Enrichment of Indigenous Pre-Primary Education of Bangladesh Through HCI

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A thesis submitted to the Department of Computer Science and Engineering
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Declaration

It is hereby declared that

1. The thesis submitted is our own original work while completing degree at Brac University.
2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. We have acknowledged all main sources of help.

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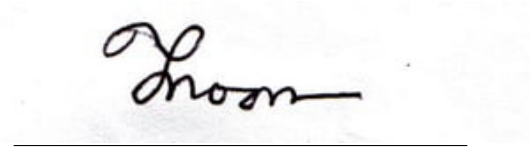

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Abstract

There are some indigenous peoples currently residing in Bangladesh. Most of them are in the hilly area in the southeast part of the country. These areas of Bangladesh are tough to reach. Even though modern technology such as electricity reached there, the lack of educational institutions hampers the development of these peoples. Another issue is that as modern technology touches indigenous peoples, they tend to forget the unique culture they are known for. In this paper, we are trying to use Human-Computer Interaction (HCI) to find a way to develop the pre-primary education system of indigenous peoples. We interviewed and surveyed many people from all life paths to find out how technological advancements like internet and websites can impact pre-primary education using the human factor of HCI. In this paper we try to establish a educational web site named IPE (Indigenous Pre-Primary Education) where there will be Indigenous language contents with supplementary Bengali contents to guide the students and teachers to help develop the indigenous pre-primary education scene. All of the work is done keeping in mind that the unique culture of indigenous people must be intact.

Keywords: Indigenous people; Pre-Primary education; Hill tract; Human-Computer Interaction; HCI; Website; Bangladesh;

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Nomenclature

The next list describes several symbols & abbreviation that will be later used within the body of the document

HSc Higher Secondary certificate

IPE Indigenous Primary Education

SSc Secondary School certificate

Chapter 1

Introduction

The name of our country is Bangladesh. In 2021 Bangladesh had approximately 166.3 million inhabitants. Part of this population is the indigenous people who reside in many corners of the country.

1.1 Indigenous People of Bangladesh

Different parts of the population prefer different terms to refer to the indigenous population. On the other hand, the indigenous people themselves prefer different terms. This sometimes leads to a heated debate between government officials and the spokespersons of the indigenous tribes. Some officials refer to the tribes as "upajati" (equivalent to "sub nation" and has close relation with the words "tribes" and "tribal"). They also refuse to refer to them as "Adibasi" (equivalent to "indigenous"). The spokesperson of indigenous people prefers the word "indigenous' in English and "Adibasi" in Bengali and rejects the term "upajati" in Bengali and "tribe' in English. Many other terms are used, such as "Jumma" (people who have a heritage in "jum" or swidden cultivation) and "Pahari" (literally "hill people") [20].

Bangladesh is home to 54 indigenous people. They speak at least 35 different languages. According to the census conducted by the Bangladesh government in 2011, approximately 1,586,141 indigenous people live in Bangladesh, accounting for 1.8% of the total population. However, indigenous peoples claim the number to be untrue. They claim the total population is approximately 5 million. Among these numbers, approximately 80% live in the flatlands of the north and southeast part of Bangladesh, and the other 20% live in the hilly areas of Chittagong hill tract and Sylhet [32].

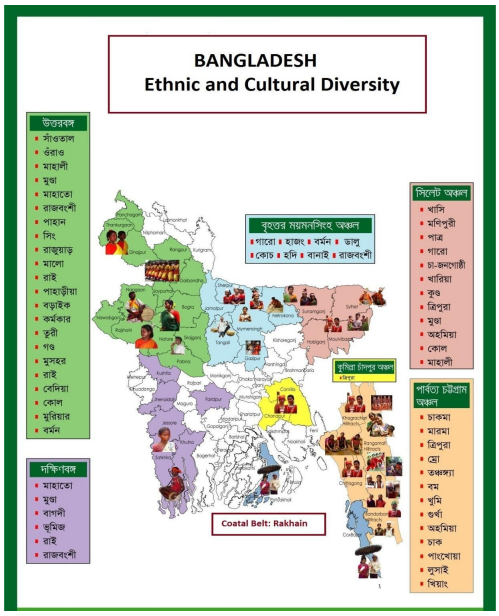


Figure 1.1: Various Indigenous groups by region

1.2 Motivation

Education is the backbone of the nation. It is impossible to develop as a country keeping such a massive population uneducated and in darkness. The government has taken different initiatives to ensure primary education for the indigenous people, but it is sorrowful that very few of them have been implemented. Moreover, in the era of technological advancement, very few of the indigenous tribe is getting the light of technological facilities. Therefore, our main concern is to try and do something for these indigenous people who are still away from this blessing of humankind.
Furthermore, to develop such a system through which they can gain confidence coming forward as an indigenous student to flourish in their life gaining primary education. This type of system definitely will help them to approach higher studies. Also, we want to keep the different cultural identities intact from generation to generation and spread them so that the general people can also help these students achieve their dreams. We as a country can achieve the peak of success and development in the future.

1.3 Research Problem

As time goes by, our country is developing at a constant speed. Numbers of educational feats have been recorded in recent years. Many higher educational institutes have made their name in the international educational community by placing themselves higher. However, not many indigenous people have made it into the biggest stage of Bangladesh. Those who have made it into the prominent universities, after close observation, can see that at some point in life, they leave their traditional education behind and starts living at places where good education is available. So, it is not possible to fully understand the situation by using their experience as data. On the other hand, in developing countries like Bangladesh performing HCI-based research faces many difficulties. So, below are some of the difficulties we might face

during the research.
There is no surety that the data collected from the organizations or government are correct or not. According to [32], the indigenous population of Bangladesh is 1,586,141, which was collected through the 2011 census. However, the spokesperson of indigenous people claims that the population is almost 5 million. Other information like how many students are in reach of the schools established by the government and how many books reach students' hands are also near invalid in developing countries like Bangladesh. So, when analyzing these data, there is always a margin of errors we have to consider.
According to [12], HCI or in general technological researchers have to be mindful of research ethics. Adding some temporary technological advancement for the research purpose only and then removing them can cause the people or, in this case, indigenous people their unique flow of life. Planning is also a complex, difficult part. Whenever collecting data traveling to the indigenous population is near impossible. Planning which technique to use is also another challenging part to plan. Culture is also another part of the difficulties we may face. The indigenous people have their unique culture, and they may not let some outsiders to temper their flow of life even if it may help them.

According to [3], the user interface or the system, the user, in our case, the in-

Figure 1.2: Indigenous elders working in traditional way

digenous people, will face is hard to design. To develop a perfect system, one has to know the user fully, and these tasks are somewhat done by a sub-task of HCI called task analysis, but it is complicated in practice. At first, the users themselves may not know what they want. So, after many iterations, a near-perfect model may stand. In these cases, existing theories and models do not work. Brand new things must be developed.
[3] mentions that when designing a user interface or a software system in general, the designer faces problems like they cannot think like the user, iterative designs

are much more complex and need a balanced design. There has to be enough time to test the system or model to know if it works as intended or not. Not only that, the primary purpose of the system is if the users are satisfied or not have to be monitored.
In our country's case, in many indigenous area's there are no technological infrastructures in place to allow the indigenous people to use the said system directly. Moreover, many other problems like ignorance and racism are present in our country.
So, keeping in mind the above-mentioned various problems the questions that this research paper is trying to answer is:

- **RQ1: How can HCI be implemented to create a simple website to develop Primary education of indigenous people of Bangladesh through technological advancements?**
- **RQ2: How can people from different means of life be of help to develop the primary education of indigenous people?**

So, when researching, we will be trying to solve the questions mentioned above and try to preserve indigenous peoples' cultural integrity. And try to find out a way to design a system to give the indigenous people access to modern primary education while at the same time not letting them forget their traditional roots.

1.4 Research Objective

The following research is to understand how the indigenous feel about modern education. We can use HCI to understand what general people know and think about indigenous people and their education problems. Designing a working system or website is also a Finding focus of this research. So, the first thing would be learning enough about HCI research by reading related materials. The same then has to be done with system or website creation. Then collecting enough data from various sources to analyze and learn how HCI help the primary education of indigenous people. The objective of this research is:

1. Learning about Human-Computer Interaction.
2. Learning how to collect mass data.
3. Understanding how indigenous people think about education.
4. Learning about web design.
5. Learning about related existing models.
6. Understanding how indigenous and illiterate people interact with technology.
7. Understanding what general people think of indigenous people and their education problem.
8. Learning the perspective of successful indigenous students.

9. Learning about designing a user interface.
10. Learning about developing user interface based on user experience.
11. Learning how to analyze mass data.
12. Recommend improvement to related existing models if they exist and are good enough to use.

1.5 Contribution

In this COVID situation prevailing within the country, it is very much difficult to go forward with our plan and try to do something which we are planning to do. But have come forward with a plan which we think can be useful for the development of primary education of indigenous people.

- We put forward some research questions focusing on our research problem.
- We reached out to different people for their response focusing on our target group.
- Surveying and accumulating all the results we have formulated what we want to do based on the responses.
- A working system or website is proposed which we think can be of use to the indigenous people's primary education and culture.
- User interface of created system or website was further developed taking reviews from the targeted group.

Chapter 2

Background

This chapter contains the background information of our research.

2.1 Educational Situation of Indigenous peoples

The educational problems of the indigenous people who reside in Bangladesh have always been a concern for the related peoples. Bangladesh government has taken the initiative to ensure primary education for indigenous children by nationalizing 210 primary schools in the Chittagong hill tract in 2017. The ministry of primary and mass education produces textbooks for these schools in 5 different indigenous languages and distributes 25000 copies of them for free. However, the concern remains as these initiatives are not enough to cover all the indigenous people. Many children even now do not understand their right to education as there are very few educational institutes to teach them that. [32].

Figure 2.1: Indigenous primary school

2.2 Human Computer Interaction (HCI)

Human-Computer Interaction (HCI) is a multidisciplinary topic that studies how humans and computers interact to build diverse computer technology. HCI was initially only concerned with the computer but now ventured into other parts of information technology. Multidisciplinary fields of HCI contain computer science, human factor engineering, and cognitive science [27].
Also, HCI or Human-Computer Interaction is a study about how and why a human can or cannot use a computer to its full extent. HCI has three parts: the users, the computer, and the way they work together. The main goal of HCI is to develop a safe and functional system by putting the user's or people's conditions first [31].

2.3 Website design

A website is a collection of interconnected, publicly accessible Web pages with a single domain name. Individuals, groups, businesses, and organizations can construct and maintain websites for a wider range of activities.[28]
The design of websites that are displayed on the internet is referred to as web design. Rather than software development, it usually refers to the user experience aspects of website development. Web design used to be focused on designing websites for desktop browsers; however, design for mobile and tablet browsers has become increasingly important since the mid-2010s.[34]
A good web design is simple to use, aesthetically pleasing, and appropriate for the website's user group and brand. Many websites are designed with a focus on simplicity in mind, so that no unnecessary information or functionality that may distract or confuse users appears. Because the foundation of a web designer's output is a site that wins and fosters the trust of the target audience, eliminating as many potential points of user frustration as possible is a critical consideration.

Chapter 3

Literature Review

Even though many HCI and web design-related research works are available on the internet, very few research works are done on indigenous people's primary education. However, we have found some works that are related, and they are mentioned below:
In the article by Rüdiger Heimgärtner, they suggested a culturally influenced HCI model. They stated, designing HCI from an indigenous and local perspective is the same as designing for any culture group as part of intercultural HCI design, which can help support the design. Using the model, people can get the idea about cultural differences and know about cultural identities [21].
Another article, written by Pauline W.U. Chinn talks about if mainstream school science is viewed as the default in the Western science culture, perhaps teachers in these mainstream schools can help indigenous or sustainability-oriented cultures and communities by teaching a more complex, systems-oriented science that supports environmental literacy and incorporates culture into the learning [13].
Olugbemiro J. Jegede said, "A person's culture shapes a person's thoughts, feelings, and actions. Therefore, people expect this anthropological truth to be recognized in education and learning." [4].
Lesandro Ponciano put forward the HCI support card technology. He mentioned four essential needs for an HCI support card: (1) the card must provide the entire syllabus and some valuable information. (2) the card must have an understanding of the area's interdisciplinary nature (3) the card must be helpful to students when conducting classwork and homework, and (4) the card's handling should be simple [26].
Peter D Chalk and Holloway Road focused on the usage of WebCT, a Virtual Learning Environment (VLE). They discussed WebCT's features and how they used it to teach the HCI module. Learning materials, virtual communities, and management tools are the three components of a general paradigm for online learning that these aspects fall into. It can be utilized as an educational resource as well as an evaluation tool [7].
BH Hunter and RG Schwab examined the impact of the Aboriginal study Assistance Scheme (Abstudy) on Indigenous Australian views on education adopted by both houses of the Australian Parliament on July 26, 1999. They spoke of some improvement in school retention between 1986 and 1996 when a growing proportion of Aboriginal youth began to stay in school longer. These resulted in a slight relative improvement in the positions of Indigenous and non-Indigenous Australians,

considering all underage 18-year-old girls out of the equation. Disturbingly, the negative difference between Indigenous and non-Indigenous youth in school attendance is increasing for all adolescents over 15 years of age [9].

A study conducted by Malin stated that indigenous students valued by the family and neighbors lost their values when moving to the urban classrooms because of how they are arranged. In addition, conflicts between values and styles of communication between teachers and these students are frequent. These conflicts, the low unconscious expectations of teachers about students' academic and social potential create serious divisions between students and teachers. These divisions grow and become a vicious circle as the students are marked out both in their academic and social life [1].

In one of his articles talking about the indigenous people, Keefe stated that Indigenous peoples' access to education, training, and employment has historically been hampered by legislative restrictions and denial of rights. Many Aboriginal and Torres Strait Islander people have struggled over the previous three decades to overcome publicly and informally erected impediments to good education, training, and employment [2].

Metta Young, John Guenther, and Alicia Boyle observed how Indigenous people participate in vocational education and training (VET) and Australia's adult and community education (ACE). They claim that school education services in the entire Australian desert are scarce, especially at middle and high schools. Access to modern technology like payphones, private phones, and the internet is significantly constrained near Northern Territory desert areas. Furthermore, they added that more than half of indigenous peoples living in desert areas speak indigenous languages as their first language, but they represent less than a third of the cohort who participated in VET in 2003; this proportion already decreased in 2004. Because English proficiency seems to be a prerequisite for participation in VET, it is not something to be achieved through school participation [14].

Marcia Langton and Zane Ma Rhea discussed indigenous education and the difficulty they face on a larger scale. They stated that a considerable proportion of Indigenous families are poor and will directly influence their children's ability to take advantage of the educational opportunities that access to school provides. Moreover, they showed that according to the most recent ABS school data (ABS Schools 2007, Table 10), Indigenous students participate in both primary and secondary schooling at a higher rate than the national average. While Aboriginal and Torres Strait Islander (ATSI) children make up at least 2.5 percent of Australia's total population (ABS Year Book Australia, 2008), their overall school enrolment percentage is 4.5 percent. It is 5% in primary schools and 3.7 percent in high schools [16].

In another article, Professor Graham Hingangaroa Smith showed a need to comprehend and address the detrimental separation between indigenous communities and the academy. This separation results in emotions of distrust among indigenous communities, a lack of access, involvement, and success at higher levels of education, and a weakened capability to break the self-fulfilling cycle of educational underachievement and socioeconomic marginalization through education. Furthermore, he added that any hypothesis must be capable of making a beneficial effect in helping indigenous people live better lives [8].

In a study about Indigenous people and technology, Laurel Evelyn Dyson and Jim Underwood found that Indigenous people who use the Internet are frightened to be

overpowered by Western culture transmitted through the Internet. Change scares some Indigenous people because it threatens their traditional knowledge and life. Also, they added that the Web's multimedia capabilities are excellent for cultures that are more oral and graphic than written. Traditional culture is stored and delivered in CD-ROM or through the Internet using sound recordings, movies, pictures, and animations. However, the risk of their traditional knowledge being misused is a genuine concern. Thus passwords have been set up so that the cultural repository is only accessible to community members [10].

Katalina Toth, Daisy Smith, and Daphne Giroux stated that making education accessible without forcing people out of their communities respects Indigenous people's relationship with the land and gives hope to individuals in the community by making the path to change apparently. Moreover, Indigenous people can reinforce and share their culture by developing their online material with better access to technology and programming instruction. The same paper showed that the Nunavut government and Pirurvik (an education facility in Iqaluit) had published applications for older children and adults that allow them to write in Inuktitut syllabics on iPads and iPhones (CBC News, 2015). Access to these kinds of technological advancements could help Indigenous languages become more relevant to younger generations, improve the usage of Indigenous languages in schools, and increase the relationship between the school curriculum and the students' culture [25].

In another article, Billson and Mancini found that many Indigenous communities' distant locations are obstacles to attaining higher education. Higher education is physically unfeasible for many kids who complete high school. Because most Indigenous communities are located far from post-secondary schools, getting a higher education typically necessitates leaving behind family, friends, and a way of life to travel to the city, where cultural barriers and loneliness are significant obstacles [11].

Cameron, Edwards, Grant, and Kearns (1999) found that Indigenous university students made up less than 1% of total enrolments in IT degree programs and IT topics in non-IT degrees. For example, Indigenous completions in IT programs at UTS are likely to total two, despite many colleges that offer computer science or information technology programs failing to enroll or graduate a single IT student. (DEST (2002) [5].

In another article, Jesster P. Eduardo1 and Arneil G. Gabriel stated the bulk of Curricula based on mother tongue only include local dialects and languages, not Indigenous languages. As a result, there is a shortage of fluent educators in the Indigenous language. Another issue is that the bulk of courses taught in higher education institutions need the usage of English terms because there is no ethnic equivalent for foreign phrases that are primarily English vocabulary [29].

The findings of Nazmul Hasan's study published in the journal aid in understanding the current constraints to ICT use for socio-economic development among socially excluded communities and the potential of ICT use for socio-economic development. In the paper, he discussed - why Local and national government budget and financial management processes for indigenous people must be more transparent and how indigenous people's rights were harmed due to a lack of personal data protection.He Also suggested establishing improved strategic usage strategies to improve indigenous people's social development capacities [30].

In an article, AKM Iftekhar Khalid pointed out that there are lots of issues in hill districts, including the primary and secondary schooling systems, parental attitudes

toward girls, private tutoring costs, religious and societal beliefs, and school distance, all of which make it difficult for girls to attend school. Moreover, some girls said that they did not get desired support for learning different subjects [22].
Another article was written by Morgubatul Jannat, Mohammed Kamal Hossain, Mohammad Main Uddin, Md. Akhter Hossain & Md. Kamruzzaman stated that the new National Education Policy 2009 promises to bring reforms to the system, such as the provision of eight-year primary education for indigenous minorities, which includes First-language-based multilingual education. However, in the context of a centrally regulated education system like the one in place now, First-language-based bilingual education for the indigenous minority is tinged with the fear of a failed system. They also added that only 50% of children get themselves to primary schooling and more petite than 10% of them can complete their secondary education [24].
Profulla Sarker and Gareth Davey stated that Children are frequently expected to labor or care for siblings while their parents work, and as a result, they are unable to attend school. Furthermore, indigenous peoples who live in dispersed distant villages and tiny hamlets with limited access to schooling tend not to send their children to school. Also, minority groups face social, political, and economic discrimination [18].
In an article, Jane Leer, Liana Gertsch, Shahana Parvin Lata, and Akter Hossain found parents' support for schooling limited, which they blame primarily on cultural and linguistic hurdles. Parents are less likely to value an education that does not take into account their culture and language [33].
Nazrul Islam Mondal, Atikur Rahman Khan, Jefarson Chakma & Golam Hossain found that 48 percent of families have at least one child who has dropped out of primary school in rural areas. The family's financial situation influences the decision to drop out of primary school [17].
According to Crystal, schools can help restore minority and endangered languages. If minority language speakers' languages are integrated into the educational system, they will have equal access to social, political, and economic engagement [6].
In a study, Nigar Sultana stated that Tribal languages and cultures are ignored in the curriculum due to the dominance of Bangla and English, and tribal people, who have no authority in society concerning the dominant culture in Bangladesh, are disadvantaged in education [19].
Cavallaro and Rahman stated that minorities' informal education needs to study in their mother tongues alongside the two major languages, Bangla and English. The education of indigenous youth in their mother tongue will lead to "an enhanced socio-economic standard of these people and, thus, contribute to the maintenance of their ethnic language" in the tribal society [15].
Ashley Karr said, "The way a user interacts with an interactive technology determines their entire experience. How easy or difficult it is to engage with the user interface elements that the UI designers have built determines the user experience. As a result, UX programmers are frequently concerned with an application's user interface. On the other side, UX designers are in charge of deciding how the user interface will work, while UI designers are in charge of deciding how the user interface will look"[23]

Chapter 4

Proposed Methodology

We are doing this research to find out the reasons why Bangladesh's indigenous people are not getting enough modern primary education. Another purpose is to find out how to use modern technology in a way that they do not lose sight of their tradition. To do these tasks a huge mass of data must be collected from visiting sights. But due to the ongoing Covid-19 pandemic that is near impossible. So then other organizations' data can be collected. There are many government and non-government organizations that are currently working for the development of indigenous people. BRAC is one of those non-government organizations that are working for education in hilly areas where the indigenous population is prominent. General non-indigenous people's opinions also can be taken to broaden the idea spectrum. There might be some people who witnessed the educational quality first-hand. We will create some specialized questions from the data we gathered from 1st interviews. We will ask these questions to the indigenous students that have gone through the concerned education process and reached the higher educational institute of Bangladesh. We will also ask some primary teachers some questions to understand the general mindset of a primary school teacher. We will also get hold of some tourists who have recently visited the indigenous areas and witnessed 1st hand the problems in educations and acquire their opinion about how can tourists be of help popularizing indigenous primary education. We can collect data from BRAC, general people, or sight visiting and analyze them using our knowledge of HCI. Then we will look to improve the existing education-related model to fit the indigenous demographic. The existing model should be very simple for a primary school student to use. The existing model should also take educational content in the regular curriculum language and also in traditional indigenous languages to store them in clouds. Our 2nd interview is fully upon the fact that how the general people and the teachers teaching the indigenous students residing there are keeping pace with technology. They will be key in terms of achieving our goal to spread the knowledge through technological means. Keeping this in our mind, we have looked forward and come up with a website which can help the indigenous students in the long run and help them understand their studies better. This website will initially contain the study materials of initial level of primary education in the native language of the indigenous students. There is lot of scopes to improve the website in future which can really turn around the picture of primary education for the indigenous students.

4.1 Design Method

The principles of human-computer interaction (HCI) play a significant part in this research effort. We examined the fundamentals of human-computer interaction (HCI) from many articles. They are the fundamental building blocks for the design and development of web interfaces.
As part of this research, we looked at the following design principles:

- Simplicity
- Aesthetics
- Flexibility
- Directness

We have tried to elaborate these principles as per our understanding.

- **Simplicity:** The end-user interface should be straightforward and attractive, with the most relevant elements presented or prioritized at the top. The interface must adhere to the visual hierarchy, be consistent, and irrelevant information must be removed.
- **Aesthetics:** Aesthetics, which refers to a product's aesthetic look, has a significant impact on the user experience of an interface in various ways. When people visit a website or utilize an application, they are drawn in by the aesthetics. If the website's aesthetic appeal falls short of the user's expectations, the user may lose interest in utilizing the interface.
- **Flexibility:** In order for a website to be flexible, it must respond to various users in diverse ways. New users, as well as experienced users, must be able to understand the web pages quickly. It should be concerned with the user's habits, personal preferences, or specific actions. For the existing needs, it is tough to achieve.
- **Directness:** Directness refers to the ability to complete operations on an interactive system in a straightforward manner by making the various options plain. In contrast to traveling via an alternative representation, a user interface designer might start the process of analyzing or updating user interface feature attributes, settings, and actions by explicitly referring to their graphical representations.

After data collection and analysis we used some tools to develop a system or web page. Then we showed the interface to the interviewee and asked them what should be added next. We got some interesting findings and implemented them to get the final user interface and took note for future works.

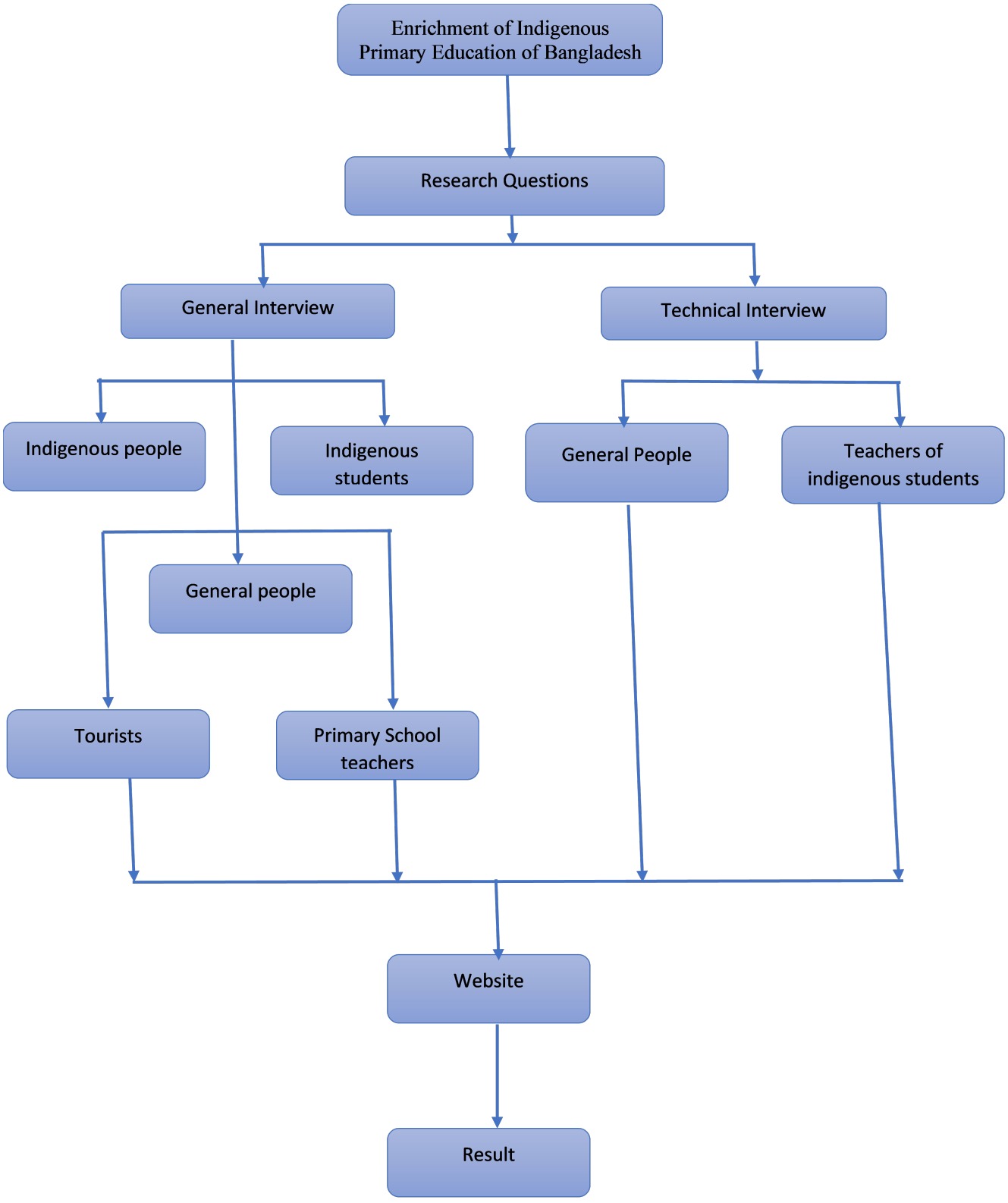


Figure 4.1: Proposed Work plan

Chapter 5

Survey Questions

We conducted our surveys in several different sections. 1st we tried to engage the indigenous people to learn about the whole situation of primary education they get. Then we engaged the general people to learn about the public's general opinion regarding indigenous primary education or indigenous people as a whole.
Then we moved to a more specialized portion of the interviews. In this portion, we used the knowledge we got from our previous interviews and asked more focused questions. We asked the indigenous students we had access to some problem-related questions and their opinions.
Then we asked some primary school teachers for their opinion and how their contribution could be helpful.
After that, we sought out some tourists who might have watched the situation 1st hand and asked them if they thought they could have some impact.

5.1 General Survey

5.1.1 For Interviewing Indigenous People

In order to conduct this interview, we sought answers to the following questions in a yes or no manner for the sake of the interviewee.

1. Sex?
2. Total Family Member?
3. Is primary education being distributed to the underprivileged indigenous people of Bangladesh?
4. Is modern education a curse for the unique culture of the indigenous people?
5. Will the implementation of modern technology hamper the culture of indigenous people?
6. Is primary education helpful in terms of eradicating Superstition to the underprivileged indigenous people of Bangladesh?
7. Do indigenous people tend to not send their children to educational institutions for racial abuse?

8. Do female children get equal opportunity in terms of education?
9. Are parents less likely to send their children to attain higher education?
10. Do parents tend to spend for only one child regarding education?
11. Do the children not want to attain higher study since they will have to leave their home place?
12. The main reason behind dropping out after primary education?

5.1.2 For Interviewing General People

For this interview, we asked the general people a mixture of yes or no questions and some opinion-based questions.

1. Age
2. Sex
3. Educational qualification
4. Do you know about indigenous or adibashi people living in Bangladesh?
5. Do you know the general location of these indigenous people?
6. Have you ever interacted with any indigenous people in your life?
7. If yes, where?
8. Have you ever seen highly educated indigenous people working in a large post?
9. Do you think there are many highly educated indigenous people?
10. Do you know about the primary education situation of indigenous people?
11. Have you ever had an indigenous friend?
12. Have you ever had indigenous classmates during primary school?
13. Do you think indigenous tradition is unique and should be preserved?
14. If a modern educational model is created for indigenous primary education, what can be useful in your opinion.

5.1.3 Focused Interview Questions for Indigenous Students Studying in Universities

For this interview, we asked some students who study in Dhaka, Bangladesh and we had accessed some yes/no and opinion-based questions. We did not ask their name for anonymity purposes.

1. Did you receive primary education in an indigenous primary school?
2. Do you think enough people are receiving quality primary education among indigenous tribes?
3. If you received primary education in both an indigenous primary school and general primary school which was best in your opinion.
4. What do you think indigenous primary education lacks?
5. If you can create any system to help develop indigenous primary education what will that be?
6. What do you think about the technological infrastructure in the hard-to-reach hilly areas?
7. If you transfer to a general school in any part of your education life, what kind of problems did you face?
8. If a web interface can be created what is 1st thing you would be looking for in it?
9. Some general opinions about how to develop primary education for indigenous people.

5.1.4 Focused Interview Questions for Primary School Teachers

For this interview, we asked some primary school teachers some opinion-based questions about their experience of teaching, opinions about indigenous primary education, etc.

1. What is your experience as a primary school teacher?
2. Do you think primary education is essential for a student to succeed in life?
3. What is the extent of your technological knowledge?
4. What do you think about indigenous primary education?
5. In any part of your teaching life did you encounter an indigenous student?
6. If yes. What problems did they face in their 1st few days of blending in?
7. If a system was to design what would be the 1st thing you would be looking out for?
8. Some general opinions about how to develop primary education for indigenous people.

5.1.5 For Interviewing Tourists

For this interview, we got hold of some people that we know who went to the hilly part of Bangladesh for tour purposes. We did not ask them too many questions as some of them were reluctant to give us much time.

1. Did you to went on a tour in the Chittagong hill tract or a similar place recently?
2. Did you have any encounters with indigenous people?
3. Did you get to see any indigenous primary schools during your time there?
4. If yes. How frequent were the schools?
5. Did you encounter any indigenous children who are in age for primary education?
6. Can they speak in a common tongue?
7. What is the situation of technological infrastructure such as network quality in those areas?
8. If you get the chance and knowledge, will you be willing to spread it the next time you went on such a tour?
9. If a system is developed to develop primary education what will be the 1st thing you would be looking for?

5.2 Technical Survey

5.2.1 For Interviewing General Indigenous People

Starting by pitching our system or web site idea we asked some technical question to the general indigenous peoples some technical questions.

1. Occupation
2. Do you have a smartphone?
3. How will you rate your smartphone usage efficiency?
4. How will you rate your Internet usage efficiency?
5. How is the internet facilities available?
6. Which Network is good in the area?
7. If you are asked by the students around the area to help them getting educational contents using internet, will you help them?

5.2.2 For Interviewing Indigenous Primary School Teacher

We asked teachers who taught the indigenous students in primary some technical but short questions.

1. Do you have a smartphone?
2. How will you rate your smartphone usage efficiency?
3. Will educational contents in their own native language be helpful for the students to understand their studies better?
4. How will you rate your internet usage efficiency?
5. If you can get updated educational contents in the native language of the students, will you be able to provide those to the students?

Chapter 6

Experimental Evaluation

This chapter includes all the data we found through various survey and interviews, their data analysis and findings:

6.1 Demographic Framework of the interviewees

6.1.1 General Survey

Our first big goal is to select the target group we want to interview. In this regard, our main focus was to keep a specific ratio of indigenous people and general people for the survey to have ideas from both sides. The demographic idea is given below:

Survey Attendees	Indigenous	General	Total
Interviewing Indigenous peoples	25	00	25
For Interviewing General People	00	25	25
Focused interview questions for indigenous students	16	0	16
Focused interview questions for primary school	2	13	15
For Interviewing tourists	6	11	17
Total	49	49	98

Table 6.1: Demographic Framework of the interviewees in General Survey

6.1.2 Technical Survey

Survey Attendees	Total
Indigenous General peoples	11
Teachers Teaching at Indigenous Primary school	8
Total	19

Table 6.2: Demographic Framework of the interviewees in Technical Survey

6.2 Interview Result

6.2.1 General Survey

Interviewing Indigenous peoples

Due to the pandemic and the hectic semester, we initially were unable to gather much data from indigenous peoples but a fortunate extended deadline allowed us to go to Khagrachari and gather data first-hand. In this section, we want to elaborate on the idea of the indigenous people about what they think about education. It is one of the most important ideas because the implementation of education will certainly depend upon how the indigenous people are accustomed to it and reacting to changes. Also, this section will include what problems do they think are acting as a barrier to education.
We have tried to keep our survey gender-neutral as it affects much of the perspectives. Among our participants 68% were male and 32% were female who gave their consent to our research study.
We wanted to know how many people are living in a family because the number of families plays a vital role in the rural areas in every decision a family makes. Over 56% of the families constituted with more than 5 persons which indicate a maximum of the families being a large one.

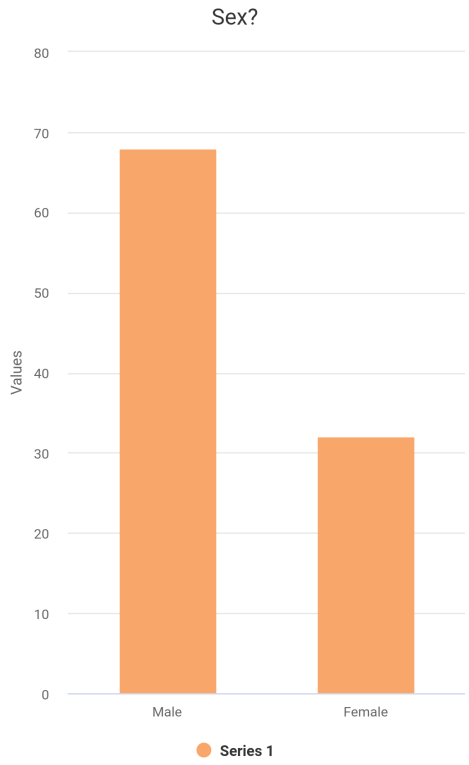


Figure 6.1: Sex?

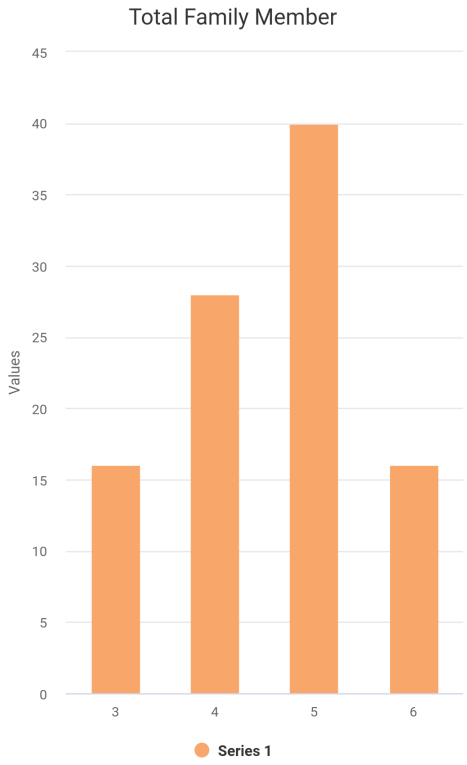


Figure 6.2: Total family member?

One of the most noteworthy things we came to know is that 24% of our focus group believes that education is not being distributed to the underprivileged indigenous people. The reason behind it as they state is political as well as social barriers. The

remaining 76% believes it is being distributed but there are many challenges that they face.
Modern education requires modern techniques and adaptability to change. The indigenous people are culturally a very strong group. But around 56% of people think that this modern education and technique is a curse to their culture. The reason behind this is there is no group that is solidifying their culture as well as bringing it into a larger picture. As a result of which children are moving away from their roots.

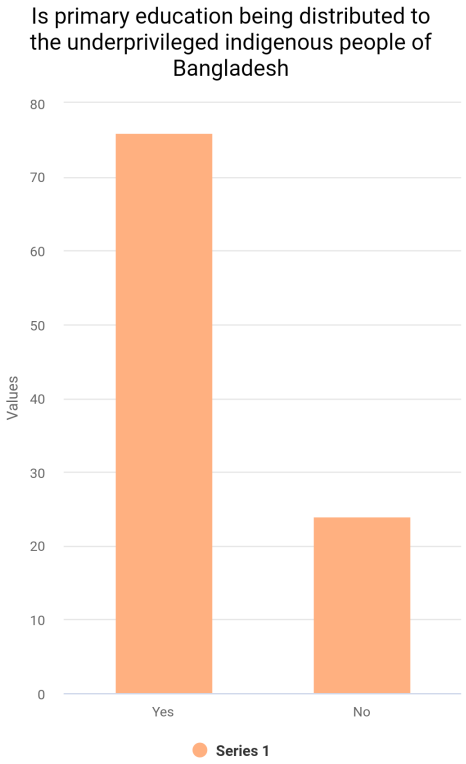


Figure 6.3: Is primary education available for all indigenous peoples?

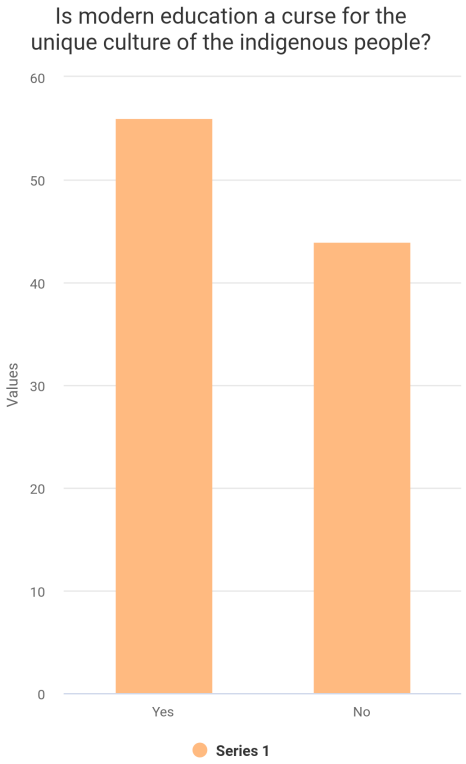


Figure 6.4: Is modern education is a curse for indigenous culture?

Different superstitions prevail in our society and the indigenous society is not different from it. To some extent, it surpasses even blind beliefs. It is a very dangerous disease in society and needs to be eradicated. Education is the main medicine for this disease. Around 68% of people believe that primary education can help in removing these superstitions. The remaining 32% does not believe it because they are totally unaware that they are following superstitions. This again points to education as that group of people did not even attend any primary schooling.
Another curse in our society is racial abuse. Indigenous people suffer a lot due to this racial abuse in all spheres of society. Parents of these indigenous people from their own experiences tend to not send their child to the educational institution so that their children do not face the same fate they faced. Around 72% of our focus group agreed to this. The remaining 28% believe that there are other contributing factors.

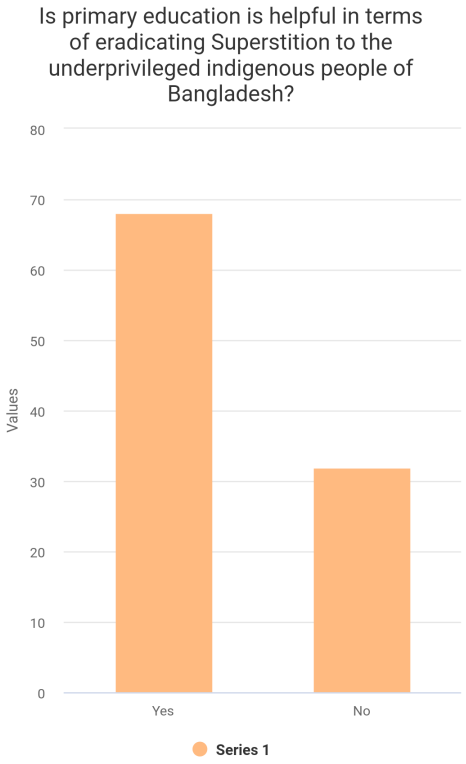


Figure 6.5: Is primary education helpful to eradicate superstitions?

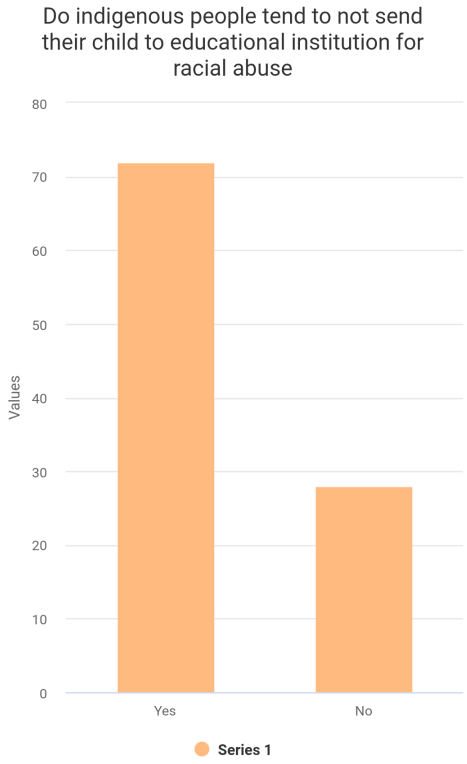


Figure 6.6: Is racial abuse a big factor not sending children to school?

Gender inequality is a big barrier to the progress of the female community. This also prevails in the indigenous society too. Around 72% believe that female children do not get equal opportunities in terms of education. It includes no support from family, society, even the educational institution where they go to learn.
Parents are more likely to send one of their children to gain education than all of them. Around 68% of parents believe that this is the only way they can survive as they do not have the financial condition to bear all the expenses of the children. As the family number increases, there are many other expenditures they need to bear and education is not the priority they focus on.

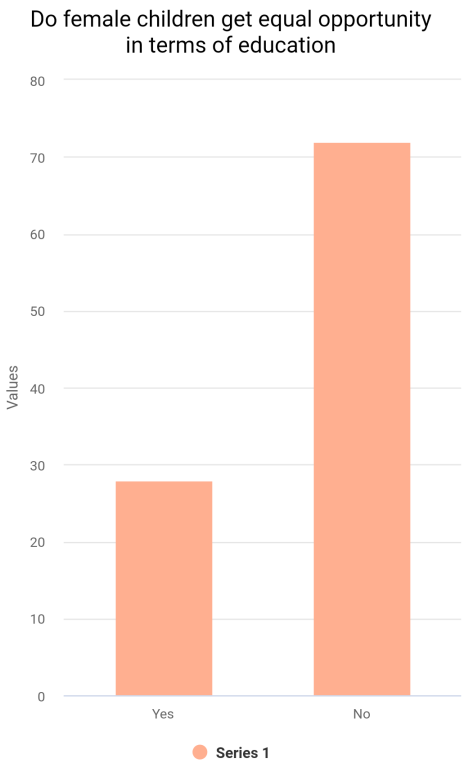


Figure 6.7: Do females get equal study opportunity as males?

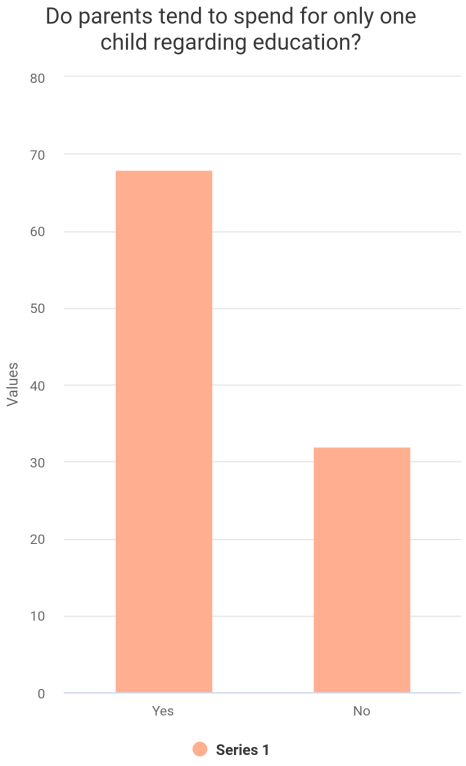


Figure 6.8: Do parents tens to send only one child for education in case of multiple children?

Many children from a very early age tend to grow affection with their home place and people. After primary education, these children tend to not go to attain higher studies as it will mean that they need to leave their home place and family. Around 64% of people believe that this is one of the main reasons why they do not attain higher education. The remaining 28% believe that there are other contributing factors.
Moreover, around 64% of people think that their parents also hold them back from higher education. The primary reason they stated is that they do not have the financial solvency to afford higher education. Also, some people said that they do not want their children to leave them. Furthermore, they added that they do not want their children to face any trouble mixing up with other cultural people.

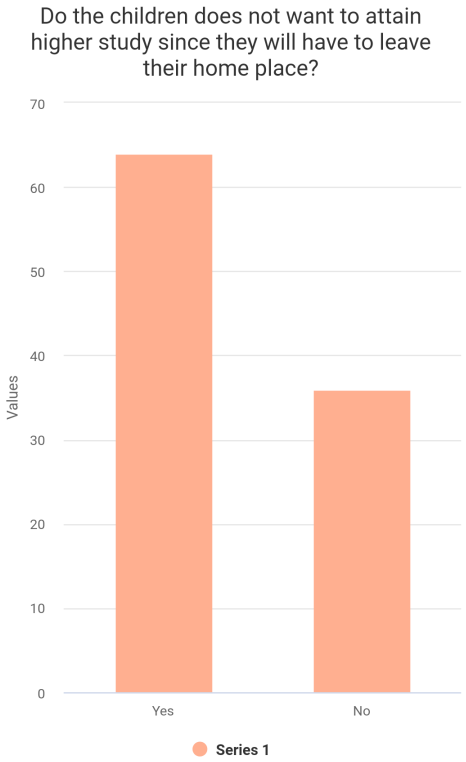


Figure 6.9: Does thought of leaving home impact the education process?

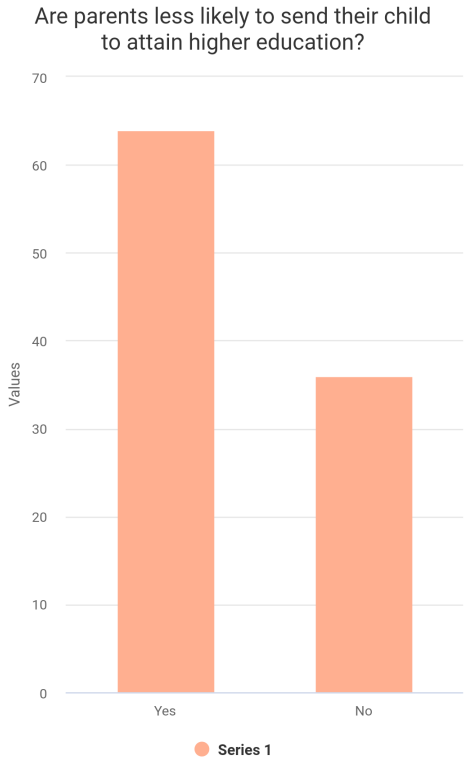


Figure 6.10: Do parents want to send their children for higher education?

Very few people in the indigenous society go for primary education. But few of them graduate because many of them drop out. Around 48% of our focus group thinks that this happens due to the financial condition of the family as they can not support them. Around 36% of people think that there is no proper guidance in the schools. So, it is better not to waste money. Around 16% think that it is due to racial abuse that children do not want to go to school anymore.

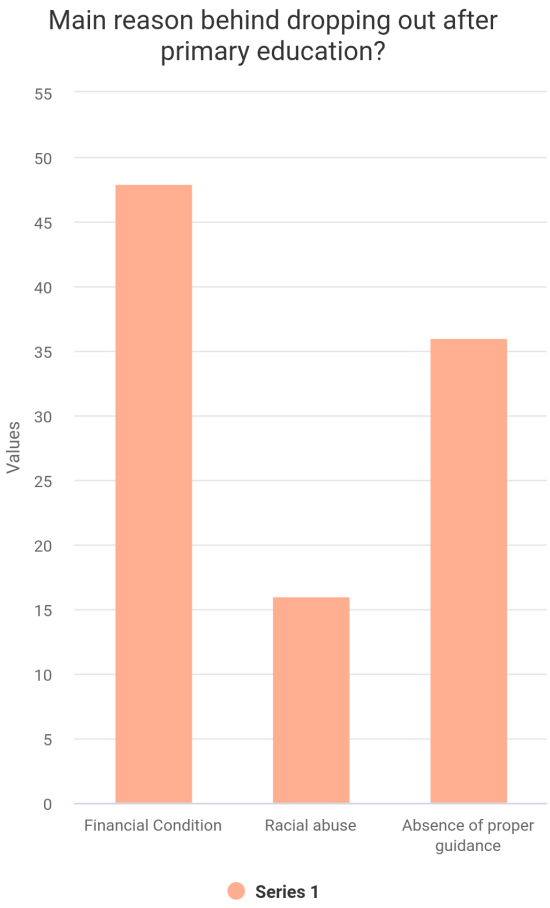


Figure 6.11: Reason behind dropping out after primary education

Interviewing General People

Due to the COVID-19 pandemic and very busy study schedule we could not gather a huge amount of data. But amongst many setbacks, we managed to interview 25 random general people. By general we mean the people we met on the road randomly. We tried to interview people of diversified ages. Amongst our interviewees, there were students aged 18-20 (24%), Students aged 21-23 (32%), service holders aged 24-30 (32%) and experienced service holders aged 30+ (12%). Totaling 100%. The people we interviewed were 62.5% male and 37.5% female.

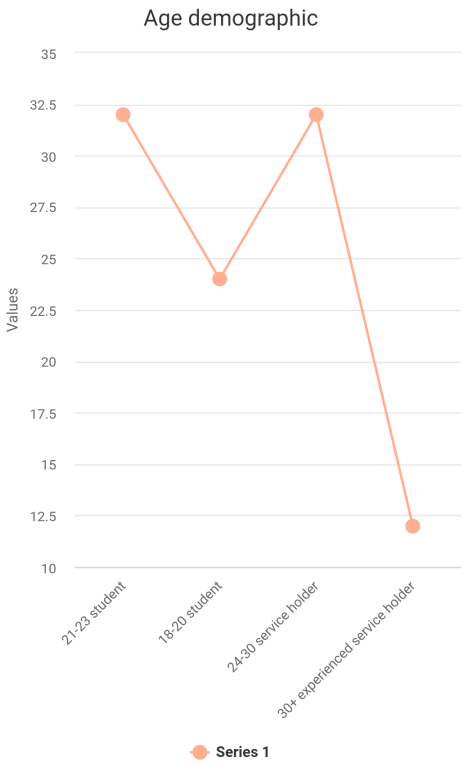


Figure 6.12: Age demographic of General people

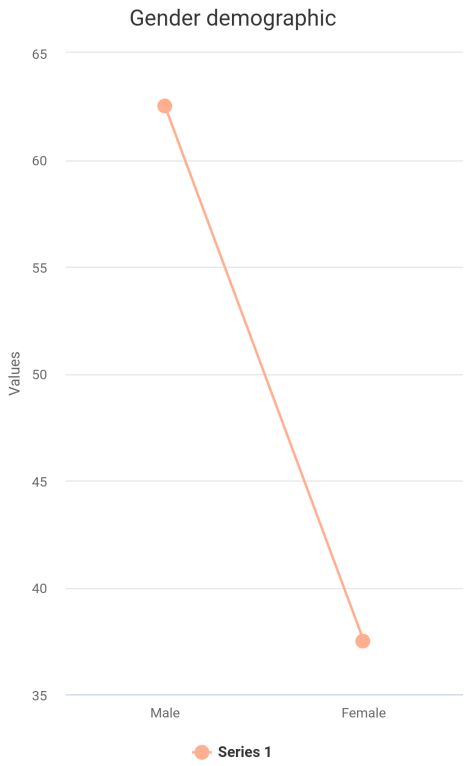


Figure 6.13: Gender demographic General people

All 25 interviewees we interviewed were all educated. We asked them about their educational qualifications. 68% of the interviewee completed their undergraduate. 24% of them had their Higher Secondary certificate (HSc) and the rest or 8% had their Secondary School certificate (SSc).
Of all the people we interviewed, all of them (100%) know that there are indigenous tribes living in Bangladesh. They all (100%) had a general idea of where these tribes reside in our country. Some of them had elaborate ideas about their locations.
Of all 25 interviewees, 19 (76%) have interacted with indigenous people in one way or another. 3 (12%) have had no interactions with an indigenous person in their life. There were also 3 (12%) who cannot remember if they had any interaction.

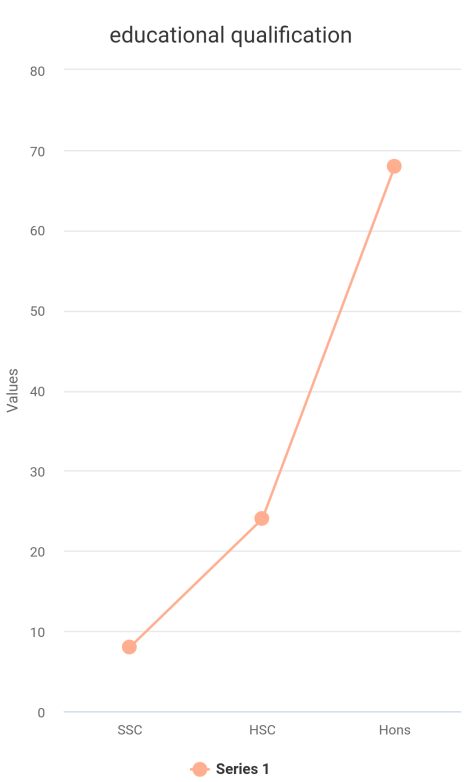


Figure 6.14: Educational qualification of general people

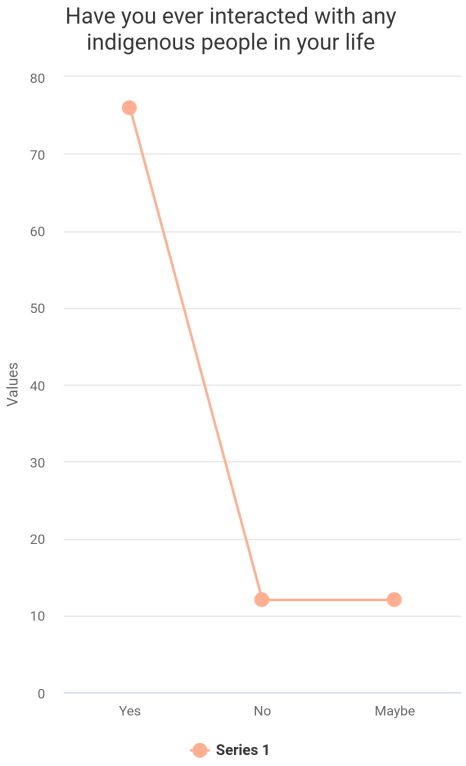


Figure 6.15: Have you ever interacted with any indigenous people in your life?

When asked about the places where they had the interactions the answers were in school, college, work or in a tour to indigenous tribes' locations. 16 (64%) of the interviewee had an indigenous friend in their life. 6 (24%) people do not have any indigenous person as their friend and the rest 3 (12%) cannot remember.
6 (32%) out of 25 had an indigenous classmate during their primary school days. 11 (44%) interviewees did not have any indigenous classmates and the remaining 6 (24%) cannot remember.

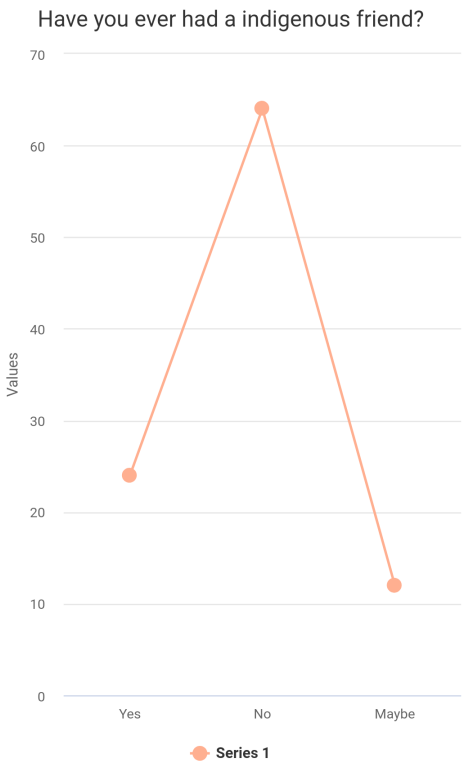


Figure 6.16: Have you ever had any indigenous friends?

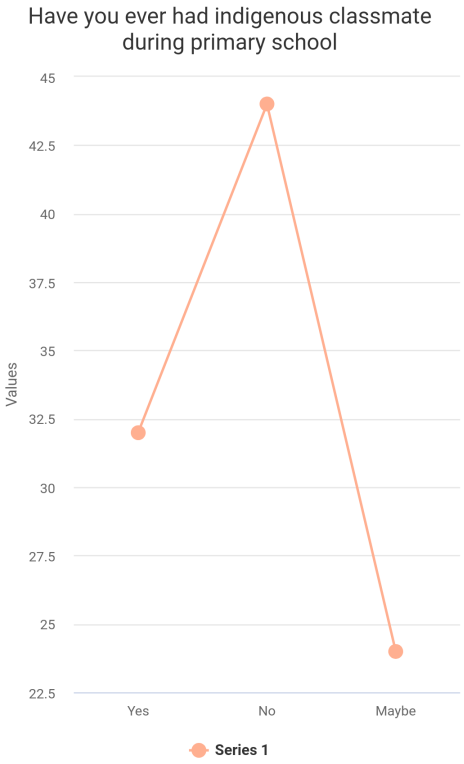


Figure 6.17: Have you ever had an indigenous classmate during primary school?

When asked if they had seen any indigenous person who has had higher education and is posted in a big post 13 (52%) have answered negatively and 12 (48%) answered positively.
When asked if there are many highly educated indigenous people around a major portion of 21 (84%) have answered no. 4 (16%) have answered yes.

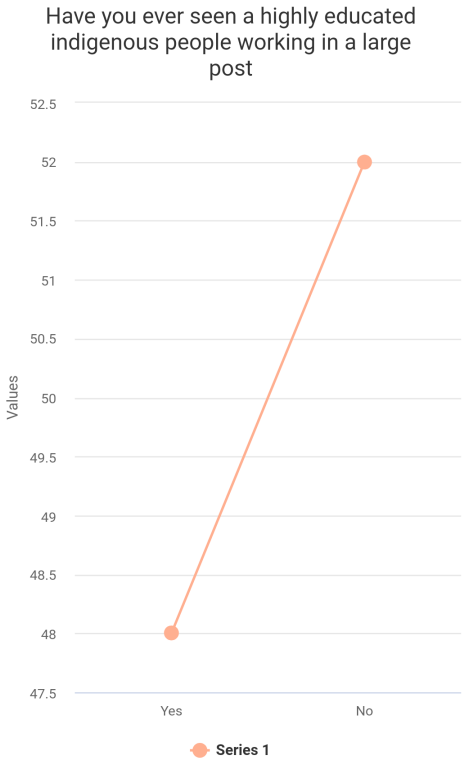


Figure 6.18: Have you ever seen a highly educated indigenous people working in a large post?

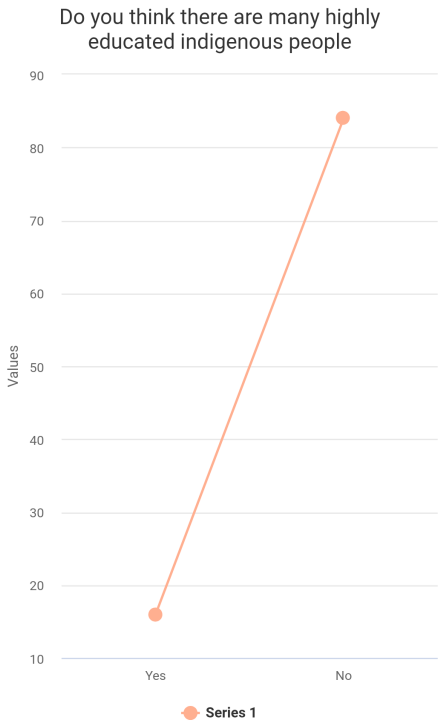


Figure 6.19: Do you think there are many highly educated indigenous people

Answering a question about if they have any knowledge about primary education of indigenous people 14 (56%) have answered no and 11 (44%) have answered yes. When asked about if the culture of indigenous tribes is unique and if they should be preserved all of the 25-interviewee responded positively.

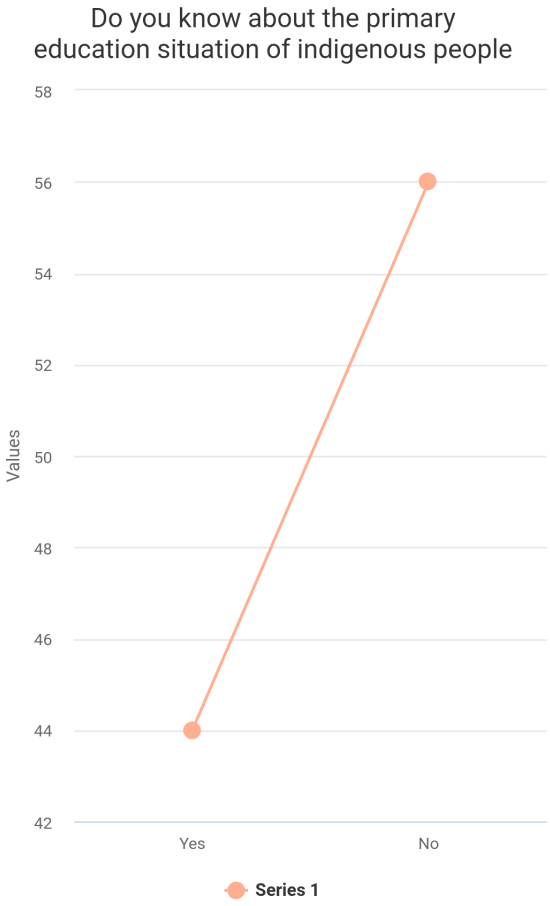


Figure 6.20: Do you know about the primary education situation of indigenous people?

When asked if modern technology will be useful for indigenous primary education one interviewee stated
"I have encountered many indigenous people from all walks of life. some of them were highly educated but not many. After interacting with them I get to know many of them pursued primary education outside of their home area. For this, they do not have much knowledge about their tradition and language. An education system that preserves their tradition and language can prevent them from getting far away from their roots"

Focused Interview on Indigenous Students Around us

For this portion of the interview, we tried to look for students that are indigenous but managed to come to a bigger institute in Dhaka, Bangladesh. Because of the Covid-19 pandemic situation, we could get hold of 16 students who came from an indigenous background and managed to come to the top educational institute of Dhaka, Bangladesh. We got to them through some.
When asked if they received their primary education in an indigenous primary school. 12(75%) of them responded positively and 4(25%) of them responded negatively. Among the positive responses, there were 7(43.75%) responses where they moved during their primary education period to a general primary school.

When asked if they think enough people are getting primary education among indigenous tribes all of them (100%) responded negatively.
We asked the 7 students who moved to a general primary school from an indigenous primary school which was better in their opinion. All 7(100%) of them deemed the general primary school as the better one.
We asked all 16 students what indigenous primary education lacks? 6(37.5%) of them said not enough teaching materials. 8(50%) of them said not enough trained teachers. 2(12.5%) said lack of technological infrastructures.

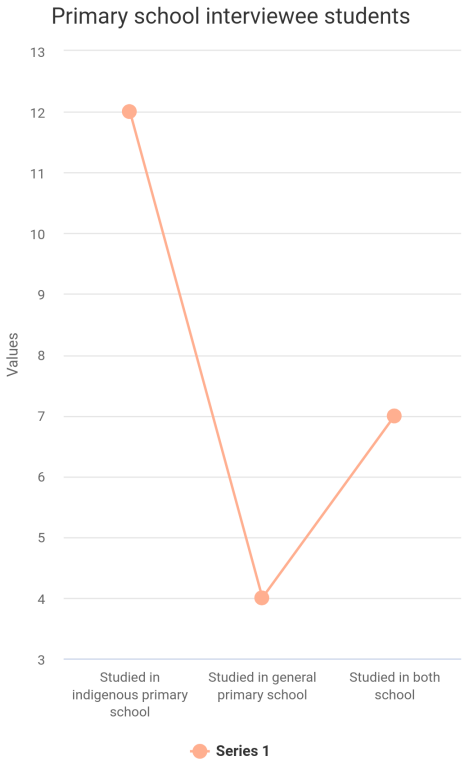


Figure 6.21: Primary school of interviewee students

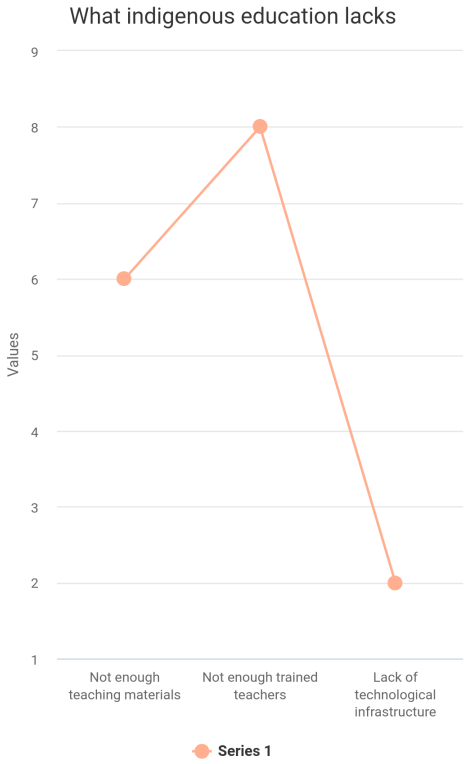


Figure 6.22: What indigenous education lacks

We asked the students some technology-based questions. We asked them if a system was to be developed to try and develop primary education 9(56.25%) of them replied a website. The remaining 7(43.75%) replied to a mobile application.
We asked the students about the technological infrastructure in hilly areas where indigenous people reside. 8(50%) of the response was no good. When asked they replied mobile network reception is getting better day by day the till now there are some parts of the hilly area where a phone call is impossible let alone accessing the internet. Other replies of 8(50%) were mixed as some of them do not live in the hilly areas anymore. And some of them did not return to the isolated hilly areas for a long time.

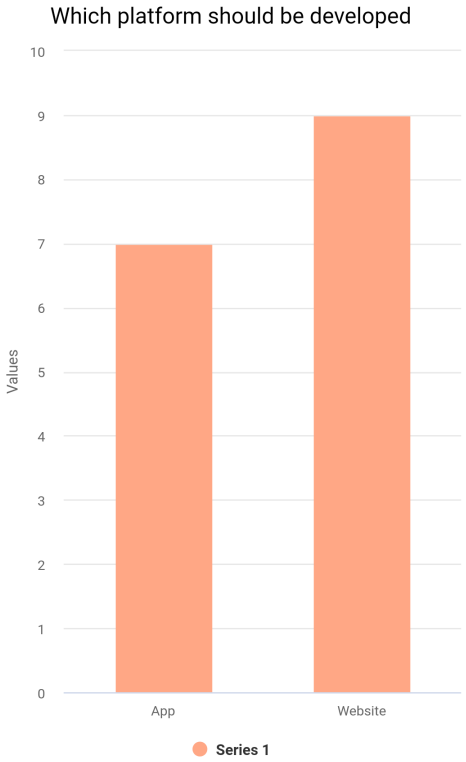


Figure 6.23: Which platform should be developed

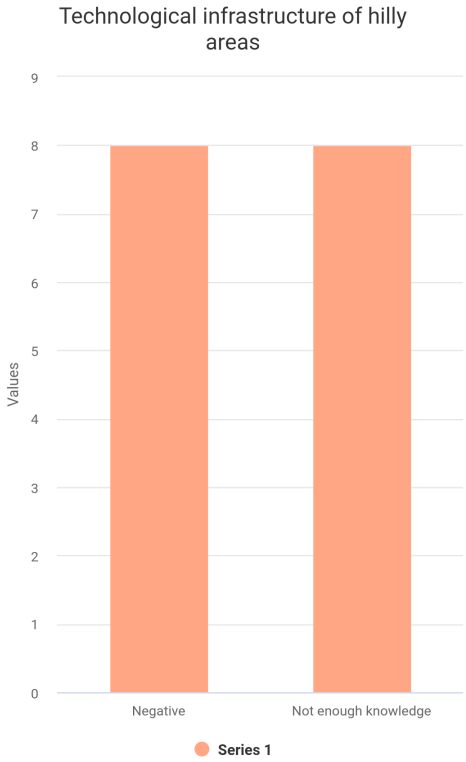


Figure 6.24: Technological infrastructure of hilly areas

Based on a previous question we asked the 7 students who said they studied in an indigenous primary school and then transferred to a general primary school about the problem they faced immediately after the transfer. 4(57.14%) students said they faced problems regarding language. 2(28.57%) students said the gap in quality of education was the problem for them. They needed much more time than general students to take in new education materials. 1(14.29%) student said they faced problem regarding racism.
we explained the 4 design principles we are trying to implement to all 16 students and asked them if a UI is to be designed what principle they will be looking for in that design.
5(32.25%) of them replied Simplicity, 4(25%) of them replied Aesthetics, 4(25%) of them replied Flexibility and 3(18.75%) of them replied Directness.

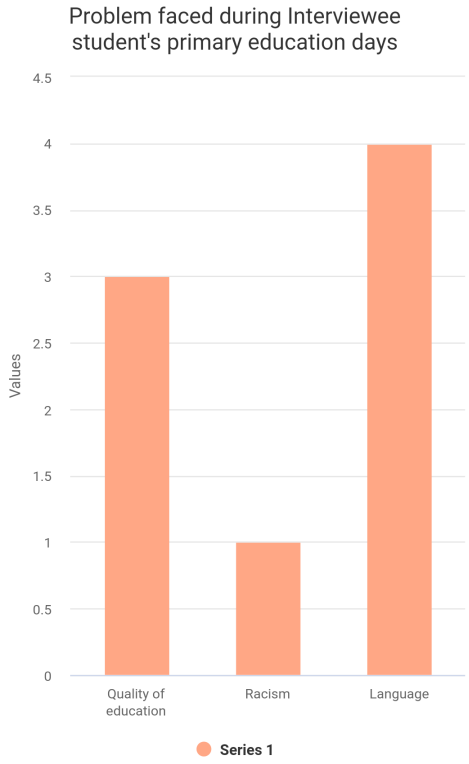


Figure 6.25: Problems faced during interviewee student's Primary education days

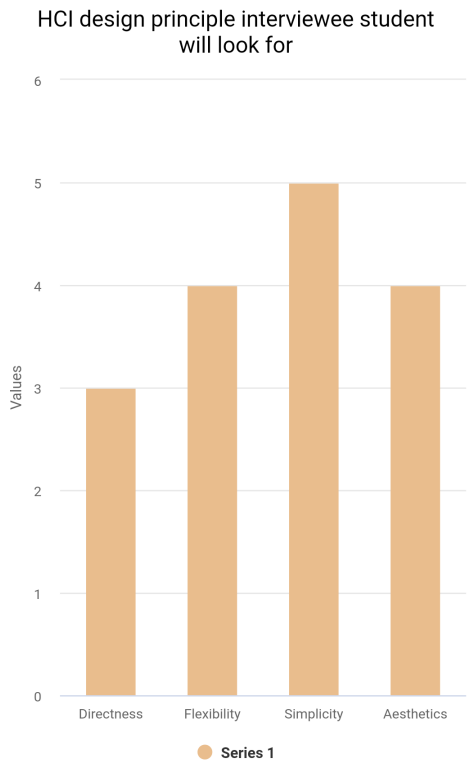


Figure 6.26: HCI design principle interviewee student will look for

Focused interview on Primary school teacher

When we asked the teachers about their experience as a primary school teachers about 60% of them replied that the experience is not that good also not that bad. They enjoy their job as a primary teacher also they face different problems. Around 33.3% of them were satisfied as a primary school teacher but astonishingly around 6.7% told that it is a bad experience for them.
All of the teachers(100%) agreed to the fact that primary education is very important for a student to succeed in their life. Without it, the base of the student life, as well as social life, does not solidify.
Technology plays a vital role in education nowadays. Primary school teachers also believe it. But when we asked the teachers about their knowledge and experience with technology, we got a diverse range of answers. Only 1(6.7%) out of 15 teachers we interviewed told that he had very good technical knowledge. 3(20%) teachers replied that they know about technology but rarely use it as their idea of knowledge is not that deep. Astonishingly, about 10(66.7%) teachers replied that their technical knowledge is not so good. Among them, 7 said that they have very poor knowledge about technology. But due to the covid situation, they are trying to get accustomed with the technological knowledge.

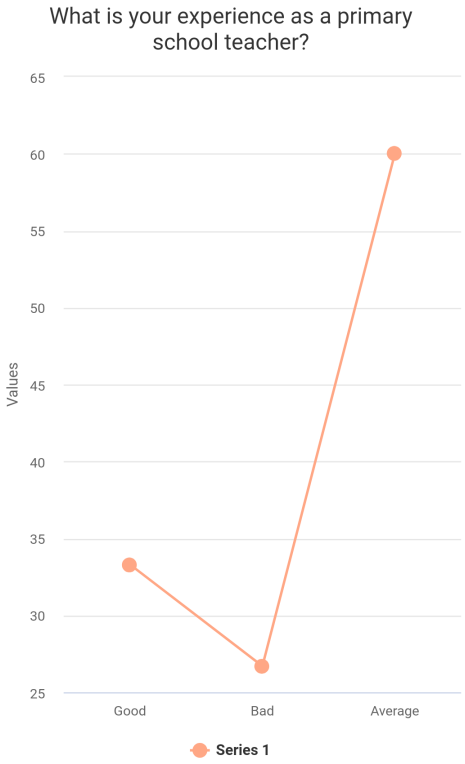


Figure 6.27: Experience of Primary school teachers

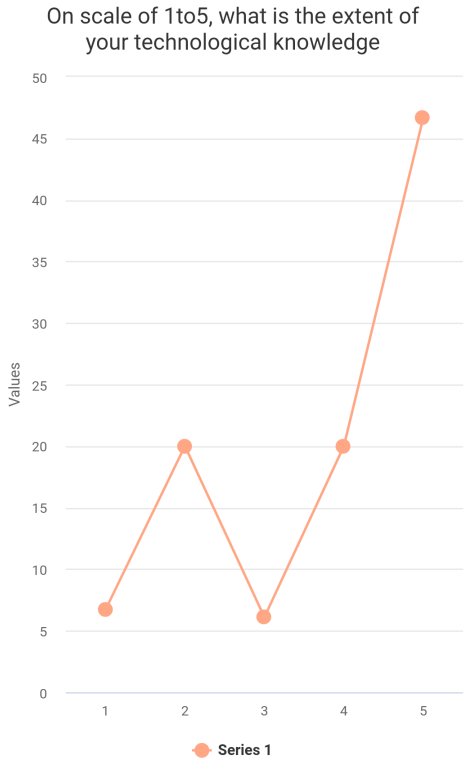


Figure 6.28: Technological expertise of primary school teachers

Regarding indigenous primary education, the teachers were very straightforward with their answers. While 9(64.3%) among 15 teachers agreed it to be very poor in structure, 2(14.3%) of them even said it to be very good for their encounter with indigenous students of secondary level.
When we were talking about their encounter with indigenous students, almost 93.3% of primary teachers agreed that they met with students from an indigenous background. Only 6.7% of them did not encounter any.

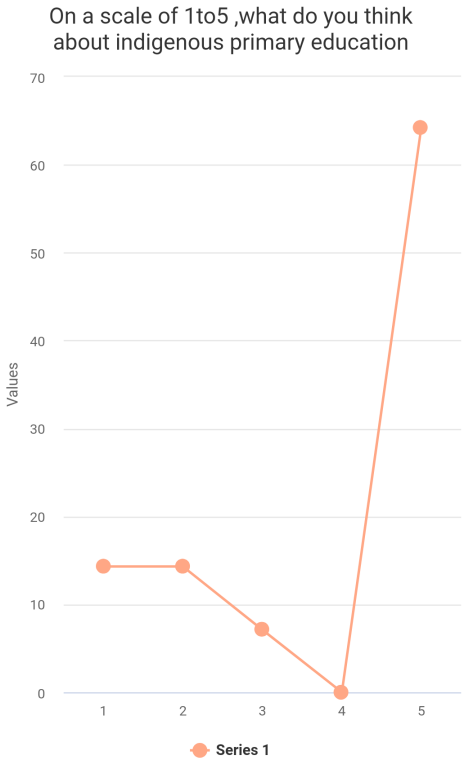


Figure 6.29: Quality of indigenous education

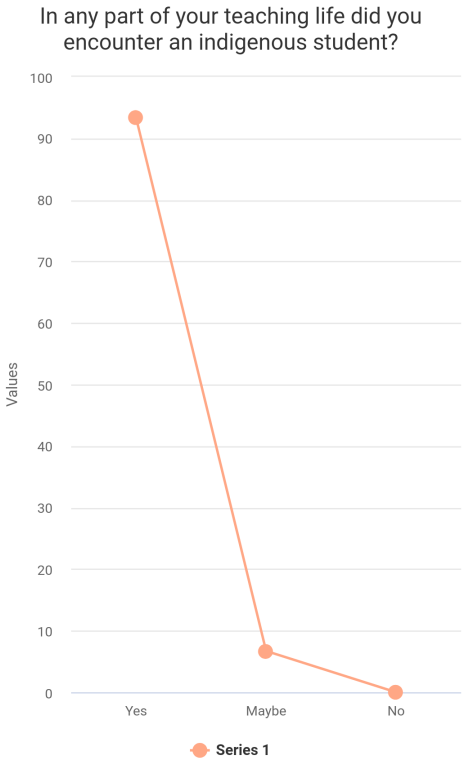


Figure 6.30: Encounter with indigenous student

The primary teachers who encountered indigenous students all focused on some problems the students faced during their primary school stage. About 12(80%) of them reported bullying, 8(53.3%) reported the students faced problems while understanding the concepts, 7(46.7%) said that language was a great barrier for the indigenous students understanding and communication, 8(53.3%) told that they suffered from loneliness as they could not make friends with others frequently and 10(66.7%) reported that the indigenous students were scared to communicate about their problems and clear their doubts with teachers as well as their peers.
We discussed with them about our project IPE and elaborated our idea to them. Everyone liked our idea of how we wanted to engage with the indigenous students of the primary level. We asked for their feedback regarding IPE and what they will look for within the system. About 66.7% of the teachers wanted simplicity within the system, other 13.3% wanted flexibility and aesthetics and 6.7% wanted directness of the system to be incorporated.

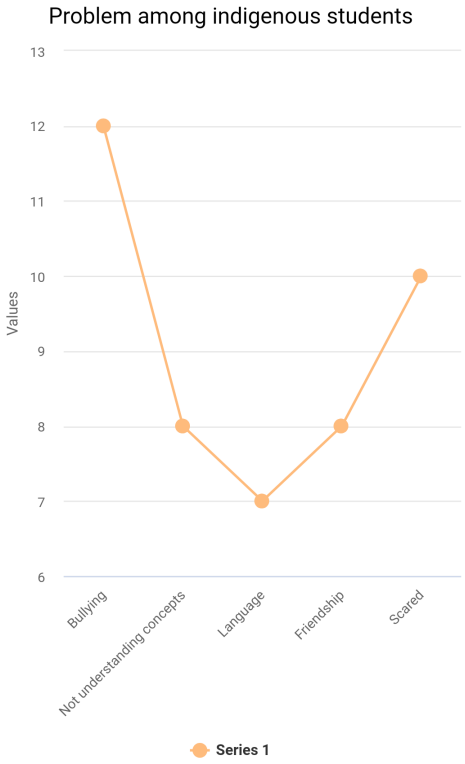


Figure 6.31: Problems among indigenous students

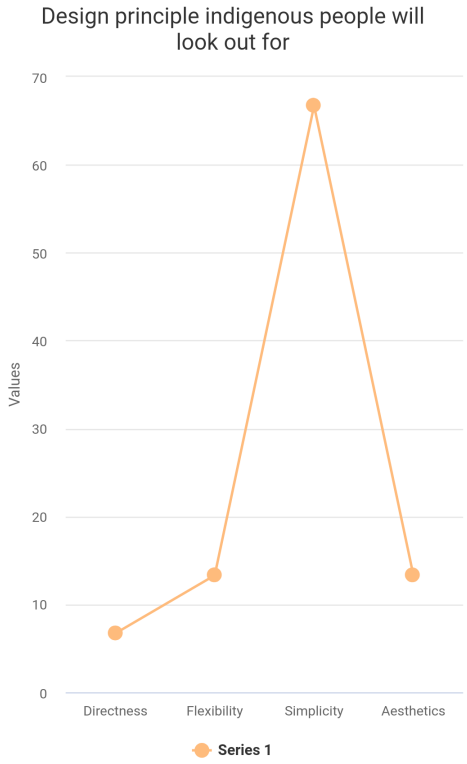


Figure 6.32: Design principle indigenous people will look out for

Interviewing tourists

Among the tourist group, we interviewed 41.2% of people who visit the hill tracks regularly that is once every week. 29.4% visit once in months and the remaining 29.4% visit once in every year.
While traveling in the hill tracts, an encounter with indigenous people is a very common matter. In this regard, about 82.4% of them agreed that they have met with indigenous people and communicated within them and the remaining 17.6% of them were unsure of it.

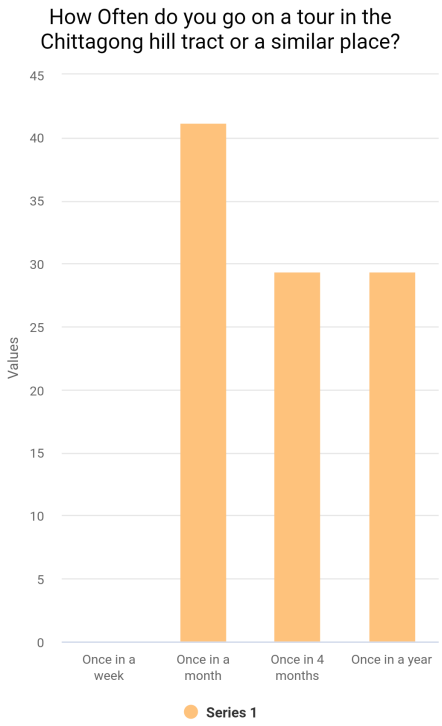


Figure 6.33: Tourist visits in hilly areas

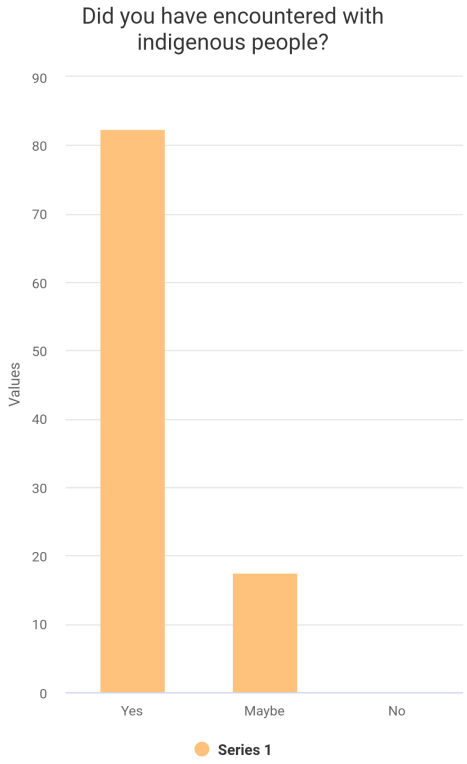


Figure 6.34: Meeting indigenous tribes

Within the hill tracts, it is very rare to see government primary schools. Many of the schools are tin sheds and few of the senior tribe members teach the minors. Only 23.5% of the people saw primary schools during their visit but a large portion of people which is 41.2% did not even see a school. 35.5% of people were unsure of the event as it is very difficult to spot these schools.
Every one of the tourist groups who saw schools agreed to the fact that the schools were not frequently seen within the hilly areas. Moreover, the schools are in very distant places.
Talking about the primary students of the indigenous tribe, 88.2% of the people saw indigenous children who were at the age of gaining primary education but very few were getting quality education according to them. The remaining 11.8% of them were not sure that the children they met were of the age of primary education or even more minor.

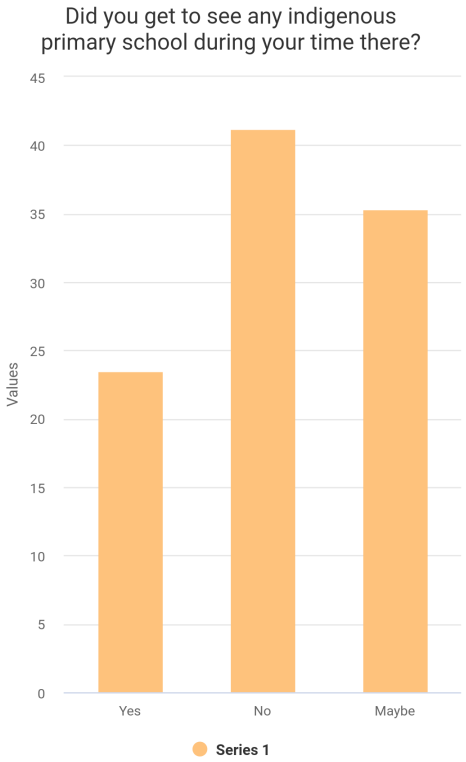


Figure 6.35: Saw indigenous primary school

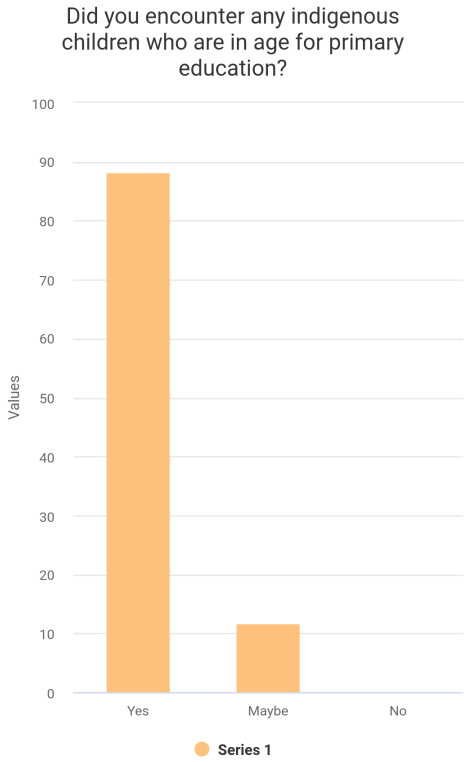


Figure 6.36: Encountering indigenous children

About the communication, the tourists focused on the fact that if the children knew Bengali to some extent but it was not that fluent. 47.1% of them said the children they encountered knew how to talk in a common tongue but were not comfortable using it. 23.5% of them encountered some children who did not even know about the common tongue. Other 29.4% encountered children who might know common tongue but did not want to communicate.
Regarding the technological infrastructure, all of them focused on the fact that the technology in those hilly areas is very bad. 14(82.4%) of them among 17 people said that the technological infrastructure is very poor in those areas. Networks are even worse. The remaining 3(17.6%) said that some areas have networks but those are not up to the mark.

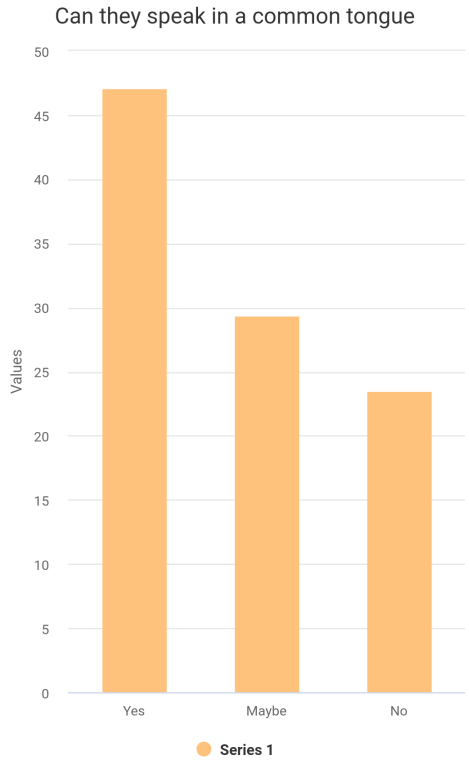


Figure 6.37: Regarding common tongue

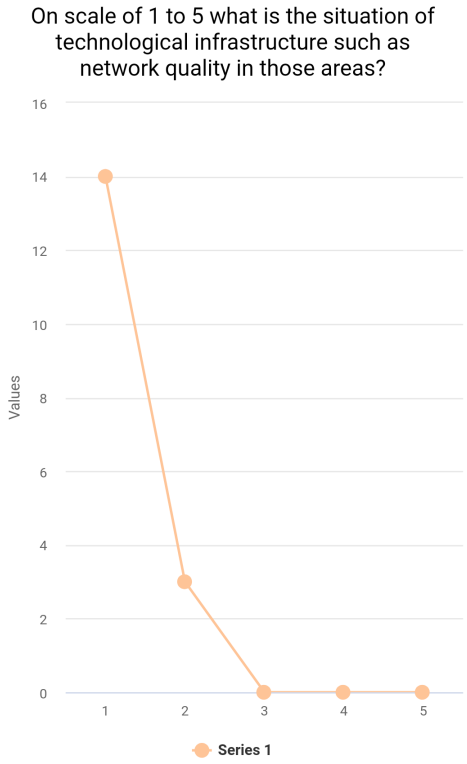


Figure 6.38: Regarding technological infrastructure

We explained our idea to them about IPE and all of them liked the system very much. They even shared some of their valuable feed backs with them. About 70.6% of them asked us to focus on the simplicity of the system, 17.6% said they want the system to be flexible. The remaining 5.9% told that directness should be a factor that would be good and others told to focus on aesthetics.

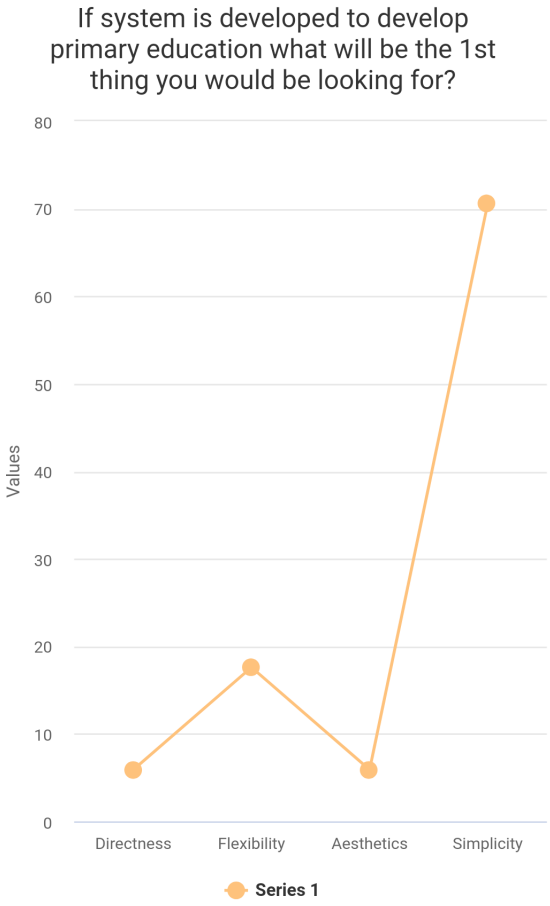


Figure 6.39: Regarding design principle

6.2.2 Technical Survey

General People

The general people around the area are a key factor in our goal for providing educational contents. We have talked with 11 people around the area and want to learn about their perspective regarding the matter. They all were very much helpful and gave some very encouraging answers. The survey analysis states as below,
The general people we asked questions regarding technological aspects around the area beside schools and households of the students, about 27.3%(3) were tourist guides, 27.3%(3) were farmers or day labourers, 18.2%(2) were drivers, 18.2%(2) were shop employee and 9.1%(1) was restaurant employee by their work.
When they were asked about smartphones, we were surprised to see that 8 people out of 11 uses smartphone which is 72.7%. Rest 27.3% (3) did not use smartphone but have phones of their own or at least 1 member in their family has a smartphone.

‘ It was quite astonishing to see that around 45.5% (5) people said that they are

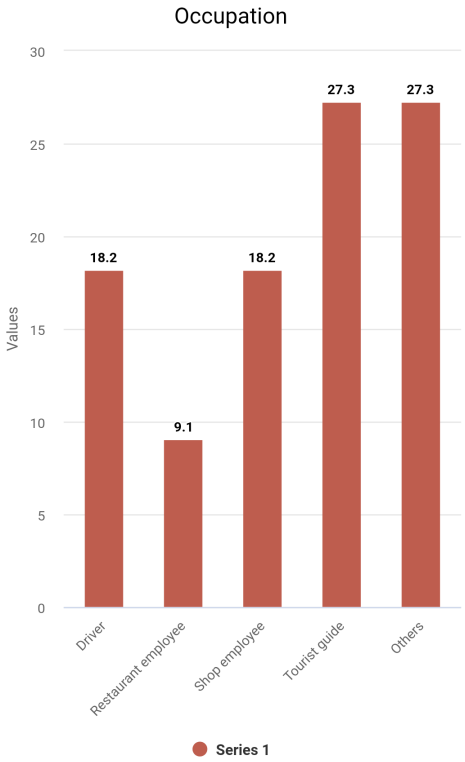


Figure 6.40: Occupation?

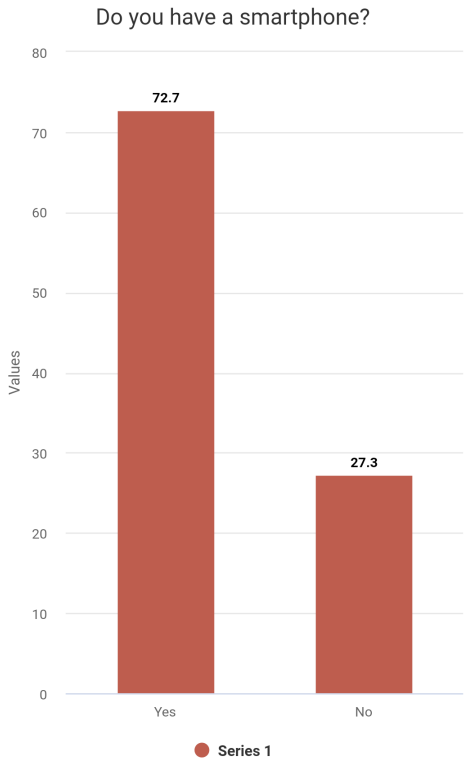


Figure 6.41: Do you have a smartphone?

either good or very good with their smartphone’s usage. They know how to handle their phones. 27.3%(3) people says they have average knowledge and the rest 27.3%(3) people have either bad or very bad understanding about smartphones. While we were talking about internet, they were very much excited to tell us about their experience using internet. About 36.4% (4) people said they have either good or very good knowledge regarding internet and how to use it. 27.3% (3) people say they have zero understanding regarding internet whilst 36.4% (4) people say their knowledge is average about internet.

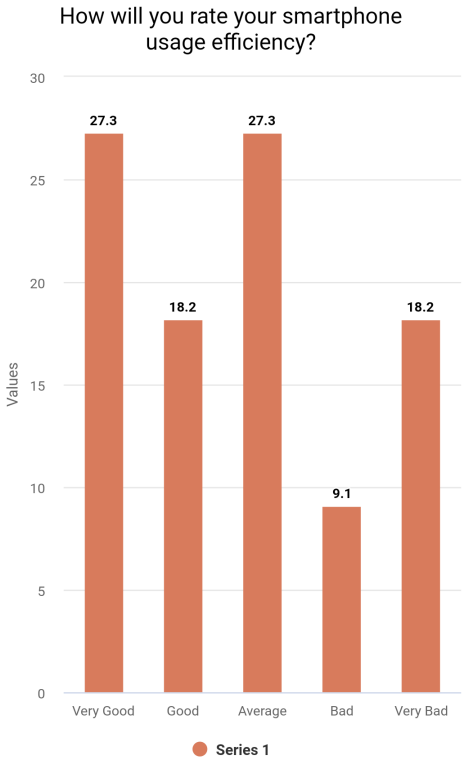


Figure 6.42: How will you rate your smartphone usage efficiency?

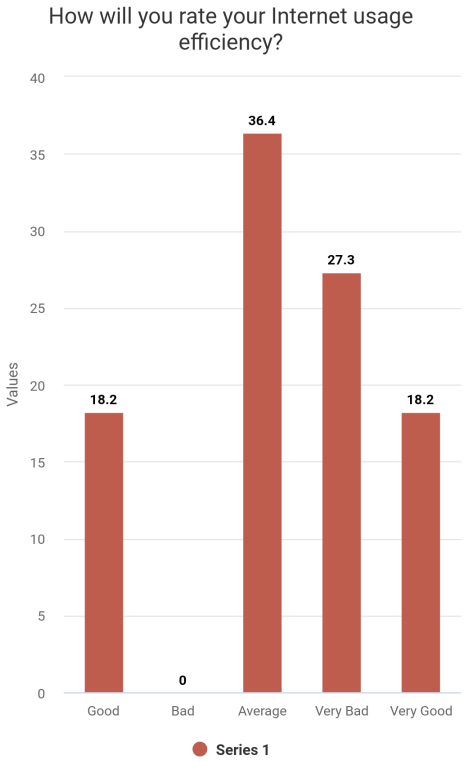


Figure 6.43: How will you rate your internet usage efficiency??

It is quite remarkable that, when we asked them about network and internet facilities around the are almost all of them agreed that this facility is already existing quite well. Around 54.5% (6) people says the facility is good whilst 45.5% (5) says it is average. But they all are aware of this facility.
Asking about the network providers, they all said that Grameenphone and Banglalink are totally having zero network coverage around the area. 100% (11) of them says that they use Robi as their number one network and it is also pretty fast regarding speed.

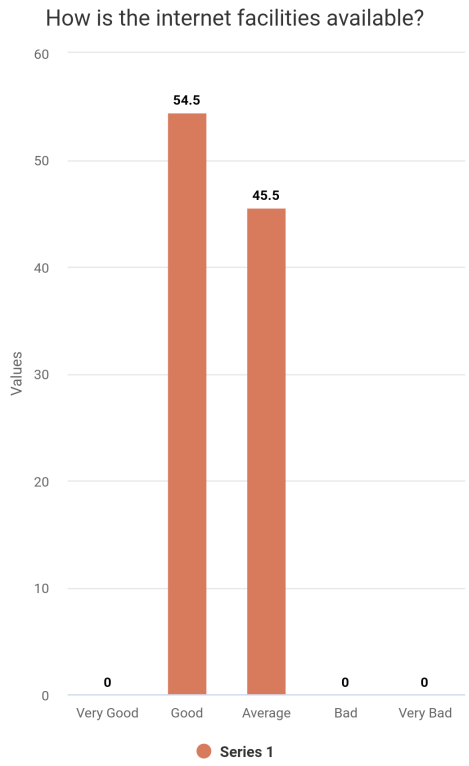


Figure 6.44: How is the internet facilities available?

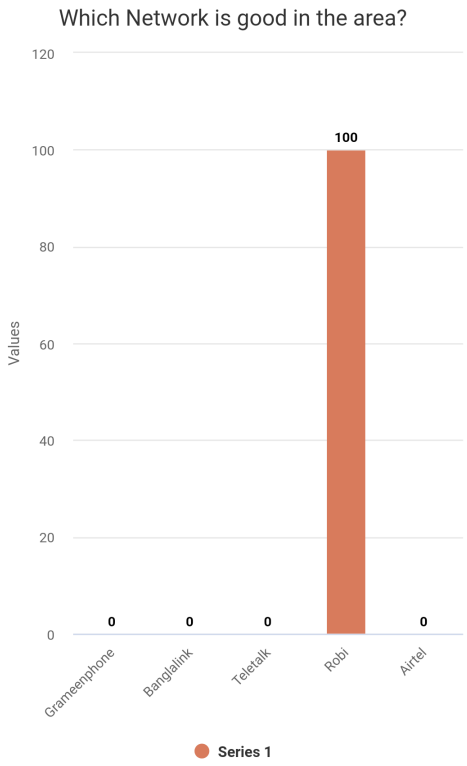


Figure 6.45: Which network is good in these area?

It is great to see the bonding of the people residing there. They try to help each other in every difficulty they face. Questioning them about students asking for their help regarding internet using, more than half the people, that is, 72.7% (8) of them said they will love to help the students and the remaining 27.3% (3) people said if they have a smartphone they would have helped.
When asked if they will help us with the testing if we come again with our proposed system or website all of them (100%) agreed.

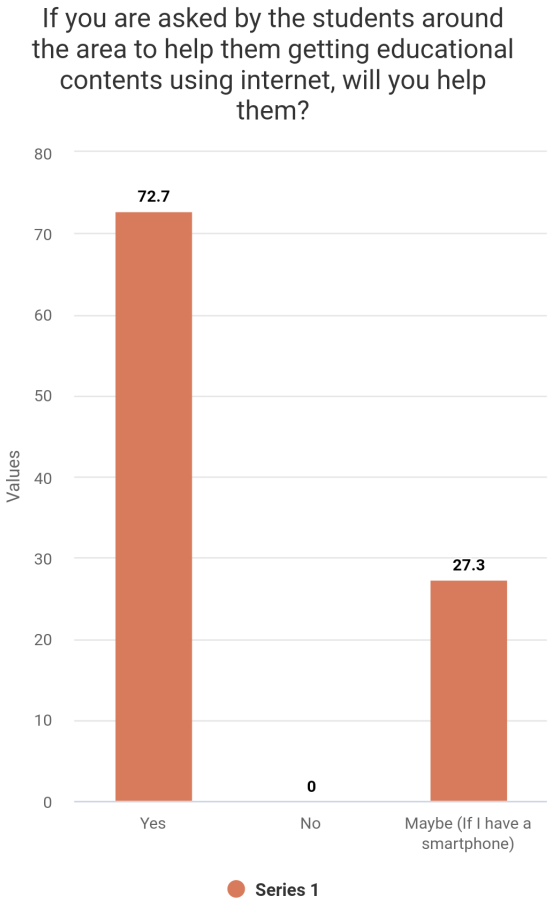


Figure 6.46: Will you help if asked to help access educational contents?

Teachers of Indigenous Primary school

Our next target group is the teachers teaching the indigenous students in the hilly areas. Talking with them we are trying to figure out whether they will be able to help us in our goal or not. We questioned 8 teachers of 2 schools and got some very encouraging answers. The survey analysis states as follows,
Asking about whether they have a smartphone or not we have got a 50% (4) each yes or no answer. They are pretty much happy with what they are using and in terms of any need, they use their colleagues' phone.
When we wanted to know about their smartphone usage, 50% (4) of the people said that they do not have any idea how to use a smartphone. It is very much justified as they do not have a smartphone. On the other hand, 12.5% (1) people says they have either very good or average understanding about smartphones whilst rest 25% (2) say they have good knowledge about usage of smartphone.

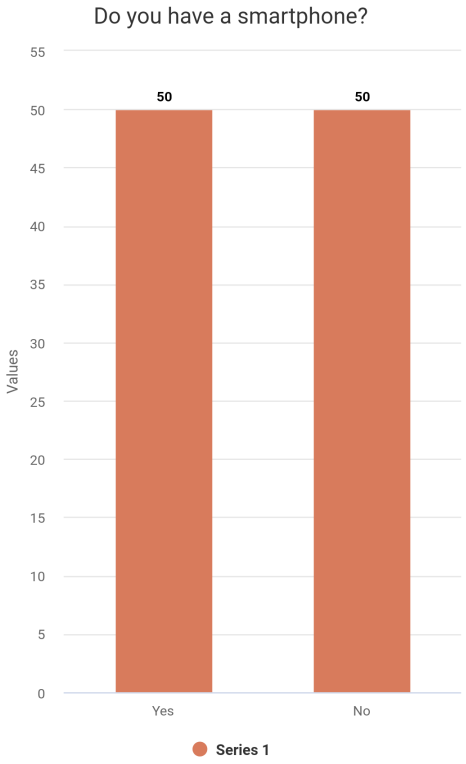


Figure 6.47: Do you have a smartphone?

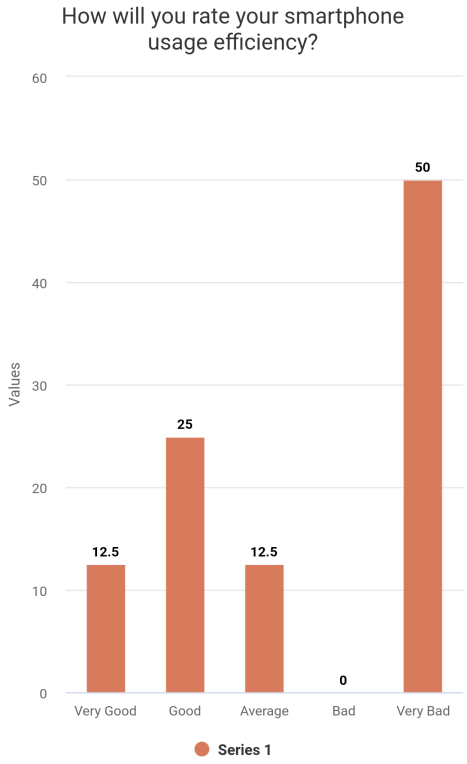


Figure 6.48: How will you rate your smartphone usage efficiency?

Talking with the teachers we have got to understand that the students have a fear of not understanding everything as they are forced to learn new language apart from their own mother tongue for study. Which was hampering their study and the students are dropping out. All the teachers, 100% (8) of them agreed to the fact that if contents in their own native language be provided to the students, it will really help them to learn and understand their study better.
While talking about the internet, as expected 50% (4) teachers says their knowledge is very bad about using internet. 12.5% (1) people says either they have average or very good understanding regarding internet and 25% (2) says they are good with internet usage. Also, they use this internet learning different contents of education and try to provide better study to the students.

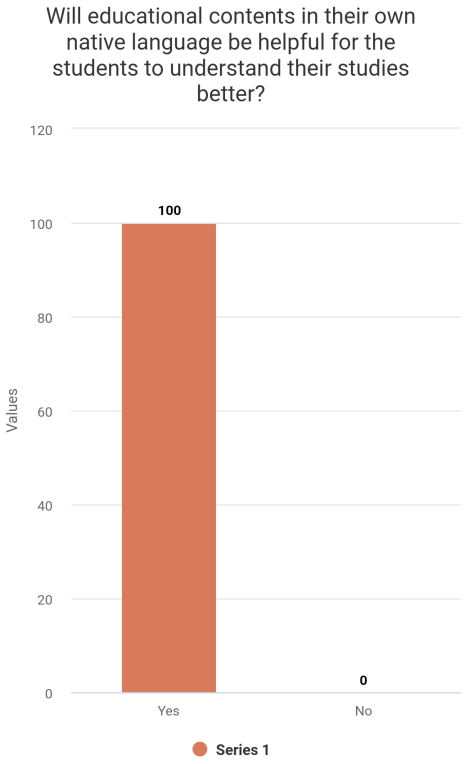


Figure 6.49: Will educational content in their native language be helpful for the indigenous students?

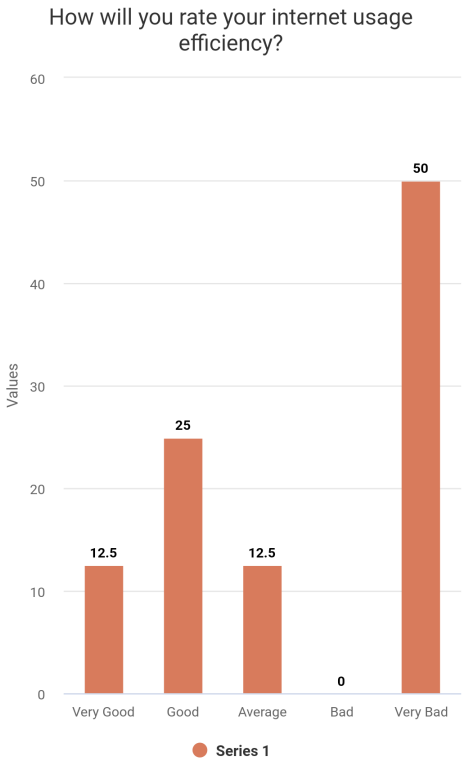


Figure 6.50: How will you rate your internet usage efficiency?

Standing at a point where the teachers are asked if they will help their students with educational contents in their own native language available across internet, all of them are very excited and are very keen to help their students as all of them agree to the fact that it will be very much helpful for their students. 50% (4) of the teachers says they will definitely try to help the students and provide them the contents and the rest 50% (4) says that if they had a smartphone they would have helped. But they will try to help the students by other means.
When asked if they will help us improving our system when developed all of them (100%) joyfully agreed.

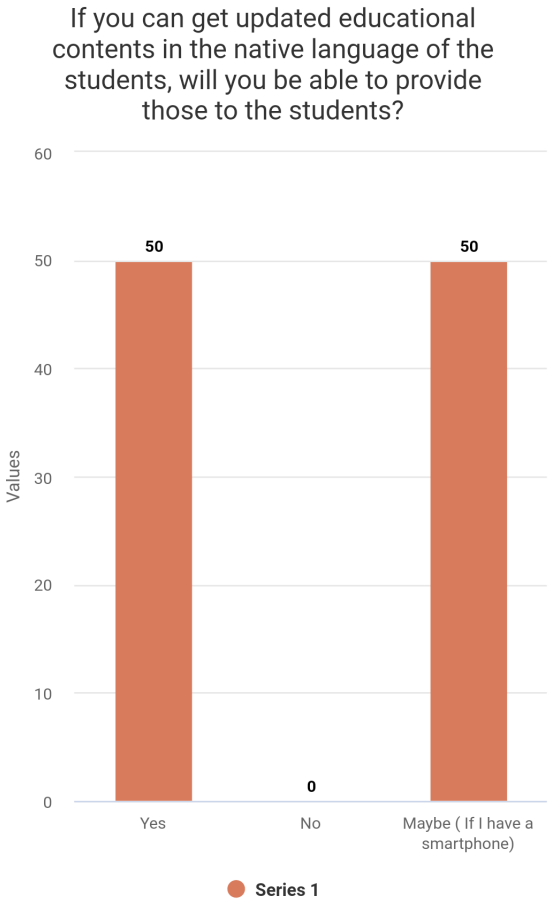


Figure 6.51: If you can get updated educational contents in the native language of the students will you be able to provide those to the students?

Chapter 7

IPE: Indigenous Pre-Primary Education

After completing the 1st set of interviews, we thought of developing some platform to help us our cause of helping indigenous pre-primary education. We then asked all our interviewees who have some knowledge about technological advancement which platform we should develop. As the most common platform for raising awareness and spreading knowledge is a mobile application and a website, we got these two suggestions only. We chose a website to be designed as it got a slightly bigger portion of the vote. We named our website IPE(Indigenous Pre-Primary education). But while creating a website the most important part is designing the interface and the simplicity of it. We have tried to follow the design principles we have talked about earlier that is, Simplicity, Directness, Flexibility and Aesthetics.

7.1 Tools

For designing the website, we used a very famous software. That is,

- Webstorm

7.2 Elaboration

7.2.1 Homepage

Anyone entering our website will directly enter the homepage where they will be asked about in which language, they want the contents. For simplicity of understanding, we have kept the design pretty simple and straight forward query so that no one gets lost entering the homepage. The user will have 3 languages to choose from.

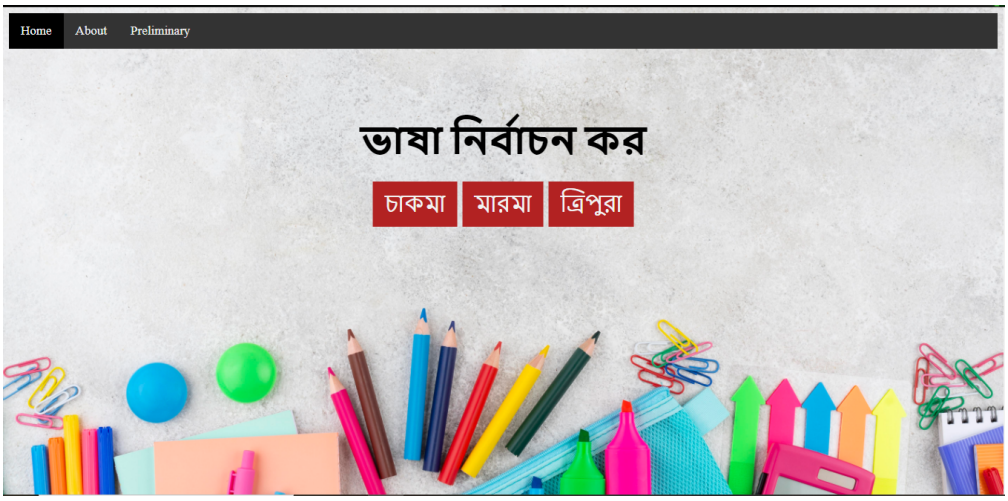


Figure 7.1: Homepage of IPE

Upon choosing in which language, they want the contents; they will be directed to the next page where they will be asked about which class they want to access. From Class 1 to Class 5 they will have 5 options to choose from. Choosing any of the class it will take them to next page.

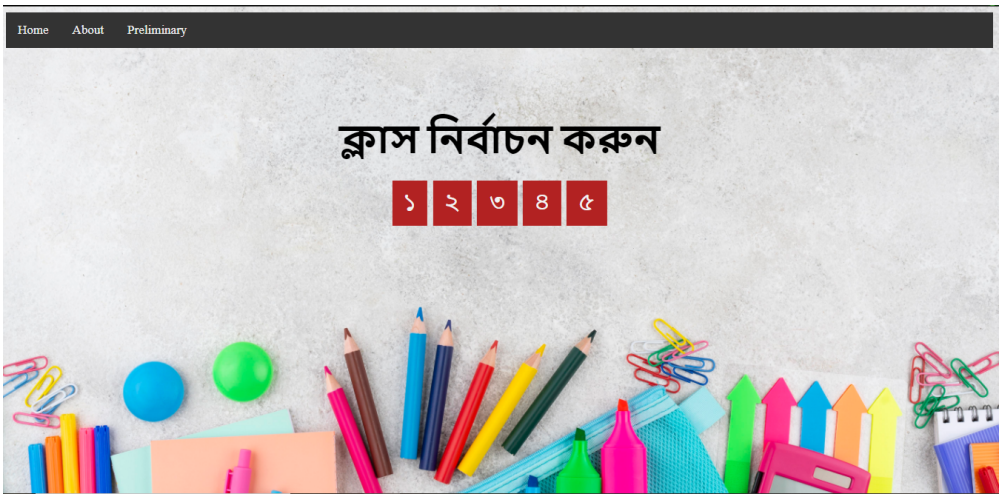


Figure 7.2: Class Selection page

Entering the next page, they will be given the option to choose content of which subject they are looking for. The main 3 subjects will be there where they need to choose from those 3 subjects.

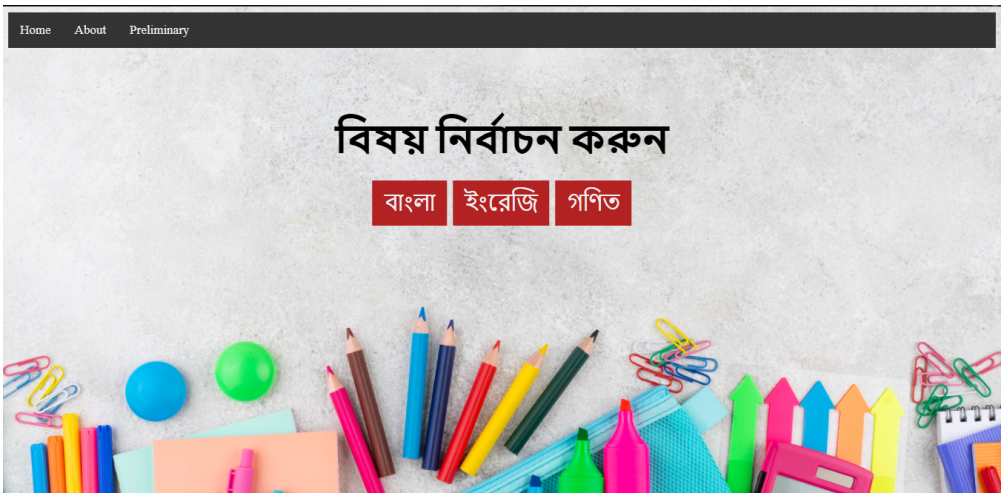


Figure 7.3: Subject Selection page

Upon selection of any subject, they will be directed to a new page where they will have a pretty clear instruction and link of the pdf file of the subject they are looking for. As simple as it is, they will get the file and can learn their lessons from the files.

Figure 7.4: Sample contents for each class

7.2.2 About

This page opens a very generalized message towards every viewer about the motivation behind the creation of this website and what this website contains. In simple words the total summary of the website is written in this page and what to expect from it.

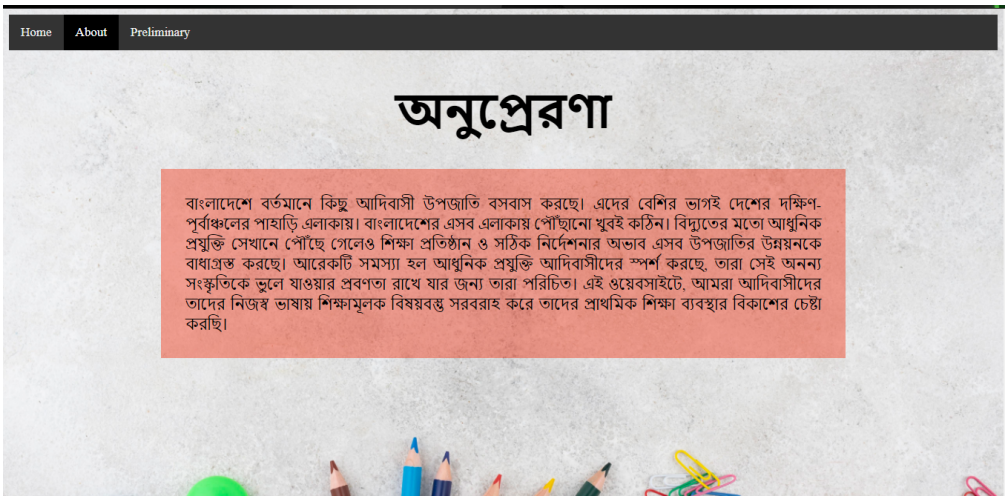
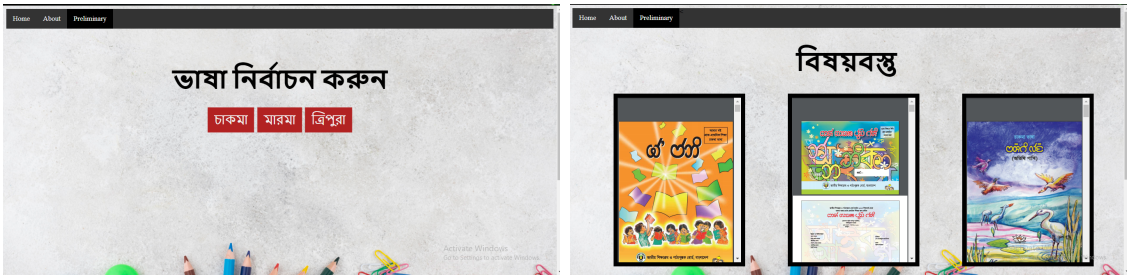


Figure 7.5: About page of IPE

7.2.3 Preliminary

This page contains the very preliminary aspects of the education that is, alphabets, numbers, how to write, different stories and other things which are the basic tools for proper understanding and learning of any language. Also, it will have proper materials which will help them to be able to learn writing in their own native language.



(a) Language selection page for preliminaries (b) preliminary contents per language

Figure 7.6: Preliminaries

Chapter 8

Testing & Feedback for Further Improvement

Due to a big time and resource constraint we were unable to reach vast amount of targeted people as we 1st intended. Among all the adversaries we were able to take our system or website and test it hand to hand with 8 general indigenous people and 4 indigenous primary teachers. Before the testing we had to make sure we go back to the interviewees of the technical survey part. But we could not get to use all of them for the testing as some of them had no knowledge about smartphone or internet. We got 4 indigenous teacher and 8 general indigenous people (N= 4+8 =12) in total 12 people to test our website.

8.1 Testing with Indigenous Primary Teacher

During our small scale hand testing we got back to our previously interviewed teachers. We could not test the website with 4 of them as they don't know much about smartphone and internet. The remaining 4 tested our website joyfully.
The teachers tested our system thoroughly and pointed out some short comings.

8.1.1 Adding more written contents

"Even though the contents provided in the website will be very useful there are some indigenous language contents available in the internet.But even more are available as books which was not yet converted to pdf and published in the internet. Find a solution for that problem and implement those contents here" One teacher said.
Other teacher more or less pointed out the same things. One teacher even showed us some of those book and pointed out where we can get them.

8.1.2 Adding video contents

We were instructed to add some video contents in our websites. *"Recently when visiting a teachers training center I saw video contents playing and people learning from them. I want something like that to implement in this website"* One teacher said.
We then informed them about the lack of video contents dedicated for the indigenous

languages. They understood the problem and encouraged us to try and create some of our own contents.

8.2 Testing with Indigenous General Peoples

After testing with the teachers we looked for the previously interviewed indigenous general people. We choose 8 for this testing we because we knew they had a smartphone of their own and have some technical knowledge.
After testing thoroughly they gave us their pointers,

8.2.1 Converting this system to a light weight system

Upon seeing the webpage was having hard time loading always fluctuating network condition some people asked us if it is possible to make the webpage light weight. One tester said, *"Can it be lighter but more nice looking. The network here is not good for many high weight website"* Another tester said, *"We are too poor to buy expensive high speed data packs. So make it less data consuming"*

8.2.2 Make a lightweight offline mobile application

Some tester pointed out that constantly connecting to the internet is not easy in those part of the country. So a offline application should be developed which will provide our contents when remaining offline from the internet.
"A application which will be small in size which we will have to download once to access the said contents will be great. There should also be option to download further contents when needed", one tester said.

8.3 Feedback

When testing the system with the teachers and general people we received much appreciation form them to trying a new and unique thing for the education of indigenous people.
"This will help more educated people come out from these type of places eventually",one teacher said.
They also praised our focus on maintaining the cultural integrity. *"I hope more privileged people will come to work for the betterment of these underprivileged indigenous peoples in the future. It will be good for the indigenous community and Bangladesh as a whole"*, one person said.

Chapter 9

Discussion

One of the most important works was to analyze the data found from interviews and surveys. However, before jumping into the findings, our significant barrier was finding answers to our research questions and the difficulties we faced. Compiling all of this together, we found the answers to our research questions and found some limitations. We tried to work on these limitations as they would have become a significant barrier on the path of our goal.

9.1 Success

One of the essential parts is that we answered our research questions. Our primary focus was how we could reach our goal. We tried to get the answers of it from the surveys and literature reviews. The answers which we got are:

- **RQ1:How can HCI be implemented to create a simple website to develop Pre-Primary education of indigenous people of Bangladesh through other technological advancements?**
  HCI research is all about the human perspective of it. Surveys and interviews can help collect data from people. Different design principles can be implemented based on these opinions to create a website and improve it gradually. Collecting user experience and improving the existing website is one of the key aspects of simple website. If a huge amount of data can be collected from the users, then a successful website can be created and integrating other technological advancements like video content creation, interactive tablet computer etc. can be used to develop a fully functioning system that can impact indigenous pre-primary education in a good way. This impact will be huge in terms of the revolution of indigenous primary education. The students will be able to learn in their own native language which will be a boost for them in terms of learning. Also, it will help them in the long run and the drop out rate due to language barrier can be minimized.
- **RQ2:How can people from different means of life be of help to develop the primary education of indigenous people?**
  People are the central part of HCI research. When surveying the concerned

portion of the people is near impossible. We had to look for people from different paths of life. The interviews we conducted gave us many new ideas. The user experience we collected from indigenous teacher and general people was also helpful for perfecting the web interface of the web site. New system idea was born from getting opinions. As the infrastructures are not as developed as town areas with some exceptions it is impossible to access 100% of the targeted people. Only through the people who have the knowledge of the mediums we are using can be helpful to deliver our message to the primary school students and their parents.

9.2 Limitations

It is very much possible to work for the betterment of indigenous primary education to become a great stepping stone for the success of the indigenous students. However, due to very little technological support in the hilly regions, apart from very few places that recently got under the radar of technology it is very hard to work smoothly. Even though internet have made it's way their, many carriers have yet to establish a strong infrastructure. Many people are yet to know about smartphone let alone a computer. So it is only possible to access the target people through peoples who have access to the internet and the devices that access them. These people are essentially the indigenous primary teachers, knowledgeable indigenous general peoples, tourists, and the current indigenous students who are studying in universities and are getting modern education. These people are the critical factor for the fulfillment of our goal. They will be the bearer of the torch towards the indigenous people who are still in the darkness. Through their support and the government's initiative, we think it is very much possible to build a better primary education for indigenous children.

Chapter 10

Future Work

Future work of this thesis can be:

- Collecting more user experience to develop 2nd, 3rd iteration and so on of the website.
- Observing how the website works to achieve the goal of developing primary indigenous education.
- Implementing many other design principles of HCI to the website to improve the system.
- Developing a mobile app for easier access to provided contents.
- Deploying our system or website to the vast targeted people to know their interaction with the system.
- In the future when technological infrastructure improves in the indigenous areas we can introduce the system directly to them and observe how it performs.
- We can also ask for help from different government and non-government organizations to broaden our area of research significantly.
- Implementation of such a system so that tourists can learn about indigenous culture while they want to visit the hill tracts. It will keep the vibrant indigenous culture alive and spread it so that more people can come forward for these people's educational well-being.

Chapter 11

Conclusion

To conclude this thesis, we can say that even though research through Human-Computer Interaction is challenging and time-consuming, it can be beneficial while developing systems for a specific user group. Nowadays, many educational and interactive systems have been developed using HCI. It has become one of the most popular aspects of research development. User Experience design is also a massive part of HCI research. Through conducting surveys and interviews of people from different parts of life, we got valuable user experience used to create our website. This thesis also implements some HCI design principles based on users' preferences. As this type of research is very time, labour and resource consuming we were unable to get to a vast number of target peoples. The peoples we managed to interview helped us tremendously to create our desired system. There might be many types of HCI-based design related research that are available online, but not one of them is directly connected to the pre-primary education of indigenous peoples of Bangladesh who are in the backwards in terms of education. So, this research work is the starting point of a huge potential research field. And with much more time and resource it can be very beneficial for indigenous community and our country.

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