Covid-19 Effects on Private Tuition in Bangladesh and Internet of Things Based support system

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Abstract: Private tutoring is an important matter in Bangladesh. Many students take private tutor for various study. Many teachers and senior students become private tutor to get some extra income or primary income. During the COVID-19 pandemic time this profession and teaching status are changed in a great extent. This work makes a survey about private tuition among thousands of students and teachers from Dhaka city in Bangladesh. This work analyzed the collected data in multiple aspects and suggested some support system with the Internet of Things and Information Technology. The proposed IoT based system can help the students and teachers with remote monitoring. With the IoT based system the tutor and student both can check each other's physical condition from a remote place without affecting them with virus. The collected data shows a clear concept about the condition of private tuition and the IoT based solution worked successfully. The outcome of the system showed good results.

Keywords: Covid-19 effects; Private tuition; IoT (Internet of Things) solutions; Online classes

1. Introduction

Private tutoring is known to all people in Bangladesh. According to Prothom Alo a daily newspaper of Bangladesh, there are about one million private tutors in Bangladesh [1]. Private tutoring job is a main or sub income source to many people of Bangladesh. In Bangladesh most of the graduate or undergraduate student's 1st job is private tutoring, some of them earn money and use that on their own tuition costs, some of them support their family. In the past 2 years private tutors losing their jobs, coaching centers have been closed due to COVID-19. As the government closed schools, many parents simultaneously suspended private tutors' services because no classes meant no homework, projects, and exams. So why would one need a tutor? According to Prothom Alo [1], a popular daily newspaper In Bangladesh 80% of students goes to private tutor or coaching center besides school or college. The total number of students in Bangladesh is 23,907,151. There are 16,230,000 students at the primary level. There are 7,400,000 students at the secondary level, and there are 277,151 students at the higher secondary level, and there are 853,267 students studying at the University. University students are not only studying, but they are also becoming self-reliant. Private tuition is one of the main ways of self-reliance. Many students are able to meet their own needs through private tuition as well as their studies. Even they

are able to stand by their families. There are many poor families in Bangladesh who are not able to afford the education of their families and children. But their children are able to meet their own needs through private tuition as well as being able to stand by the side of the family. Even doing private tuition as a student is beneficial for various interview jobs and increases Knowledge. As a result, poverty is being reduced and the educated nation is improving. But now the epidemic COVID-19 is flowing in many ways over everything. The worst affected is the education system, private tuition is one of them. Because countless young people and teachers have been affected by the coronavirus (COVID-19) in private tuition. Most of the students studying in the university did tuition. From here, they were able to cover their living expenses and tuition fees, as well as help their families. But those tuitions were stopped after the coronavirus (COVID-19) infection started in Bangladesh. Due to the corona situation, going to someone's house and doing tuition is very risky [2]. As risky for students as it is for teachers [3]. As a result, private tutors and university students are under stress [4]. Private tuition was the source of income as well as education for the university students of the cities around Dhaka. But the main source of income has been cut off since the outbreak of the epidemic Coronavirus. But there is no data on how many people do tuition or how much depends on tuition.

However, many people have chosen private tuition as their main profession. Some students consider tuition as a source of income after their university studies. If schools, colleges are not reopening most of the private tutors can't rejoin their job, until then they will be unemployed. This work will give an idea about the unemployment rate and how the covid-19 pandemic affected the private tutoring job in Bangladesh and what are the solutions.

The objectives and contributions of this work are as follows:

1) Create a clear concept about the condition of private tuition in Bangladesh during the pandemic time.

2) Design and implementation of IoT and ICT based solution for this problem and analyze the outcome.

The rest of the paper is arranged as follows: Section 2 discusses the related works associated with this paper. Section 3 demonstrates the system model, algorithms, circuit diagrams and flowcharts of the work. Section 4 shows the results and analysis of this work in multiple aspects. Discussion and findings are illustrated in section 5. Finally Section 6 provides the concluding remarks and future scope of this work.

2. Literature Review

For the Covid-19 pandemic, demand for private tutors dropped significantly [5]. That's why many students who have worked as private tutors are passing miserable days. Also, the Guardians are not willing to appoint tutors to avoid COVID-19 infection. World Health Organization strictly spoke of social distancing and many parents opined that letting in tutors would increase the risk of bringing home the lethal virus [2]. There are many people who came to Dhaka city for jobs. Before finding any jobs, they are supporting themselves by tutoring students and in coaching centers. But after the covid-19 situation, they are suffering to survive in Dhaka city. Due to that, they have to resume their studies for jobs and go to their hometown for lack of earning support [6]. There are lots of private tutor provider organizations in Bangladesh. They work as a third party between tutors and students. This way it's easier for both tutors and students for tuition. These organizations have been losing profits for the COVID-19 situation in Bangladesh. According to Bangladesh Tutor Providers' Association, the number of students seeking private tutors has declined by 70% compared to the pre-COVID-19 pandemic situation [7]. ZI Nixon, managing director of the Teacher's Café, has been running his organization for six years. But he is counting losses since the beginning of the pandemic in the country [7]. However, for the present situation, to ensure students' education their parents or guardians are willing to appoint private tuition online. In Bangladesh, only the private universities are the only educational institution which is conducting their educational program online. Not only universities but also a few private tutors are tutoring their students online. COVID-19 pandemic did not only affect the educational system in Bangladesh but also opened new ways to conduct tutoring or teaching. Such 'Teacher

on' is an online-based organization that provides online private tuition all over the world [8]. It also provides tuition in our country too. Many people from our country registered themselves as tutors in this organization too. It became so common after the COVID-19 situation all over the world since it provides online-based private tuition. IoT and ICT based solution can make changes in medical sectors [7], patient management [6], restaurants sectors [9], EVM [10], and many other sectors [11]. Remote sensing [12] makes a great change in virus-affected people monitoring [13]. IoT-based systems are also secure [14]. These systems can also help in agriculture [15], poultry farm [16], disable people management [17], electronic voting [18], gaming [19], farming [20], nursing [21], remote data sensing [22], virus affected area monitoring [23][24] from remote places [25]. IoT based irrigation systems are helping farmers [26] and farming [27]. Robotics and IoT are doing great in medical fields also [28]. IoT based supporting systems are also helping people in pandemic situation [29]. So, for education and tutoring, we also proposed a solution with the help of IoT.

3. Methodology

This research collected data from secondary sources, some direct and small-ranged surveys, and from some governmental paper and online sources. This paper illustrates the situation of the uncontrollable effect of COVID-19 Corona Virus pandemic on Private Tuition. The paper states the time duration of the year March 2020 to March 2021, in the deadly Corona Virus pandemic period. Questionnaire surveys are conducted with the help of Google form to collect situational information. The researchers of this paper collected their aimed data through 82 random part-time and full-time home-tutors (Male-39%, Female-61%) and 1665 students (college & university) having tuition classes as their job. As private tuition includes the private coaching centers, some data are collected from the authorized persons of multiple renowned coaching centers (Pathshala, Medhakunja Academic Care, Utkorsho, E-Hok, etc. Local: Biddarjonghor, Nasir-Sharif academic, ABC academic center and some individual school-college teacher's home) of Bangladesh.

Other than these several organizations that deal with the tutors to set them students also gave a hand to create this work. Some information was collected from the journal reports and governmental papers to represent the whole scenario of our country Bangladesh. This detached information is being combined to create this project. Also, fewer positive changes are happening because of the pandemic also shown in this paperwork. The methodology of this work is illustrated in Figure 1.

After analyzing all the problems, we proposed a system to support the people. Online teaching may solve many problems and remote monitoring of affected or normal people may help a lot. We designed an IoT-based remote monitoring system that can monitor the students and
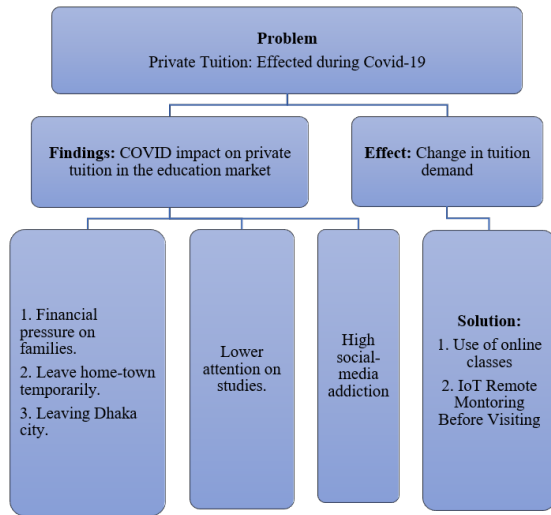
Figure 1. Methodology

teachers health condition remotely. This system can collect sensor data from affected and healthy people and upload their data to a cloud database. Any healthy people can monitor any affected people from a distant place without harming themselves. If anyone needs to reach any other one, they can check their status online, and if found safe people can visit them. The system architecture of that remote monitoring system is mentioned in Figure 2.
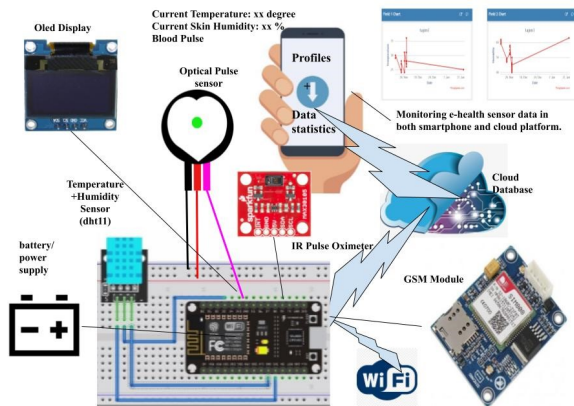

Figure 2. Proposed remote monitoring system architecture

Containing micro controlling unit, senor unit, power unit, and Wi-Fi connectivity this system will collect data from the people with sensors and send the data to the cloud server via Wi-Fi, then anyone can see the real-time data from the cloud. Tajim and et. al, proposed this method in 2021 [12] they also proposed a robot-based solution in 2020 [9]. We have updated the system which can also send SMS notifications. The proposed system uses node MCU esp8266 as the micro processing unit. IR pulse oximeter sensor will measure the oxygen level in blood and blood pulse per minute. An optical pulse sensor will measure the blood

pressure and pulse also. As blood pulse is very important and pulse-oximeter fails some time we took optical pulse sensor along with it. Dht11 will measure the temperature and humidity of the human body. The OLED display will show the collected data and GSM module sim-900 will send an SMS notification to a dedicated phone number. The node MCU will collect all the data and send them to a cloud server with Wi-Fi. This work is done by following the Algorithm 1.

Algorithm 1 Remote Data Sensing with Node MCU

1: Include Libraries: SPI, Wire, Adafruit-GFX, Adafruit-SSD1306, DHT, ESP8266WiFi, WiFiClient and ThingSpeak.
2: $oledRESET \leftarrow ledBUILTIN$; $DHTPIN \leftarrow D4$; $DHTTYPE \leftarrow DHT11$; $ssid \leftarrow wifiName$; $password \leftarrow wifiPassword$; $myChannelNumber \leftarrow thingspeakChannelNumber$; $myWriteAPIKey \leftarrow thingspeakWriteApiKey$; $dataState \leftarrow false$;　▷ Defining pins and variables.
3: AdafruitSSD1306 display(oledRESET);
4: DHT dht(DHTPIN, DHTTYPE);
5: **procedure** SETUP()
6:　Serial.begin(115200);
7:　dht.begin();
8:　**if** (SSD1306LCDHEIGHT != 64) **then**
9:　　print("Height incorrect, please fix AdafruitSSD1306.h!");
10:　**end if**
11:　display.begin(SSD1306.SWITCHCAPVCC, 0x3C);
12:　display.clearDisplay();
13:　display.display();
14:　display.setTextSize(1);
15:　display.setTextColor(WHITE);　▷ making oled display ready
16:　WiFi.begin(ssid, password);
17:　**while** (WiFi.status() != WLCONNECTED) **do**
18:　　delay(500);
19:　　Serial.print(".");
20:　**end while**
21:　print(WiFi.localIP());　▷ Connect to WiFi network
22:　ThingSpeak.begin(client);　▷ start cloud server communication
23: **end procedure**
24: **procedure** VOID LOOP()
25:　temperature = dht.readTemperature();
26:　humidity = dht.readHumidity();　▷ getting the data
27:　display.clearDisplay();
28:　display.setCursor(0, 0);
29:　display.print(temperature, " ");
30:　display.print(humidity);
31:　display.display();　▷ printing the data in oled display
32:　Serial.println(temperature);
33:　Serial.print(humidity);　▷ printing the data in serial monitor
34:　**if** (temperature < 100 and humidity < 150) **then**
35:　　**if** dataState **then**
36:　　　ThingSpeak.writeField(myChannelNumber, 1, temperature, myWriteAPIKey);
37:　　　$dataState = false$;
38:　　**else**
39:　　　ThingSpeak.writeField(myChannelNumber, 2, humidity, myWriteAPIKey);
40:　　　$dataState = true$;　4
41:　　**end if**
42:　**end if**
43:　delay(15000);　▷ uploading the data to the cloud server
44: **end procedure**

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4. RESULTS

We may consider 2 types of results here. One is for the IoT-based remote monitoring system another is for the survey results we got from several cities and sources of Bangladesh.

A. Remote monitoring system working

The remote monitoring system we developed worked properly and the server showed the collected data like Figure 3.
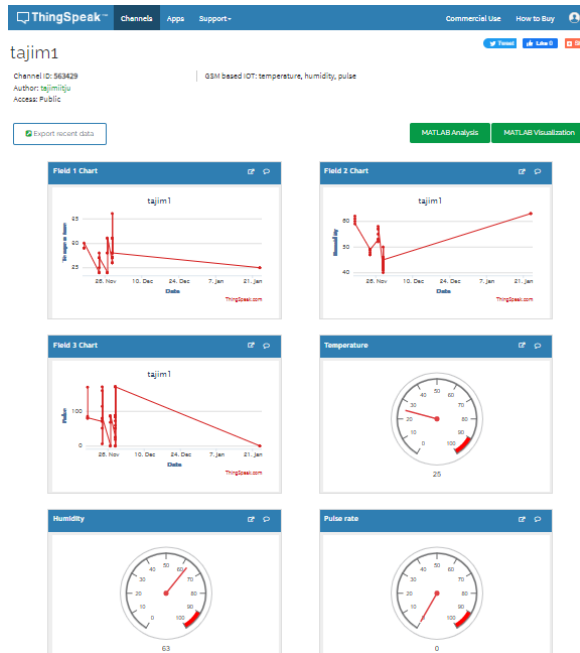
Figure 3. Cloud based IoT remote monitoring system

We used the ThingSpeak cloud server and the real-time data which can be monitored by anyone are available in this link: https://thingspeak.com/channels/563429 now. Anyone can monitor teacher or students data from the server before visiting them. Though one Node MCU (Micro-Controlling Unit) ESP8266 is not enough to take all the sensor data but it is effective. The features we have obtained with the monitoring system is as follows:

- Collects e-health sensor data (Temperature, Skin Humidity) from human body (95% times accurate).

- ESP8266 NodeMCU is used to communicate via Wi-Fi (90% times accurate).

- Can show graph of health condition with the collected data (94% times accurate).

- Patients can be monitored from all over the world.

- Overall low cost device and system.

B. Survey results and obtained data analysis

The enormous impact of COVID-19 does not hide from anyone. Among the multiple sectors that are responsible for the growth of Bangladesh, one is the educational sector. Private tuition works as a bridge to strengthen the education system in our country. For the pandemic, the private tuition scheme gets threatened as well. From a short survey of 82 random people of Dhaka city, some information is collected to manifest a glance at the negative changes that affected the private tuition system in Bangladesh during the pandemic. The survey data and their analysis are illustrated in the following tables.

TABLE I. PERCENTAGE CHANGE OF PRIVATE TUTORS DURING MARCH 2020 TO AUGUST 2021

Ages	Already Have (%)		Willing To (%)	
	Before	During	Before	During
18-20	14.75%	5.75%	5.5%	1%
21-25	17.05%	7.8%	5.8%	3.5%
26-30	9.25%	5.9%	3.95%	3.25%
30+	7.6%	3.8%	3.05%	2.05%
Total Male=39% Female=61%	48.65%	23.25%	18.3%	9.8%

TABLE II. DIFFERENT PRIVATE TUITION DEMANDS AT CERTAIN ACADEMIC VERSIONS & THE PERCENTAGE EFFECT ON MARKET DEMAND FOR PRIVATE TUITION

Versions		Demand (%)	Effect Range	Total
BM 70%	Before	60.5%	<30%	12.2%
	During	18.15%	30%-40%	8.54%
EV 65%	Before	23.2%	40%-50%	6.1%
	During	8.12%	50%-60%	54.86%
EM 60%	Before	16.3%	>60%	18.3%
	During	6.52%	Total	100%

Here in (TABLE II),
BM = Bangla Medium approximately.
EV = English Version approximately.
EM = English Medium approximately

TABLE III. EFFECT ON THE INDIVIDUAL'S NUMBER OF TUITION

Categories	NT	PE	
-	-	Before	During
Null	0	0%	76.9%
Initial	1	40.5%	0%
Pre-Medium	<=5	22.6%	10%
Medium	5	16.1%	5.7%
High	>=5	20.8%	7.4%

Here in (TABLE III),
NT = Number of Tuition
PE = Percentage of the Effect

A questionnaire survey is conducted among the university, and college students having tuition classes as a job. The information of this survey collected from around 1665 students. Their results are also discussed in the data tables. Many coaching centers conducted their regular classes with students through online facilities. A small local survey was conducted by the fewer private coaching center authorities to show the pandemic situation that they shared. Their results are also discussed. Finally, the tables particularly

TABLE IV. PRIVATE TUITION FEES RANGE

Categories	Range	PB	PD
Initial	≤ 5000	34.8%	5.22%
Pre-Medium	5000-10000	15.3%	3.83%
Medium	11000-15000	15.4%	3%
Higher	16000-25000	20%	6%
Professionals	≥ 25000	20.5%	5.15%

Here in (TABLE IV),
PB = Percentage Before
PD = Percentage During.

TABLE V. ATTENDED STUDENTS' PERSONAL INFORMATION

TS: 1665		
Gender	Male	57.1%
	Female	42.9%
RI	Urban	42.7%
	Rural	8.7%
	Staying at city for study	48.6%
LE	College	9.95%
	Under-graduation	70.55%
	Post-graduation	19.5%
II	Public	64.3%
	Private	35.7%
JI	Only Tuition	82.6%
	Part-time job except tuition	17.4%

Here in (TABLE V),
TS = Total student.
RI = Residential Information.
LE = Level of Education.
II = Institutional Information.
JI = Job Information.

TABLE VI. PREFERRED SEVERAL VERSIONS AND TARGET STUDENTS AT DIFFERENT CLASS LEVELS

Version	Before	During	Level	Before	During
BM	58%	23.2%	PL	27.5%	4.75%
EV	21.7%	8%	SL/OL	53.6%	13.4%
EM	20.3%	7.08%	HL/AL	18.8%	7.55%

Here in (TABLE VI),
BM = Bangla Medium
EV = English Version.
EM = English Medium.
SL = Secondary Levels.
OL = O'Levels.
PL = Primary Levels.
HL = Higher Secondary Levels.
AL = A'Levels.

have the following interests:

1) Table-I discussed about the percentage of interest changed among the tutors from 2020 to 2021.

TABLE VII. COVID EFFECT ON TUITION CLASSES SALARIES

Among all students	Reduced Classes	Reduced Salary
<40%	14.5%	12.2%
40%-50%	24.6%	26.1%
50%-60%	40.6%	27.5%
>60%	20.3%	34.2%

TABLE VIII. OVERALL COVID IMPACT ON PRIVATE TUITION IN THE EDUCATION MARKET OF BANGLADESH

Categories	Representing Percentage	Number of students
Unexplainable	>60%	169
Extreme	50%-60%	530
High	40%-50%	748
Neutral	30%-40%	97
Controllable	<30%	121

TABLE IX. THE SUMMARY OF THE COACHING SURVEY

Demographics	Respondents	Percentage (%)
Gender:		
Male	490	58%
Female	354	42%
Residence:		
City	446	53%
Village	398	47%
AOC:		
Yes	762	90%
No	82	10%
LRO:		
< 40%	242	
40%-50%	244	
50%-60%	134	
>60%	142	

Here in (TABLE IX),
LRO = Level of regularity in the online classes.
AOC = Attending Online Classes.

2) Table-II mentioned market demand of private tuition in Bangla and English medium studies.

3) Table-III showed the data of the effects on the individual's number of tuition.

4) Table-IV illustrated the data of private tuition fees range.

5) Table-V showed some personal information of the attended students in the survey.

6) Table-VI shows the data among several versions and levels.

7) Table-VII shows the effects on tuition salaries.

TABLE X. THE EFFECT ON THE DEMAND FOR HOME TU-TORS ACCORDING TO TWO RENOWNED ONLINE TUTOR MATCHING PLATFORMS IN BANGLADESH

C	Online Tutor Platforms					
	TutorSheba			DeshTutor		
GP	M	F	T	M	F	T
NTT	956	1280	2236	16106	18015	34121
AAP	5.98%	7.63%	6.92%	30.86%	49.97%	40.9%
NTN	239	245	484	10066	978	11044

Here in (TABLE X),

T = Total

C = Categories, M = Male, F = Female, GP = gender Preference.

NTT = Number of tutor then (2019).

AAP = Average affected percentage (2020-2021).

NTN = Number of tutor now (2021-2022).

8) Table-VIII gives the idea about overall effects of covid in private tuition in Bangladesh.

9) Table-IX gives the idea about the summary of the coaching survey.

10) Table-X showed the effect on the demand for home tutors according to two renowned online tutor matching platforms in Bangladesh.

5. DISCUSSION AND FINDINGS

This section will mention our findings and discussion. A thorough analysis is done on the data findings. This analysis clearly represents how crucially the COVID-19 pandemic affected the education system. Also, how much the private tuition has effects to the parents along with the tutors. Multiple charts and graphs are used to show the consequences that occur because of the deadly pandemic. However, this pandemic is responsible for some developments to the student's activities that are also included in this analysis. Altogether, the discussion is apart into five perspectives representing the whole situation in response to the pandemic which is covering the topic Private Tuition: Effected during COVID-19.

A. The perspective of the survey of 82 random private tutor

The analytic changes that occur because of the pandemic issues are undoubtedly alarming which is proven by the data collected from the survey.

B. Change of the percentage of private tutors

The explicit changes are shown to the Figure 4 & 5, that clearly representing the pandemic effects on the decreasing percentages of already have tuition and the people who were willing to become one at different age ranges (Male=39%; Female=61%).

C. Change of tuition demand

Previously, Bangladesh had a high demand for home-tutors in the education market [30]. But during the pandemic the demand has started falling at a very rapid motion. The
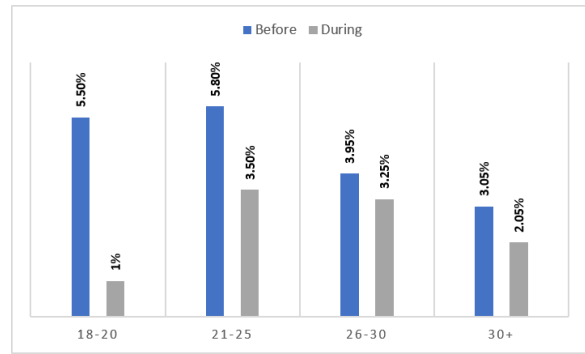

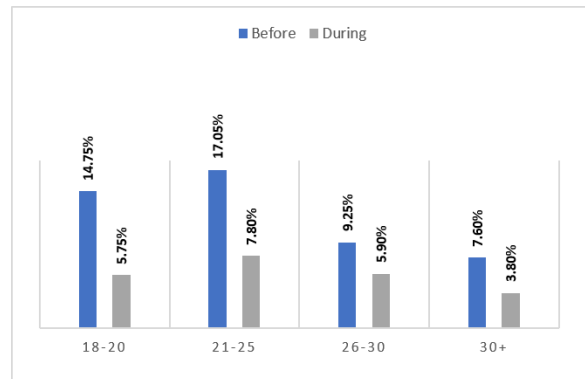Figure 4. The change on the percentage of willing to

Figure 5. The change on the percentage on already have tuition.

parents are opposing to bring a tutor to their home as their first priority is life safety. Keeping pace with that most of the tutors thinking about their own safety considering their jobs. For these reasons, the percentage has fallen during the pandemic period Mentioned in Figure 6.
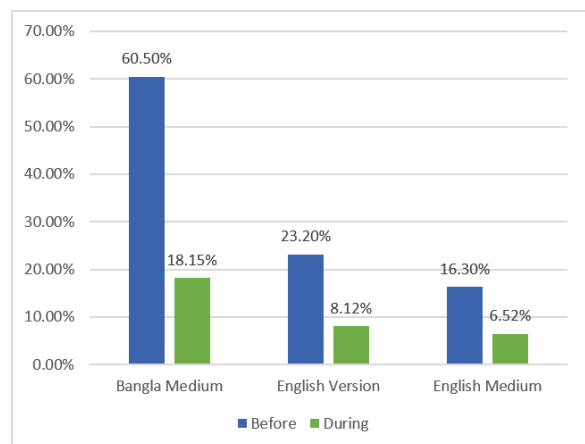

Figure 6. A glance of the crucial change that happened on the Tuition Demand

D. Change in the individual's number of tuition

There is a high change on the number of tuition that individuals had before the pandemic and have now during
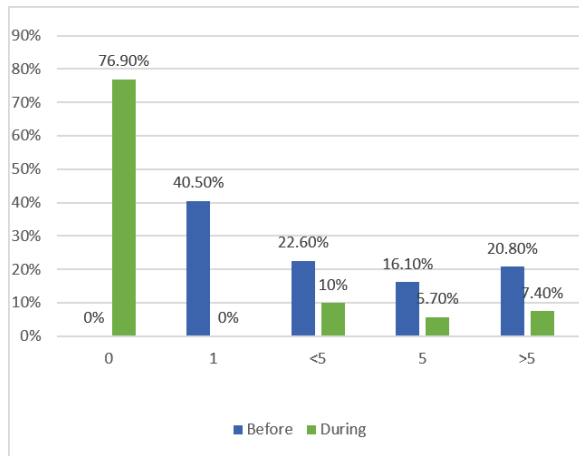
the pandemic illustrated in Figure 7.

Figure 7. The noticeable change on individual's tuition.

E. Changes in the tuition salary

For the COVID-19 impact the demand for multiple academic versions fall at a crucial rate and alongside the tutor's fees affected as well. Again, during the pandemic period the percentages of each ranges diminish at a particularly high rate and till now the rate does not reach at a satisfactory point, shown in Figure 8.
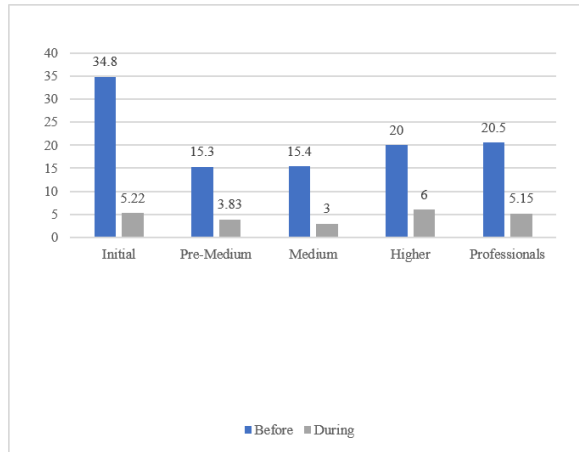

Figure 8. The diminishing percentages are shown to represent the changes.

F. Changes on the preferred versions and level

1665 students have different preferences to choose their tuition, concerning the versions and levels of classes. However, the preferential percentages have changed in a crucial rate during the COVID-19 pandemic period. Changes in versions are given in Figure 6 and the changes in level age given in Figure 9.
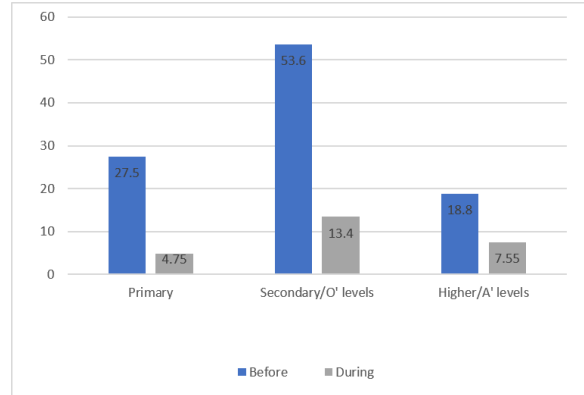

Figure 9. Changes on the class levels in tuition preference.

G. Effect on tuition salary and classes

Again, the students highlighted their perceptions on how much the COVID-19 pandemic affected their tuition classes and tuition salary [31]. The deadly pandemic causes a highly noticeable effects on the percentages that clearly represented on the Figure 10.

Figure 10. The deadly effect on tuition salary and classes.

H. Tuition as a job

There are many students who tries to start jobs for multiple reasons. In Bangladesh students have many obstacles to join any kind of jobs because of their zero experiences, lack of higher degrees and so on. That's why there is a high tendency of the college and university students to start a tuition job. Reasons can be anything, but the students reported these following reasons to become a private tutor:

1) Become financially independent: (33.3%)

2) Carry out living expenses: (10.1%)

3) Pay own tuition fees: (11.6%)

4) Just practice: (14.5%)

As COVID-19 pandemic caused damages on almost every single person's life in multiple ways, the students who

have jobs as tuition classes facing some kinds of difficulties as well. There is a list of difficulties that they are facing because of pandemic are as follows:

1) Facing financial instability.

2) Cannot carry out his/her living expenses.

3) Difficulties with regular basic expenses.

4) Unable to carry out own tuition fees.

5) Having observable financial pressure on their families.

6) Must move hometown temporarily.

7) Some people need to left Dhaka city.

I. Online tutor matching platform's perspective

There are various sources where a student and a teacher get to meet with each other. Between them, one is the online tutor matching platform. In the recent few years this source made a demandable place in the education market of Bangladesh. There are almost hundreds of platforms like this. Among them we collected data from two especially renowned ones named TutorSheba and DeshTutor. Their information are shown in Figure 11 and 12.
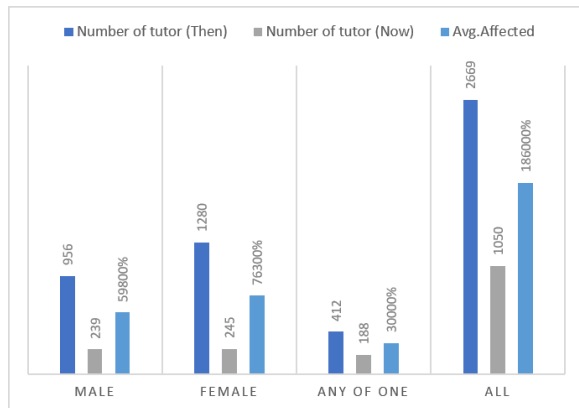
Figure 11. Effects at TuitorSheba.com

J. Coaching Center's Perspective

Except the home-tutors in Bangladesh every city and village students had an enthusiastic demand on the private tuition as coaching centers. During the lock-down of Corona Virus pandemic this crucial demand decreased at a good rate. Some coaching centers are trying to conduct online classes yet that does not turn at a satisfactory move. Some are trying to reopen their centers at their regular time which is seemingly impossible because of the inconvenience state of the virus. After discussing the pandemic situation most of the coaching center's executives informed both the positive and negative changes that happened on their organizations through the corona pandemic. Besides, as they are conducting their classes with the help of the online facilities, they shared the dimension of their student attendance and responsiveness.
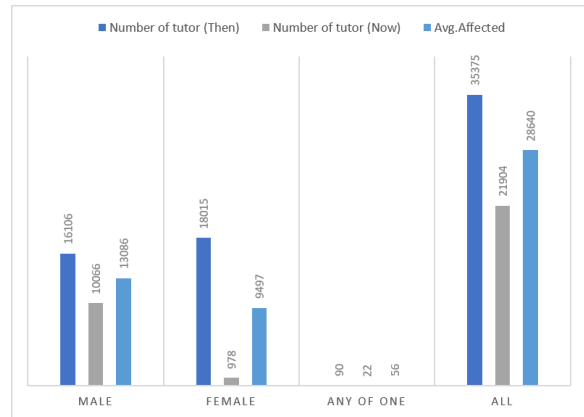
Figure 12. The effects at DeshTutor.com

K. Use of online classes as a way of solution

There is a relatively high demand on online classes. Though the COVID-19 pandemic affected the tuition system still a few participates of the survey replied as a yes on the question whether they are using online facilities for taking classes during pandemic regular basis. When it has been asked if they are using online facilities or not, around 554 students responded with a yes. Which is a positive view for both the tutor and student. The concept of traditional education has changed radically within the last couple of years. Being physically present in a classroom is not the only learning option anymore. Nowadays, students have access to a quality education whenever and wherever they want if they can get internet connection. We are now entering a new era, the revolution of online education. The reasons why online learning is the future of education are as follows:

1) Flexibility and Easy Accessibility.

2) Offers a wide selection of programs and more cost-effective than traditional education.

3) Again, allows for a customized learning experience.

It can be said that this is the positive effect of the pandemic. In Bangladesh, it was tough to think about conducting distance-learning around 3-4 years ago but now both the teachers and students are almost get used to with it. Also, to ensure that learning continues from home during school closures, the Government of Bangladesh is working with UNICEF to implement effective remote learning programs using TV, radio, mobile phone and Internet platforms. Through these the students and teachers gaining new experiences on Information Technology that is counting as a development of our country. Studies have already demonstrated that online mode of teaching will enable the educational institutions to teach 15-18% additional students at the same cost, as a report of Daily Star [5].

L. The noteworthy problems and outcomes of taking online classes

According to the executives and some of the teachers who are taking the classes, the outcomes are not satisfactory. The information they provide about the critical problems and outcomes they are facing because of conducting their classes through online are given below-

1) Problems:

1) Many students and some of teachers having crisis of devices through which the classes are conducting.

2) Both sides having inconsistent internet connection during class hours.

3) Electricity problems or load shedding.

4) Not understanding topics through online have an impact on the students' attention.

5) Poor responsiveness of the students.

6) Irregularity in joining the online classes.

7) Fewer scope of Practical and LAB works along with questioning and answering through online.

2) Outcomes:

1) Poor results.

2) Lower interaction.

3) Poor parental guard.

4) High social-media addiction.

5) Higher attachment with electrical devices.

6) Causing eyes problems by looking at the device screen for long time.

7) Fewer learning about creative activities.

8) Fewer attachment with the outdoor activities

9) Lower attention on studies.

10) Home sickness.

11) Increasing sadness and depression.

3) Attendance and Responsiveness:

The attendance is not changed in a significant amount in the online classes, shown in Figure 13. After measuring the level of responsiveness shown in Figure 14, this is clear that the response level is not very bad [32]. Although the responsiveness is increasing as more of the time passing [33]. Students are trying to understand that they must cope with the changing situation as a proverb goes that "time and tide waits for none."
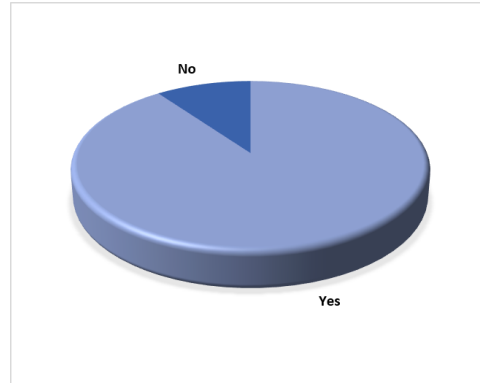

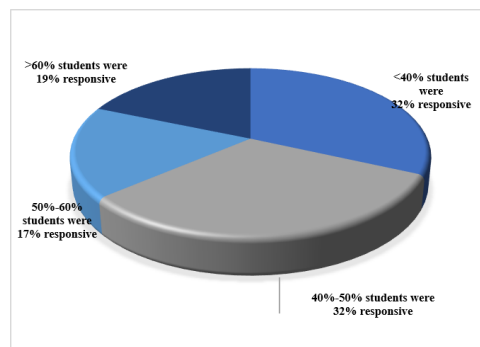Figure 13. Percent of attendance in online classes.

Figure 14. Responsiveness in online classes

M. Impact of IoT based solution:

Previously we discussed about the output of the IoT remote monitoring system in Figure 3. We offered 20 students and 20 tutors to use this system for 30 days. The results are shown in Table XI. The results showing that among 20 students and 20 tutors all of them did not used the system regularly in 30 days. But a good portion of them used it. In first 10 days 92.5% among all the teacher and students used it. In last 10 days of the month 77.5% people used it. Teachers and student placed their finger on the developed device. It collected the data and send it to the cloud. The other one student or teacher see it from the cloud server without any contact with each other. From the cloud monitoring system teachers and students found each others health condition. How many percentage of students and teacher's found not healthy is mentioned in the Table XI's 6 to 8 rows and consecutive columns. After knowing the health condition how many students and teachers changed their decision to have physical contact with each other is mentioned in Table XI's 9 to 11 rows and consecutive columns.

So, we can say the IoT support system was able to help both tutors and students.

6. Conclusion

The demand for private tutors in Bangladesh is very high. For COVID-19 that demand decreased. This effect

TABLE XI. Effects of IoT Solution among 20 students and 20 students

	Students	Teachers	Percentage (%)
Total (40)	20	20	-
U1	18	19	92.5
U2	14	17	77.5
U3	15	16	77.5
NH1	3	4	17.5
NH2	3	5	20
NH3	2	3	12.5
DC1	2	3	12.5
DC2	3	4	17.5
DC3	2	3	12.5

Here in (TABLE XI),
U1 = Used in day 1 to 10
U2 = Used in day 11 to 20
U3 = Used in day 21 to 30
NH1 = Not healthy found in day 1-10
NH2 = Not healthy found in day 11-20
NH3 = Not healthy found in day 21-30
DC1 = Decision changed in day 1-10
DC2 = Decision changed in day 11-20
DC3 = Decision changed in day 21-30

affected both students who is seeking tutors to study and tutors who is seeking tuition to teach and earn their livelihood. For COVID-19 pandemic, private tutors' number of tuition and salary decreased. But this situation opened new ways of teaching too. In this work it is also shown that many private tutors are conducting their tuition online. Online tuition is now very common in education sector. Still majority of private tutors does not take their tuition online. This work may recommend them not to wait for COVID-19 situation to get better and conduct their tuition online. This research could be a key suggestion towards Effectiveness of online tuition, after COVID-19 situation and furthermore research topic. This work also presented and IoT based remote monitoring system for the students and teachers. That IoT systems showed good results. It shows how IoT can help people in education sector and daily life in this pandemic situation. In future some Machine learning methods can be added with the IoT system to predict future condition of students and teachers.

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