0
		Statistical Analysis	16.0
		Others	5.0
8	From whom did you learn how to use computer?	School	43.0
		Friends	16.0
		Family	29.0
		Personally, on your own	19.0
		Others	9.0
9	Do you have a computer?	Yes	46.0
		No	53.0
10	Do you know how to use cell phone?	Yes	94.0
		No	6.0

11	Have you ever been taught how to use cell phone?	Yes	74.0
		No	26.0
12	Do you know that some cell phones can browse the internet?	Yes	93.
		No	4.0
13	Have you ever used cell phone?	Yes	91.0
		No	8.0
14	From whom do you learn how to use cell phone?	School	17.0
		Friends	17.0
		Family	24.0
		Personally, on your own	52.0
		Others	1.0
15	What do you use cell phone to do?	To make call	65.0
		To play games	44.0
		To browse the internet	55.0
		To watch videos	40.0
		Others	9.0
16	Do you have a cell phone?	Yes	79.0
		No	21.0
17	How long have you been using cell phone?	Less than one year ago	22.0
		1 – 2 years ago	22.0
		2 – 3 years ago	15.0
		3 – 4 years ago	13.0
		4 – 5 years ago	5.0
		More than 5 years ago	14.0
		Non response	9.0
18	Do you own any internet application accounts?	Yes	87.0
		No	12.0
19	Indicate which of the following internet application account you own?	E-mail account	28.0
		Facebook account	73.0
		WhatsApp account	32.0
		Telegram account	4.0
		Twitter account	12.0
		Instagram account	22.0
		Personal Blog	4.0
		Personal Web page	3.0
		Others	2.0
20	Are you aware of the tools to help cut down on the amount of time spend on phones?	Yes	44.0
		No	55.0
21	Do you know how to us the tools to help you cut down on the amount of time you spent on phones?	Yes	40.0
		No	58.0
22	Do you use these tools to help you cut down on the amount of time you spend on the phones?	Yes	33.0
		No	61.0

23	Does your school have rules and regulations about phone use?	Yes	91.0
		No	8.0
24	Do you ignore your parents' instructions on use of phones?	Yes	26.0
		No	73.0
25	Are your parents happy about the way you ignore their instructions on use of phones?	Yes	18.0
		No	78.0
26	Are you happy about your parents instructions on use of phones?	Yes	77.0
		No	18.0

3.3 Secondary school students' awareness and use of smart city related technological innovations

Table 3 shows series of questions and responses on secondary school students' awareness and use of Smart City related technological innovations. Secondary school students were asked whether they have ever thought about location of any place or something. Their responses show that majority (80%) of them have thought of location of places or something. They were asked whether they have ever thought about direction and distance to any place. Their responses show that majority of them have thought of direction (80%) and distance (81%) to places. They were asked whether they have ever browsed the internet to search for location of any place or something, direction to any place and distance to any place. Most of them (56%) said they had browsed the internet to search for location of places or something, 57% to search for direction to places and 53% for distances to places. Majority (87%) of them were aware of maps, 88% had seen maps, 89% know what maps are used for, 75% know how to read maps, and 76% had ever used maps. Most (56%) said that they had browse maps on the internet. When asked which online maps they were aware of. Most of them said they were aware of Google Maps (67%), Google Earth (29%), and Bing Maps (8%). In response to which online maps they had browsed and used, 60% of them said they had browsed and used Google Maps, 21% Google Earth and 2% Bing Maps. Most of them said they were aware of Global Positioning Systems (GPS) (56%), and the use of GPS (59%). Some of them (43%) said that they were aware of Geographical Information Systems/Remote sensing technology. When asked if they were aware of some materials for GIS/Remote sensing, majority of them were aware of maps (96%), printer (86%), scanner (79%) and GPS (61%). When asked to indicate which GIS/Remote sensing materials they had ever used, majority of them had used maps (75%), printer (70%), scanner (62%), and some of them had used GPS (44%).

Table 3: How is secondary school students' awareness and use of smart city related technological innovation?

S/N	Questions	Response	% (n = 194)
1	Have you ever thought about location of any place or something?	Yes	80.0
		No	17.0
2	Have you ever thought about direction to any place?	Yes	80.0
		No	17.0
3	Have you ever thought about distance to any place?	Yes	81.0
		No	16.0
4	Have you ever browsed the internet to search for location of any place or something?	Yes	56.0
		No	41.0
5	Have you ever browsed the internet to search for the direction to any place?	Yes	57.0
		No	40.0
6	Have you ever browsed the internet to search for distance to any place?	Yes	53.0
		No	34.0
7	Are you aware of maps?	Yes	87.0
		No	12.0
8	Have you ever seen maps?	Yes	88.0
		No	11.0
9	Do you know what maps are used for?	Yes	89.0
		No	8.0
10	Have you ever been taught how to read map?	Yes	51.0
		No	14.0
11	Do you know how to read a map?	Yes	75.0
		No	23.0
12	Have you ever used a map?	Yes	76.0
		No	23.0
13	Are you aware of existence of maps on the internet?	Yes	77.0
		No	22.0
14	Have you ever browsed the maps on the internet?	Yes	56.0
		No	43.0
15	Which online maps are you aware of?	Google Earth	29.0
		Google Maps	67.0
		Bing Maps	8.0
		None	16.0
		Others	0.0
16	Which online Maps have you browse and used?	Google Earth	21.0
		Google Maps	60.0
		Bing Maps	2.0

		None	23.0
		Others	0.0
17	Are you aware of Global Positioning System (GPS)?	Yes	59.0
		No	40.0
18	Are you aware of the use of GPS technology?	Yes	59.0
		No	40.0
19	Are you aware of Geographical Information System/Remote Sensing technology?	Yes	43.0
		No	56.0
20	Please indicate by ticking if you are aware of the following materials for GIS/remote sensing?	Maps	96.0
		Air photos	8.0
		Satellite images	12.0
		Computer system with GIS software installed	10.0
		Sketches showing GIS/remote sensing components	6.0
		Slide showing GIS/remote sensing components	7.0
		Digitizer	13.0
		GPS	61.0
		Printer	86.0
		Scanner	79.0
		Multimedia CD on satellites/GIS/remote sensing	9.0
		Posters on GIS and remote sensing	8.0
		Published materials on GIS and remote sensing	7.0
21	Please indicate by ticking if you have ever used the following materials for GIS/remote sensing?	Maps	75.0
		Air photos	2.0
		Satellite images	3.0
		Computer system with GIS software installed	2.0
		Sketches showing GIS/remote sensing components	1.0
		Slide showing GIS/remote sensing components	2.0
		Digitizer	6.0
		GPS	44.0
		Printer	70.0
		Scanner	62.0
		Multimedia CD on satellites/GIS/remote sensing	4.0
		Posters on GIS and remote sensing	2.0
		Published materials on GIS and remote sensing	3.0

3.4 Secondary school students' interest in being trained in Smart City related technological innovations

Secondary school students were asked whether they have interest in being trained in Smart City related technological innovations. Table 4 shows their responses to questions on whether they have interest in being trained in smart city related technological innovations. Majority (84%) of the secondary school students said that they have interest to learn how to read maps. Majority (74%) of the secondary school students said they have interest to learn how to use GPS technology. Majority (72%) of them said they have interest to be trained in Geographical Information Systems/Remote sensing. Majority (79%) of them said they have interest in training on the use of geospatial technology (e.g. way-finding technologies, vehicle tracking technologies, etc.

Table 4: Do secondary school students have interest in being trained in Smart City related technological innovation?

S/N	Question	Response	% (n = 194)
1	Do you have interest to learn how to read maps?	Yes	84.0
		No	15.0
2	Do you have interest to learn how to use GPS technology?	Yes	74.0
		No	23.0
3	Do you have interest to be trained in Geographical Information System/Remote Sensing technology?	Yes	72.0
		No	22.0
4	Do you have interest in training on the use of geospatial technology (e.g. way-finding technologies, vehicle tracking technologies, etc.)?	Yes	79.0
		No	18.0

3.5 Challenges and implications of secondary school students' use of Smart City related technological innovations

Secondary school students were asked various questions about the challenges they have in their use of smart city related technological innovations. This is with a view to gaining an insight into the implications of digitization of life on their health, well-being, and demographic behavior. Secondary school students were asked various questions relating to health challenges, attitude and behavior, and academic challenges. Their responses are shown in table 5.

On health challenges secondary school students were asked whether they think that their use of phone/computer affects their health. Majority (74%) said that use of phone/computer affects their health. After using phone/computer some of them said they used to have the following feelings: tiredness (34%), eye problem (27%), headache (10%), depression (10%), stress (7%), and weariness (5%).

On their attitude and behavior, they were asked whether they use phone too much. Some (40%) said that they use phone too much. When asked how they feel without using phone, most of them said that they used to feel lonely (51%). Some of them said that they used to feel unhappy (27%). Few of them said that they used to feel anxious (8%), and upset (7%). However, few of them said that they used to feel good (19%), and happy (5%).

On their academic challenges, secondary school students were asked whether their phones distract them in the classroom. Some (26%) said that their phone distracts them in the classroom. When asked whether they think phone disturb their academic performance, some (38%) of them said that their phone disturb their academic performance.

Other challenges that they have include: lack of cell phone that can browse (38%), lack of regular supply of electricity to charge cell phone and personal computer/laptop (33%), lack of personal computer/laptop (30%), lack of finance to pay for training in geospatial technologies (26%), lack of understanding of map terminology (22%), low battery capacity of the cell phone and personal computer/laptop (17%), lack of finance to buy cell phone and personal computer/laptop (17%), too technical (13%), and did not understand how to read maps (13%).

Table 5: Challenges and implications of secondary school students' use of Smart City related technological innovations?

S/N	Challenges & implications	Question	Response	% (n = 194)
1	Health challenges	Do you think use of phone/computer affects your health?	Yes	74.0
			No	25.0
		After using phone/computer do you have the following feelings?	Tiredness	34.0
			Headache	10.0
			Weariness	5.0
			Feeling eye problem	27.0
			Feeling stressed	7.0
			Feeling depressed	10.0
			Others	2.0
2	Attitude & Behaviour	Do you use phone too much?	Yes	40.0
			No	55.0
		How do you feel without using phone?	Feeling lonely	51.0
			Feeling anxious	8.0
			Feeling upset	7.0
			Feeling unhappy	27.0
			Feeling good	19.0
			Feeling happy	5.0
			Others	5.0
3	Academic	Does your phone distract you in the classroom?	Yes	26.0
			No	72.0

		Do you think phone disturb your academic performance?	Yes	38.0
			No	59.0
4	Other challenges		Lack of cell phone that can browse	38.0
			Lack of personal computer/Laptop	30.0
			Low battery capacity of the cell phone and personal computer/Laptop	17.0
			Electricity (power supply) problem to charge the cell phone and personal computer/Laptop	33.0
			Lack of finance to buy cell phone and computer/Laptop	17.0
			It is too technical	13.0
			Lack of understanding of the map terminology	22.0
			Did not understand how to read map	13.0
			Lack finance to pay for training in geospatial technologies	26.0
			Others	1.0

3.6 Results of the test of hypotheses

3.6.1 Hypothesis 1

There is no significant gender difference in the perceived health challenges experienced by secondary school students after using phone/computer. Table 6 show the result of the Chi-Square analysis. The table shows that there is no significant gender difference in the perceived health challenges experienced by secondary school students after using phone/computer.

Table 6: result of the Chi-Square analysis

Hypothesis	Chi-Square	Sig.
There is no significant gender difference in the perceived health challenges experienced by secondary school students.	.714	.982

Hypothesis 2:

There is no significant difference in the perceived feelings of secondary school students when they did not use phone. Table 7 show the result of Chi-Square analysis. The table shows that there is significant difference in the attitudinal feelings of secondary school students when they did not use phone.

Table 7: Result of the Chi-Square analysis

Hypothesis	Chi-Square	Sig.
There is no significant difference in the attitudinal feelings of secondary school students when they did not use phone	38.124**	.000

**Significant at the 0.01 level

4.0 Summary and conclusion

This paper has carried out an exploratory study of the smart city related technological innovations' awareness and use of secondary school students in Ibadan, Nigeria. Findings include: 51% of the secondary school students were male while 49% were female. The age distribution shows that the age of the teenagers interviewed falls between 13 years and 18 years. The mean, median and mode of age of the students interviewed was 15 years respectively. 31% were in Senior Secondary School (SSS) 1, 36% were in Senior Secondary School (SSS) 2, while 33% were in Senior Secondary School (SSS) 3. Majority of their fathers and mothers know how to read and write. The highest educational institution attended by most of their fathers and mothers was university. The occupational/professional distribution of the fathers and mothers of the students interviewed was of a wide range. However, most of them were into trading/business related activities.

Most of the respondents' parents have computers. Majority of their fathers and mothers have cell phones. Majority of the secondary school students interviewed know how to use computer. Majority of them have been taught how to use computer. Majority of them had used computer. They had used computer to do school work, browse the internet, watch video, play games, word processing, and statistical analysis. Most of them learnt how to use computer from school, followed by those from family, personally on their own, and from friends. Most of them have computers.

Majority of the secondary school students know how to use the cell phone. Majority have been taught how to use the cell phone. Majority of them know that some cell phones can browse the internet. Most of them learnt how to use cell phone personally on their own, followed by those who leant from family, friends, and from school. Majority of them use cell phone to make calls, to browse the internet, play games, and to watch videos. Majority of them have cell phones. Most of them had been using cell phone for within the past 4 years, while some of them had been using cell phone for more than 5 years. Majority of them own internet application account. Majority had

Facebook account, followed by WhatsApp account, Instagram account, and twitter account. Majority of them said that their school had rules and regulations on the use of phones. Few said that they ignore their parents' instructions on use of phones. Majority of them said that they were happy about their parents' instructions on use of phones.

Secondary school students' responses to series of questions on location, direction/distance of any place or something show that majority of them have thought of location of any place or something, as well as direction and distance to places. Most of them had browsed the internet to search for location of places or something, direction to places and distance to places. Majority of them were aware of maps, had seen maps, know what maps are used for, know how to read maps, and had used maps. Most of them were aware of Google Maps, followed by Google Earth, and Bing Maps. Most of them had browsed and used Google Maps, Google Earth and Bing Maps. Most of them were aware of Global Positioning Systems (GPS), and had used GPS. Some of them were aware of Geographical Information Systems/Remote sensing technology.

Majority of the secondary school students had interest to learn more on how to read maps, how to use GPS technology, had interest to be trained in Geographical Information Systems/Remote sensing, and to be trained on the use of geospatial technology (e.g. way-finding technologies, vehicle tracking technologies, etc.

Secondary school students' responses to various questions about the challenges they had in their use of Smart City related technological innovations show that digitization of life have implications on their health, well-being, and behavior. On health challenges, majority of them said that use of phone/computer affects their health. After using phone/computer some of them said they used to have feelings of tiredness, eye problem, headache, depression, stress, and weariness. Although a large strand of studies find a positive relationship between information communication technology (ICT) and health outcomes, there are other strands of studies which question a positive relationship between ICT and health outcomes (Viorela and Monica, 2022), thus asserting that internet use is negatively associated with well-being (McDool et al, 2020). One of such studies conducted on a large representative sample of children in England over 2012-2017 (McDool et al, 2020), validate the negative effect of internet usage upon the psychological well-being of children, measured through their perception about various life aspects (Viorela and Monica, 2022). According to Viorela and Monica, (2022), the authors suggest parents should limit internet and social media use especially during childhood, in order to boost the emotional health of their children.

On secondary school students' attitude and behavior, some of them said that they use phone too much. Most of them said that they usually feel lonely without using the phone. Some said that they usually feel unhappy without using phone. Few of them said that they usually feel anxious, and upset without using phone. However, few of them said that they feel good and happy without using phone.

On their academic challenges, some of them said that their phones distract them in the classroom. Some of them said that their phones disturb their academic performance. Some other challenges that they have include: lack of cell phone that can browse, lack of regular supply of electricity to charge cell phone and personal computer/laptop, and lack of personal computer/laptop.

The results of Chi-Square analysis indicate that there is no significant gender difference in the perceived health challenges experienced by secondary school students after using phone/computer. Also, there is significant difference in the attitudinal feelings of teenagers when they did not use phone.

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