

# Evacuation of Students to Dining Hall/Dormitory and Construction of Walls to Separate Classes

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#### 4 Project Goals

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### **Abstract**

Global innovation students are a group of Stony Brook students trying to help the town of Ileret with any problems they have. This project addresses the issue of a collapsing corridor in the main school. Classrooms 3, 4, and 5 are incredibly unsafe and students need to immediately leave those rooms. After many ideas, this project proposes the creation of a barrier in the dormitory to split the building into two classrooms, and move classes 1, 2, and 3 there and move classes 4 and 5 to classrooms 1 and 2. On June 7<sup>th</sup>, this plan was implemented.

### **1. Introduction**

- 1.1 – **Program Description:** Global Innovation is a program started by the College of Engineering and Applied Sciences at Stony Brook University in which faculty and students are sent abroad to impoverished areas in other countries. The goal of the program is to identify problems and provide solutions, either theoretical or practical, to be implemented in order to benefit and improve the lives of the local people.
- 1.2 – **Location:** The current location of the program is in the town of Ileret, Kenya, near the Ileret facility of the Turkana Basin Institute. Located in the Turkana Basin area to the east of Lake Turkana, the availability of resources is limited, including basic needs such as food and water due to the arid environment and unpredictable rainfall.
- 1.3 - **Project Description:** This project is the immediate removal of students in the collapsing area of the school building and placing them in either the dining hall or boys dormitory, both of which are structurally sound. As this is only a temporary solution, the long term solution is to write letters to the Kenyan government asking them to construct a new building.

### **2. Existing Conditions**

- 2.1 - **Description of Facility:** There are three buildings used in this project; the dormitory, the dining hall, and the collapsing corridor.

The collapsing corridor, seen in appendix 1, pictures 1-7, is noticeably structurally unsound. It was made from concrete with large aggregates of sandstone. The cement separating these aggregates is greatly cracking. Large aggregates are crumbling out from the wall; there are very large cracks in the concrete going from the bottom of the wall to the top. The concentration of the largest cracks is outside classroom 5, shown in picture 1.

Classroom 5 is the most structurally unstable classroom. The column has a large chunk of cement missing (picture 2). The side of the classroom has rocks missing from the concrete (picture 4). The columns for classroom 4 and 5 are bowing outwards. The column for classroom 4 is shown in picture 3, and for classroom 5 picture 6. The columns for classroom 4 and 5 are cracking off the wall (picture 7). The columns do not support the ceiling weight at all. For classrooms 1, 2, and 3, the columns are still attached to the wall and are not bowing outwards. The largest cracks for classrooms 1 and 2 are at the bottom of the wall, as seen with picture 5.

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The dining hall is located to the left of the collapsing corridor. Its width is 22 ft 9 inches, and its length is 39 feet 8.5 inches. There is a 7.5 inch step going to a stage, occupying 9'3.5" of the total room. The kitchen is behind the hall, and there is a block of concrete out of a window connecting the eating area with the kitchen. There are 9 trusses, and the height from the floor to a truss is 9'4.5".

The dormitory is located right and behind the collapsing corridor. It has a length of 54'10" and width of 17'9", and 9 trusses. The height of the truss is 9'2.5" on one side, 9'1" on the other.

Both the dormitory and the dining hall are made from the same concrete, and the aggregate is finer than of the corridor. They are shown starting with picture 8.

- 2.2 – **Assessment of Existing Facilities/Services:** The corridor may collapse at any moment. It is imperative to move the students immediately out of classroom 4 and 5.

The dormitory has not been used or cleaned for a while. Mud wasp nests run along the wall, and there are many birds' nests on the trusses. There are wild cats that live in the building; the building has a distinctive bad scent. There are many metal bed frames, about 24. The back end of the dormitory, there is a shower room and another personal bedroom. The shower room has four showers and a faucet. There is a door located in the back of the shower room. There are three doors to the dormitory, one in the back of the shower room, one in the far end of the dorm and one in the front end of the dorm; both facing the same side towards the school.

The dining hall is made from the same material as the dormitory and is structurally sound. These two building will be used temporarily for new classrooms.

- 2.3 – **Other Considerations:** The dining room has 6 tables, each of the dimensions are 6'7" length, 3'10" width, and 2'5.75" height. The wood from these dining tables can be used in the making of a wall.

Classrooms 3, 4, and 5 need to be moved, but classrooms 1 and 2 are more structurally sound. The columns for those classrooms are not bowing and are still attached to the wall. If necessary, classroom 3 may still be used as a classroom, although it is dangerous.

For using the dining hall as a classroom, the students may receive food anytime during the waiting period for a new corridor, which would render the temporary classrooms in the dining hall unusable. Fortunately, the students did receive a shipment of food on June 6<sup>th</sup>. The dining hall will not be used as a classroom, nor will the dining tables be used for the wall.

### 3. **Basis of Design**

- 3.1. **Proposed Service:** Classes in classrooms 3, 4, and 5 will be evacuated to either the dining hall or dormitory, or both (classrooms 1 and 2 do not need to be evacuated as the left side of the building is still visually structurally stable). Grades 1 and 2 will be moved out of the school building and grades 4 and 5 will take their place. The new classrooms will then need to be partitioned, using the tables and benches in the dining hall as materials for the barriers/walls.

As of June 6, 2017, the school will be receiving food again, and so the dining hall is no longer available as a potential area to place the students. The dormitory is the only space that can now be utilized. As such, two walls will need to be built to accommodate for three classrooms. Due to the limited space, the third classroom may have to stay operational, but the attempt will be made to optimize space to allow for all three classes to be evacuated from the critical areas.

However, it seems that the school has decided to combine two classes into one, and so there will only need to be one wall in the dormitory to accommodate for two classrooms. As originally planned, all three classes will be evacuated out of the critical area. Two will be moved to the boy's dormitory and the third to wherever the school designates as appropriate. One wall will be constructed within the dormitory out of materials provided by The Tukana Basin Institute to separate the two classes. The frame will be cut and welded on site.

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materials provided by The Rakana Dashu Institute to separate the two classes. The frame will be cut and welded on site.

- 3.2 **Technical Background:** The walls are not meant to be load bearing, and as such, they will only need to be able to support their own weight and potential external forces acting on it (children hitting/bumping into it, etc.). The frame/studs will be designed to be able to do both. Between where each piece of wood meets another, there will be angle (L) beams to provide support and stability. There will also be vertical angle beams that will act as studs to provide lateral support. The studs will have metal plates welded to each end, which will then be secured to the trusses and to the ground with concrete screws or bolts and either epoxy or adhesive cement. Two bolts will be used for the trusses and four for the ground. Given the available materials (see Appendix A1), it would be most efficient to have each wall in the dining hall be 16 feet 5 inches long, 7 feet 8 inches at the highest point, 6 feet 7 inches in the middle and 5 feet 7 inches at the end. This allows for a 6 feet 4 inch gap to allow the children to navigate to their classrooms through since there is only one entrance leading into the dining hall (see Appendix A2). The dormitory has two entrances, one on either end, and with the materials available, the wall can be completely closed (7 feet 8 inches high, 17 feet 9 inches long) as it is a narrower building (see Appendix A3).

With the dining hall operational again, two walls will need to be built in the boys' dormitory. With the materials that TBI can provide, the walls can be 10 feet long, which is slightly more than half of the width of the building, and 8 feet high. There will be angle beams secured to one wall and three that will act as studs along the length of the wall (see Appendix A4)

Given that the school had decided to combine two classes into one, there will only need to be one wall in the boys' dormitory. TBI is sympathetic to the cause, and will be able to provide enough materials to construct one full 8 feet high wall (17 feet 9 inches long). There will be diagonal angle beams to provide support for the wood boards, all of which TBI will provide. The frame will be secured as originally planned, but concrete nails will be used in place of concrete screws for the ground (see Appendix A5).

- 3.3 **Design Constraints:** There is limited material available, though TBI may be able to provide the materials necessary for framing. There are only six tables in the dining hall, which make up the majority of the materials readily available, and construction of a wall reaching the full height of the walls of the building is not feasible, and neither is constructing a ceiling. As a result, sound from the other classes will inevitably reach each other. The framing for the wall is also dependent on whether or not TBI is willing and able to provide the materials necessary. If the dormitory is to be used, it will need to be thoroughly cleaned and refurbished, as presently there are wild cats, birds and wasps living in the building.

As of June 6, 2017, it seems that the school will be receiving regular shipments of food again, and so the dining hall can no longer be used nor the tables. However, TBI has 4'X8' plywood boards that can be used in place of the dining tables instead, of which they can spare five. That is enough for two 10 feet walls, which will leave a 7 foot gap between the wall and the wall of the building. The walls will be 8 feet high, which would not be enough to reach the trusses, which are 9 feet high. Sound will inevitably travel up and over as well as around the walls.

TBI is sympathetic to the cause, and is willing and able to provide the materials and means necessary to construct one full wall within the dormitory. The wall will remain 8 feet high, but will be completely closed, reaching from one side of the dormitory to the other. Sound will still travel up and over the walls as well regardless of the fact that it will only be 8 feet high as the building had an open ceiling, though the wall should dampen most of the sound. The school does not have blackboard paint, and so the walls will need to be painted green with normal paint, which may not retain powder from the chalks as well.

- 3.4 **Environmental Considerations:** The proposed plan is contingent upon the approval of the school and the faculty. The dining hall and dormitory are also being effectively vandalized if a wall is constructed within them. The children may not adapt well to the change in environment either, which may hinder their learning capabilities, especially if they are distracted by sounds from other classes. The younger children (grades 1 and 2), may have an easier time adapting to the change environment as they haven't been

change in environment either, which may hinder their learning capabilities, especially if they are distracted by sounds from other classes. The younger children (grades 1 and 2), may have an easier time adapting to the change environment as they haven't been attending the school for nearly as long as the children in grades 4 and 5. The construction sounds will also be extremely loud, which will distract the students and potentially hinder their learning ability for the duration of the project.

Given that the two walls in the dormitory will have a seven foot gap that the children can see into other classes through, it will be extremely distracting, especially if and when they start talking or gesturing to each other during class. The teachers will be affected as well, and will have to learn how to adapt to such a drastic change in the classroom dynamic compared to what they are used to considering the large amount of open space that will be present between the classrooms.

Combining two classes is a significant change to the school structure. The students will require time to adapt to the change in environment, which may be something that they may never be able to fully do. The students will need to deal with the effective doubling of their class size as there will be an influx of potential strangers, which may change the social dynamics of the class, for better or for worse. The teachers will also need to learn how to work together to effectively run the class, and during this learning phase their teaching ability may not be the best that it can be, which may reflect in the performance of the students. This change will persist for each incoming class as the students move up in grade until a new school building can be built and each class will have its own classroom again.

**3.5 Social Impact:** Should the walls in the dining hall or dormitory be constructed, it will change the structure of the school, however temporary or permanent. The children that were in the critical area of the original school building will be safe and free from harm, which will ensure that the community will retain the trust they have in the school, something that would have been lost if the school building should collapse, regardless of if anyone was inside. This will also ensure that the parent will continue to send their children to school knowing that no harm will come to them, which will allow the children to continue receiving education, which may be life changing for them

#### **4. Project Goals**

##### **4.1. – Expected Performance:**

The expectation is to move kids from classrooms 3,4,and 5. The first step is to move classes 4 and 5 to classrooms 1 and 2, and move the classes 1, 2, and 3, to a new room which is manually constructed. Considering the resources available, there will be expected audio interference between classrooms. The wall is expected to remain sturdy against any hits, and will remain standing even after they receive a new corridor.

##### **4.2. – Future of Proposed Work:**

There is not enough materials to be able to fully rebuild or repair the building that is collapsing. The students on this trip will write one letter each asking the government to build a new building. In the meantime, while the government is waiting to respond, the children will be kept in the dormitory or dining hall.

##### **4.3. – Evaluation Criteria:**

Students will get food.  
Safety

5.

#### **7. Project Implementation**

##### **7.1 – Description of implementation:**

The implementation of the project began June 7<sup>th</sup>, when the TBI group went to the school to clean the dormitory. First, the metal bed frames were moved from the boy's dormitory to the girls. Then, the dirt was swept out of the dorm. Lastly, the floor was moped. Only some birds nests were taken down from the trusses; however, not all is needed to be taken down. The next day, the students began to paint the room's walls with brown paint. The plan was to finish the paint and the metal frame that day, however, the first two coats were painted around most of the building, and the metal frame is almost complete. It will take one more visit to completely finish

paint and the metal frame that day, however, the first two coats were painted around most of the building, and the metal frame is almost complete. It will take one more visit to completely finish building and painting.

#### Appendix 1: Pictures

Picture 1



Picture 2







Picture 3



Picture 4



Picture 5



Picture 6







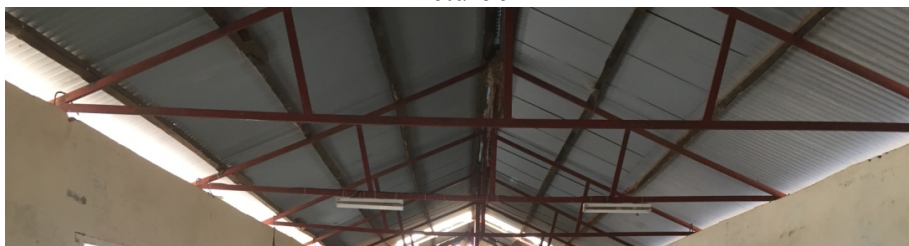
Picture 7



Picture 8



Picture 9







Picture 10

