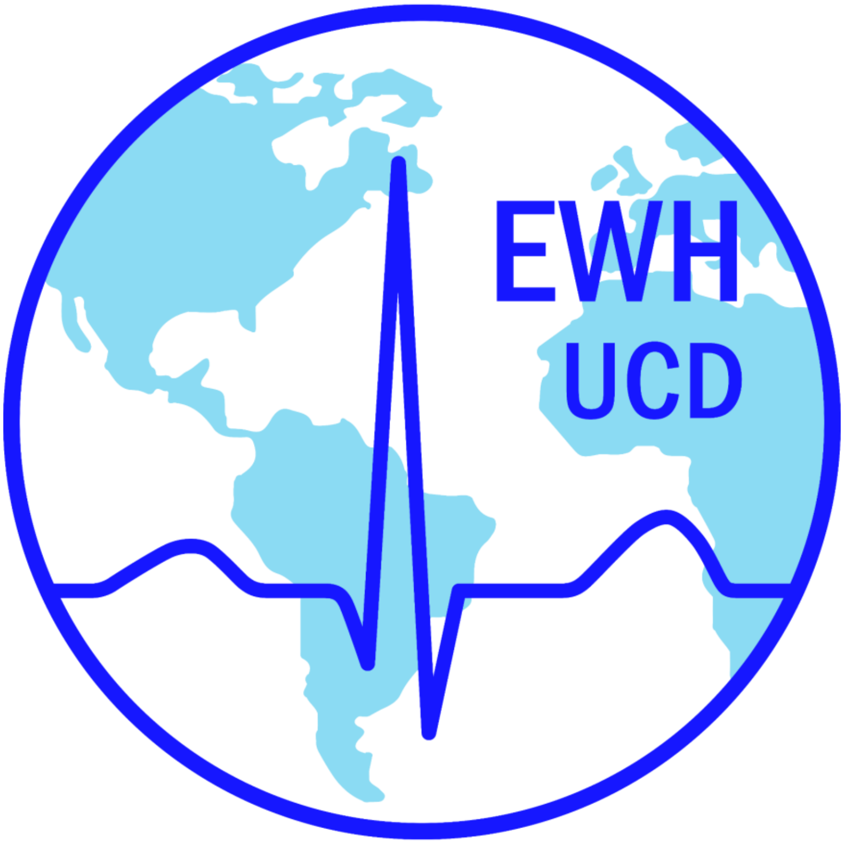
Chapter of the Year Competition Report



University College Dublin

30th May 2022

Section A: Programs and Projects Description

1. Design Project

Dark Adaptation Project

This year we aimed to tackle the problem of vitamin A deficiency in LMICs by creating a low-cost, portable adaptometer with no disposables which can be used in the potential screening for vitamin A deficiency in children over five and pregnant women. Nyctalopia, the abnormal inability to see well at night or in dim light is an indication of vitamin A deficiency as vitamin A is a precursor to rhodopsin, which is a photopigment found in the rod cells which are essential for vision at night and in low lighting conditions.

Current methods of vitamin A deficiency diagnosis include blood tests, electroretinograms, electro-oculography and a clinical assessment of the eye. These methods have associated issues of needlestick injuries, excessive disposables, expensive equipment or invasive procedures. Hence there is a gap in the market and a need for a low cost, non-invasive screening tool for vitamin A deficiency.

Our device allows an operator to perform a standard test protocol to assess a subject's ability to dark adapt. This will be done by the subject placing their head upon an adjustable chin and head rest to stabilise the position of the eye relative to our device. Corrective lenses can then be applied to correct vision defects to enable a focused view of the test and fixation lights. The subject will then be bleached to photoconvert at least 70% of the rhodopsin in a single eye. The subject is then asked to look directly at a red fixation light to allow for the testing of a specific region of the eye. A test light then flashes at varying intensities as per the test protocol explained. This test protocol provides the operator with a series of values, of time and log intensity of the test light, which are plotted and a rod intercept time. These values can then be used to assess the subject's ability to dark adapt which can be used as an indicator of vitamin A deficiency. CAD drawings of the design, a flow diagram of the test protocol and photos of our current prototype can be found in Appendix A.

2. Kit Builds and Equipment Repaired

This year we hosted a number of soldering workshops for our members and engineering students who were interested in joining the chapter. Three sessions were held, and the kits provided by EWH were used. Heart rate monitor, pressure calibration and ECG simulator kits were built. Everyone really enjoyed the hands-on experience, and it was a good way of attracting new members to the chapter. Pictures of these workshops can be seen in Appendix B.

Next year we also plan to set up and learn about our new 3D printer and conduct some 3D printing workshops for our members.

This year, one of our members, Sarah Mehigan, has travelled to Rwanda with EWH on the Summer Institute program where she will be repairing medical equipment in various hospitals. At the time of writing this report, she has landed in Rwanda, started Kinyarwanda language classes, and begun lectures and labs in Rwanda.

3. STEM Activities

This year the outreach committee visited a youth centre which creates a safe place for children and teenagers to go after school to do sports, study, learn, and have fun. Our visit entailed a fun engineering design challenge with primary school aged students. The challenge was to build the tallest tower possible that could hold a tin of beans. The children could use 15 sheets of paper and some sellotape. The challenge got the children thinking about what shape would create the sturdiest base for the tower.

This was the second of two challenges we did with the youth centre. The first was to build a catapult out of pencils, pens, rubber bands and anything else they could find in the classroom.

Alongside the youth centre we made plans to visit two secondary schools to carry out similar challenges and do a presentation on engineering and the opportunities it creates. These visits have been scheduled for September as the outreach committee were undergoing exams by the time we had confirmed the workshops with the schools.

Pictures from our STEM Activities can be seen in Appendix C.

4. Future Activities and Next Year’s Goals

Our future plans and activities include collaboration between us and other societies like the UCD Medical Society and Electrical Engineering Society to get our name out there and to alleviate and reduce time spent on projects or events.

This includes an engineering ball in collaboration with all the separate engineering societies.

One project we have already planned on collaborating on is a weekly robotics project on neural engineering with the Electrical Engineering Society. We plan to send our members to work on the project and also help with the costs of the project.

We have also planned to expand our social media presence by starting a discord server making communication between the committee and the members or people interested in our charter better.

Our Outreach Program will continue to expand next year, and our engineering challenges will be brought to even more schools in Ireland with the aim to educate and inspire more students to consider studying engineering.

Section B: Organizational Activities

1. Chapter Structure and Statistics

Our EWH Chapter Committee consists of 11 members - a President, two Vice Presidents and Treasurer which make up the Executive Committee, as well as the Outreach, Events, Sponsorship, IEEE EMBS, and Social Media Officers. During the middle of semester two, a fresher's rep from 1st and 2nd year were also elected. These 11 Committee members meet weekly to oversee all EWH UCD Chapter business, to update each other on funding, events, the outreach program, general administration, and to plan for the coming weeks and any major events.

In semester 1, all committee and weekly meetings were held in person in UCD, as were all workshops and events. In semester 2, a significant portion of the committee and EWH's members were based outside of Dublin on internship/study abroad programs. This led to all the committee meetings being held on zoom and for the weekly meetings to be split into an in-person meeting and a zoom meeting. The online team decided to work on a project for submission to the EWH Design Competition while the in-person meeting worked on ideation and potential ideas for next year's team. Pictures from meetings can be seen in Appendix D.

The Outreach Officer runs a sub-committee of 7 members who spearhead our Outreach Program. This involves creating STEM themed challenges for schools and youth clubs, running these challenges, and giving talks on engineering to pre-college students.

Our EWH UCD Design Competition Team meets weekly to work on their entry. The team is composed of 6 masters students (5 studying biomedical engineering and 1 studying energy engineering).

Our Chapter has 33 regular members in total. When hosting larger scale events with corporate sponsorship and collaborations with other university societies, attendance has been significantly higher, with 133 attendees at our EWH Ball this year.

We use email and group chats to keep in contact with our active members. We use several social media platforms to update all of our followers including:

- LinkTree (https://linktr.ee/ewhucd),
- Instagram - 420 followers (@ewh_ucd)
- LinkedIn - 290 followers (https://www.linkedin.com/company/engineering-world-health-ucd)
- Facebook - 47 followers (https://www.facebook.com/ewhucd).
- Twitter - 25 (@EwhUcd).
- Mailchimp - 221 members

Our social media posts include committee member announcements, medical professional talks, a pub quiz, workshops, outreach, EWH Ball, Pizza Ideations, and recruitment. See Appendix E for examples of what we post on our social media platforms.

2. Fundraising Approaches

We kept up relationships with our sponsors from last year, Resmed and Stryker, who both decided to renew their sponsorship contract with the chapter. Example slides from our sponsorship deck can be seen in Appendix F.

The MidazoClamp Team’s 2nd place winnings were used to pay for the Chapter fees and the remaining sum was reinvested back into the chapter.

Funding Source	**Amount**
Stryker Sponsorship	€1500
MidazoClamp Winnings	€500
Nova UCD Winnings	€750
Resmed Sponsorship	€500
Total	**€3250**

3. Events

EWH Ball

We hosted a formal ball this year as a large social event to help advertise the chapter and as a fun event for the current members. The theme was “A Starry Night” and it was a big success with 124 tickets sold. See Appendix G.

Guest Speakers

As part of the ideation process, we reached out to some medical professionals from low income countries to hear their opinion on what problems they see in their own hospitals. This year we had two guest speakers. The first was Dr. Pierre Goussard from South Africa and the second was Nurse Stevie Kanyama from Zambia. These talks help us narrow the focus on what we want to look into for the design competition.

Sponsorship Workshops

We had two big sponsors that we worked with this year, Resmed and Stryker. Both of which are large medical device companies. For each sponsor we hosted a workshop where one or two employees would explain product development from an industry perspective. These workshops were held virtually for ease of access for both the sponsors and the attendees.

Collaboration

This year we hosted a pub quiz in collaboration with the UCD World Aid Society in aid of the Helen Keller Foundation. More than 170€ was raised for the charity.

New Kit

This year the chapter members also invested in EWH fleeces. It is our hope that this will help in advertising the chapter and gaining more members in the coming years.

Recruitment Campaign and Information Evening

At the start of semester 1 we hosted an information evening about EWH UCD and what we had planned to do for the year. We gained several new members from this and also got some new ideas about what people would be interested in seeing from EWH UCD in 2021 and 2022. See Appendix H for pictures from this event.

Trips to View Adaptometers

The Design Competition team reached out to the Research Foundation in the Royal Victoria Eye and Ear Hospital in Dublin and the Wellcome Trust-Wolfson Northern Ireland Clinical Research Facility in Belfast and they were kind enough to facilitate visits for our members to see and experience adaptometers in a research setting. These visits were invaluable to the team and helped with their understanding of the inner workings of adaptometers. The comparison of the entirely manual Goldmann-Weekers device created in the 1950s to the fully automatic AdaptDX launched in 2014 proved incredibly useful as the team tried to balance the cost effectiveness and effectiveness of their own prototype. Photos of these trips can be seen in Appendix I.

Assisting Virginia Tech EWH Chapter in their Set-Up

Justin Laiti from the EWH Virginia Tech Chapter reached out to us on instagram while they were starting up their chapter. We shared our chapter of the year report with them and were available to offer any advice needed. We hope to collaborate with them virtually next year.

Nova UCD Student Enterprise 2021 Summer Competition:

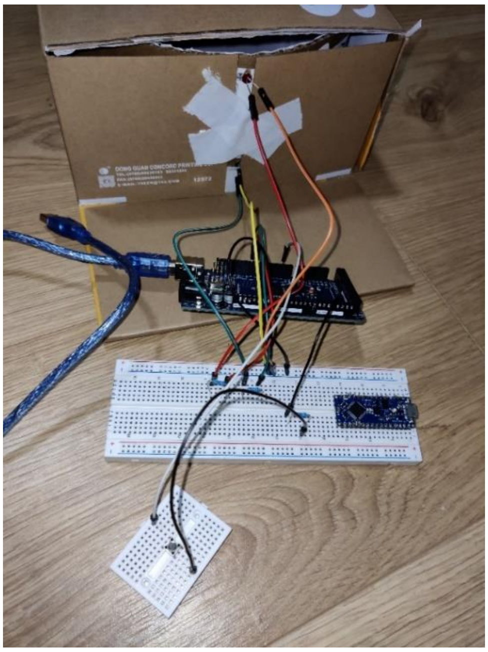
This is a competition that assists students in refining their start-up ideas through various structured workshops, taught content from industry experts, interactive workshops, pitching sessions and mentoring. A team representing EWH came in 2nd place in developing their 'Broncophone' project and won €2000 in prize money to develop their project further. The Bronchophone is a device which allows the adaptation of out-of-date fiberoptic bronchoscopes into low-cost video bronchoscopes by combining the fiberoptic bronchoscope with a smartphone camera using an attachment comprising of a series of lenses.

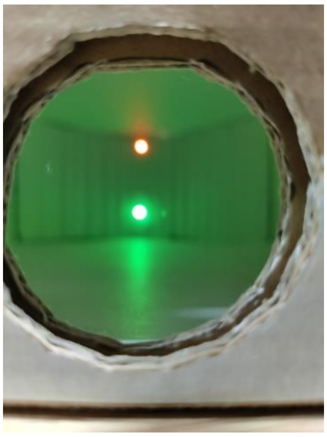
Section C: EWH Chapter Feedback

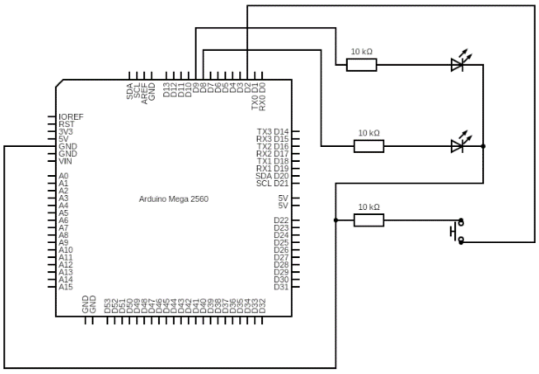
As a chapter based in Ireland, something we would like to see would be more events or collaboration projects that European chapters can get involved with.

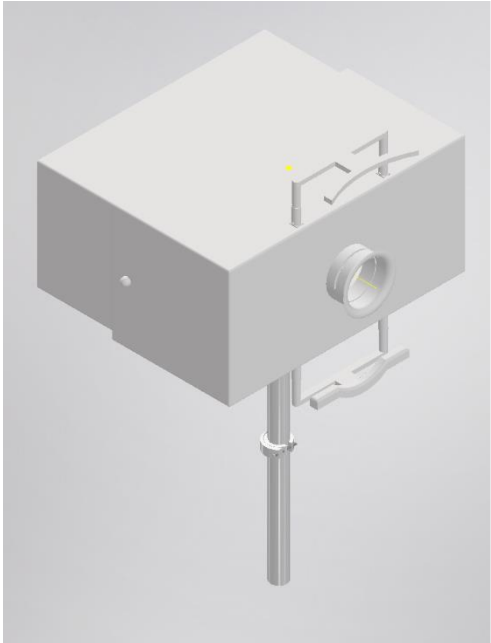
Section D: Appendix

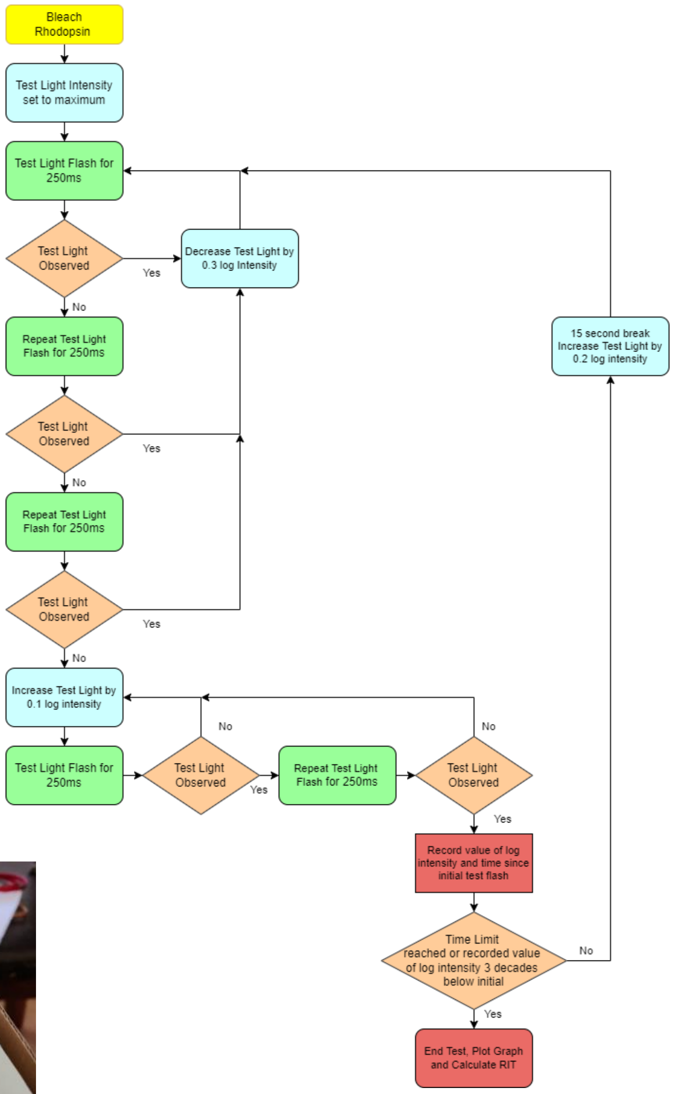
Appendix A: Adaptometry Design Competition Entry

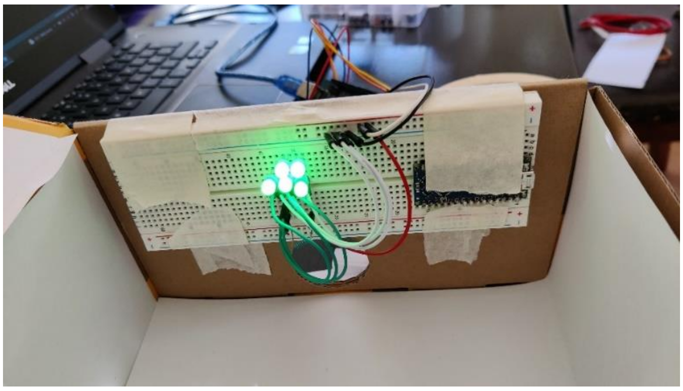




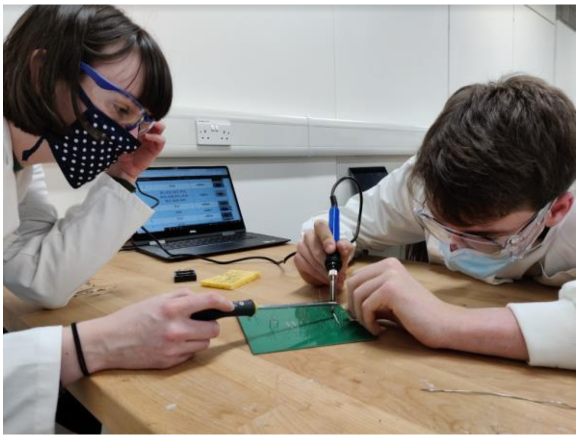

Arduino Mega 2560
10 kΩ
10 kΩ
10 kΩ

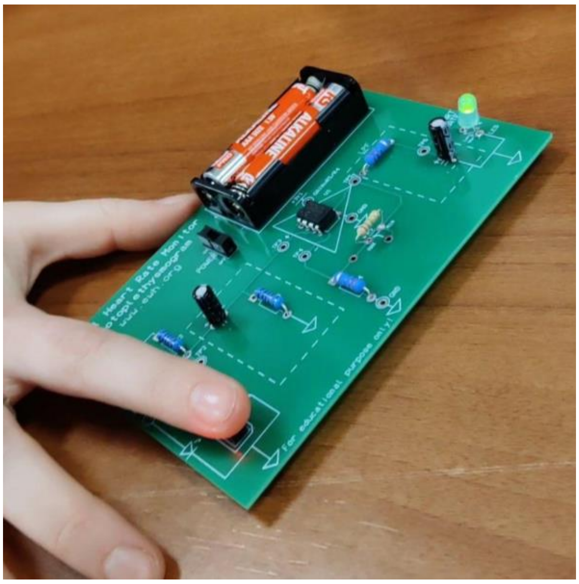



Bleach Rhodopsin
Test Light Intensity set to maximum
Test Light Flash for 250ms
Test Light Observed
Yes
Decrease Test Light by 0.3 log Intensity
No
Repeat Test Light Flash for 250ms
Test Light Observed
Yes
No
Repeat Test Light Flash for 250ms
Test Light Observed
Yes
No
Increase Test Light by 0.1 log intensity
Test Light Flash for 250ms
Test Light Observed
No
Yes
Repeat Test Light Flash for 250ms
Test Light Observed
No
Yes
Record value of log intensity and time since initial test flash
Time Limit reached or recorded value of log intensity 3 decades below initial
No
15 second break Increase Test Light by 0.2 log intensity
Yes
End Test, Plot Graph and Calculate RIT



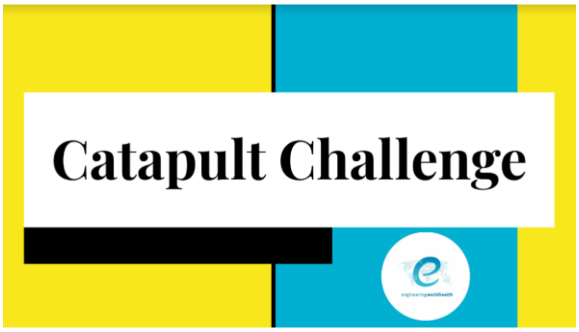
Appendix B: Soldering Workshops



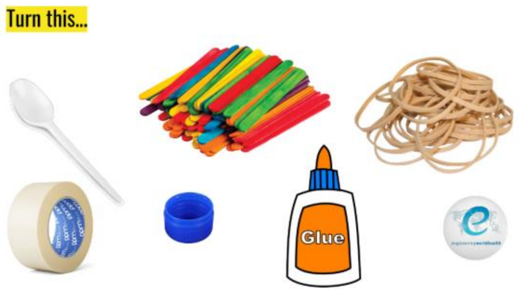


Appendix C: Outreach Programme

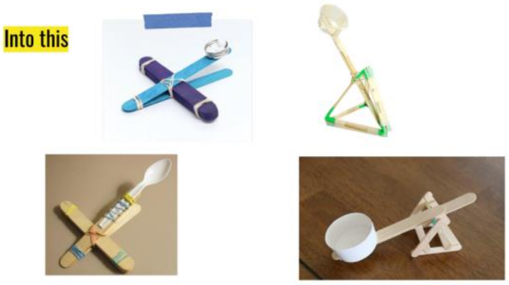
Pictures from the Youth Club Catapult Build



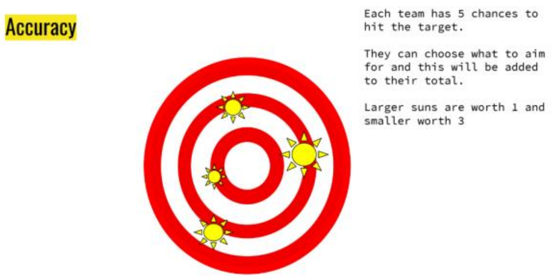
Catapult Challenge



Turn this...



Into this

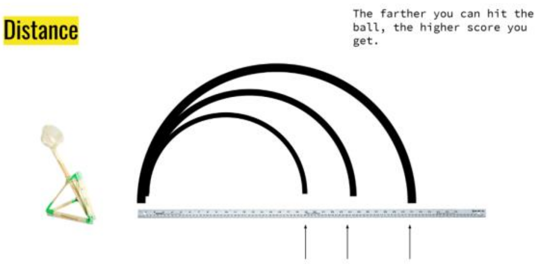


Accuracy

Each team has 5 chances to hit the target.

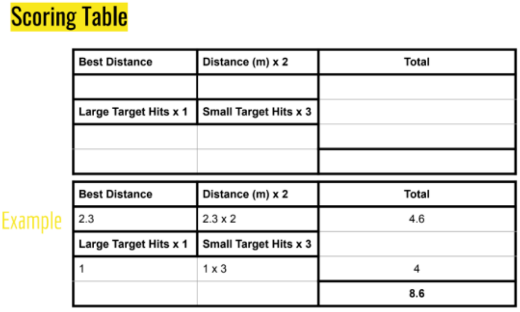
They can choose what to aim for and this will be added to their total.

Larger suns are worth 1 and smaller worth 3



Distance

The farther you can hit the ball, the higher score you get.



Scoring Table

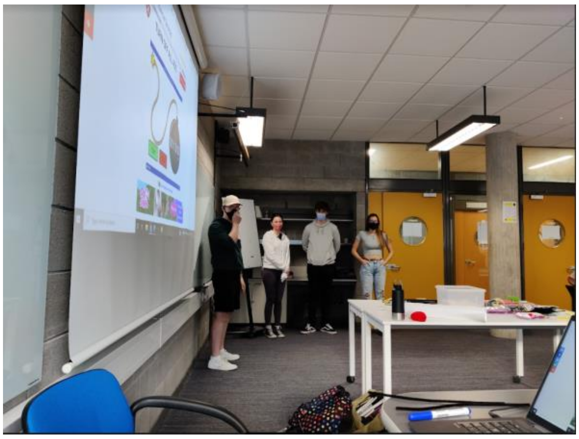
Best Distance	Distance (m) x 2	Total
Large Target Hits x 1	**Small Target Hits x 3**	

Example

Best Distance	Distance (m) x 2	Total
2.3	2.3 x 2	4.6
Large Target Hits x 1	**Small Target Hits x 3**	
1	1 x 3	4
		8.6

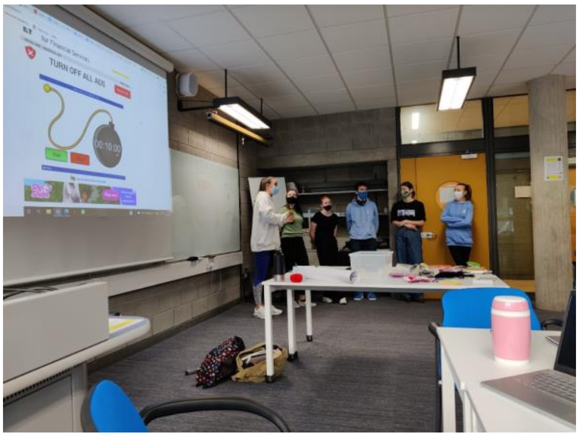
Slide Deck Presented to the Schools/Youth Groups for Catapult Challenge

Appendix D: Pictures from Meetings

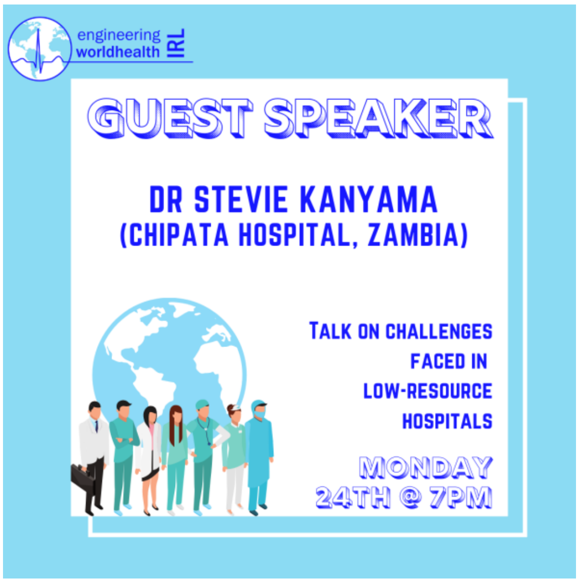


TURN OFF ALL ADS
00:10:00

TURN OFF ALL ADS
00:10:00


TURN OFF ALL ADS
00:10:00

Appendix E: Social Media Graphics



engineering worldhealth IRL

GUEST SPEAKER

DR STEVIE KANYAMA
(CHIPATA HOSPITAL, ZAMBIA)

TALK ON CHALLENGES
FACED IN
LOW-RESOURCE
HOSPITALS

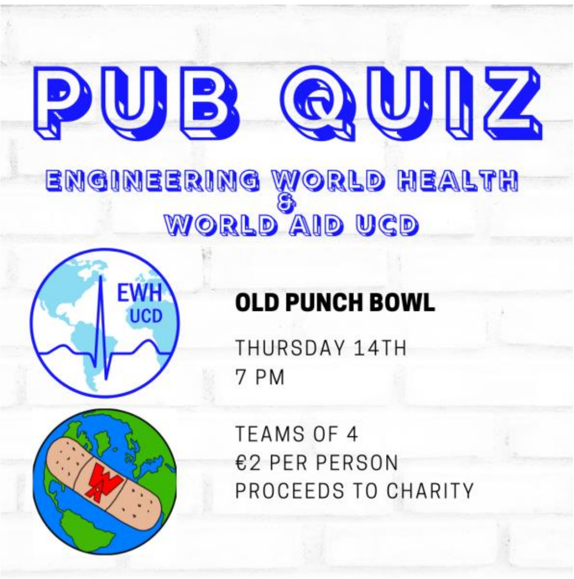
MONDAY
24TH @ 7PM

First Meeting
2021/22

Join us in ENG 204 at 5pm

Guest Speaker
Dr Pierre Goussard,
Paediatric Pulmonologist

engineering worldhealth UCD



PUB QUIZ

ENGINEERING WORLD HEALTH
&
WORLD AID UCD

EWH
UCD

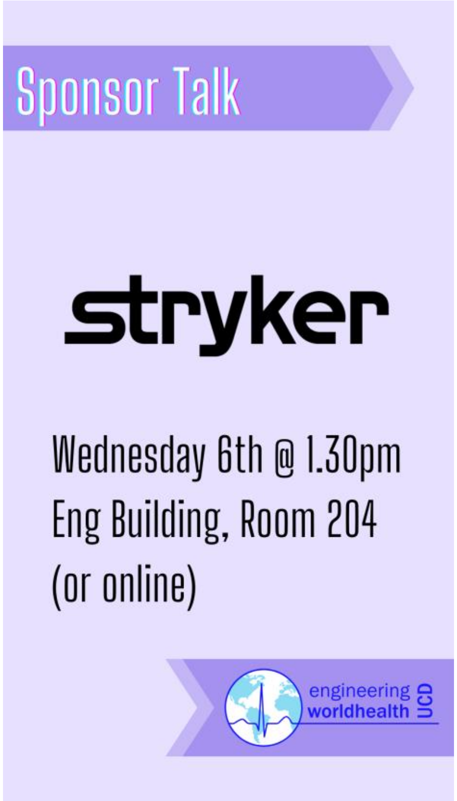
OLD PUNCH BOWL

THURSDAY 14TH
7 PM

TEAMS OF 4
€2 PER PERSON
PROCEEDS TO CHARITY

PUB QUIZ 2021

engineering worldhealth UCD

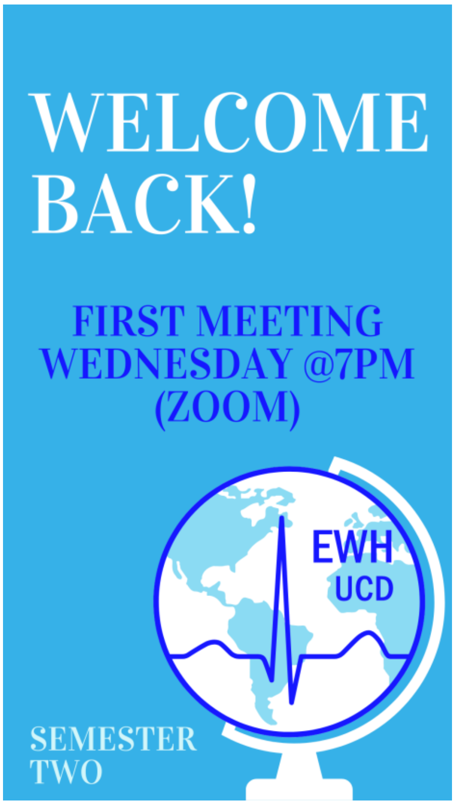


Sponsor Talk

stryker

Wednesday 6th @ 1.30pm
Eng Building, Room 204
(or online)

engineering worldhealth UCD

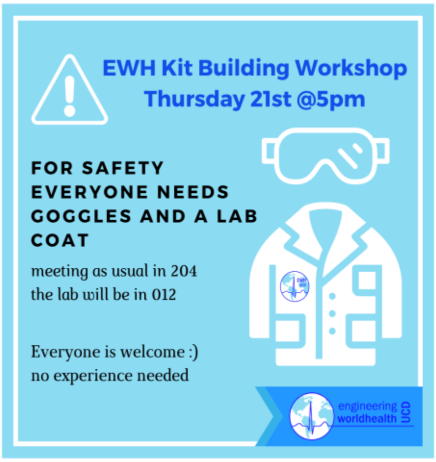


WELCOME BACK!

FIRST MEETING
WEDNESDAY @7PM
(ZOOM)

EWH UCD

SEMESTER TWO



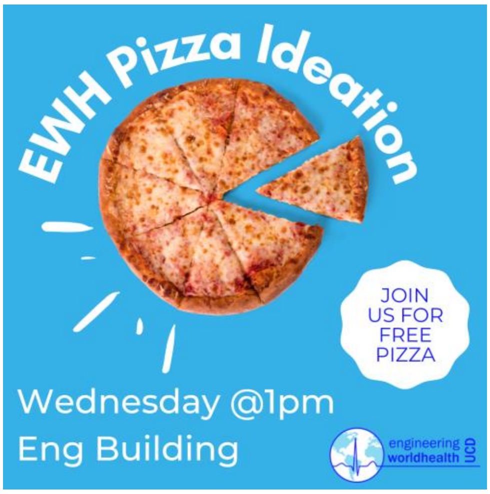
EWH Kit Building Workshop
Thursday 21st @5pm

FOR SAFETY EVERYONE NEEDS GOGGLES AND A LAB COAT

meeting as usual in 204
the lab will be in 012

Everyone is welcome :)
no experience needed

engineering worldhealth UCD

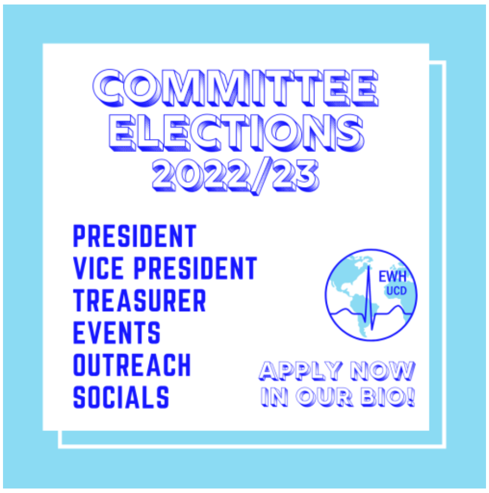


EWH Pizza Ideation

JOIN US FOR FREE PIZZA

Wednesday @1pm
Eng Building

engineering worldhealth UCD



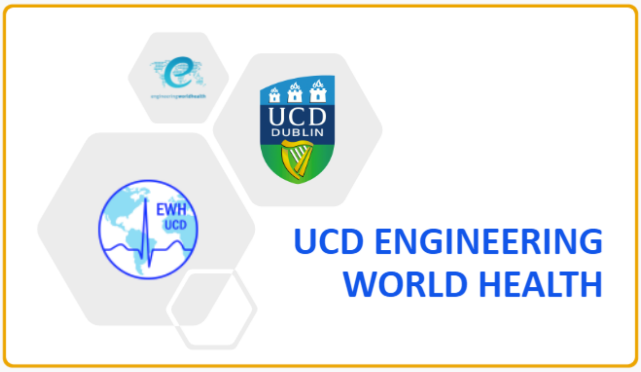
COMMITTEE ELECTIONS 2022/23

PRESIDENT
VICE PRESIDENT
TREASURER
EVENTS
OUTREACH
SOCIALS

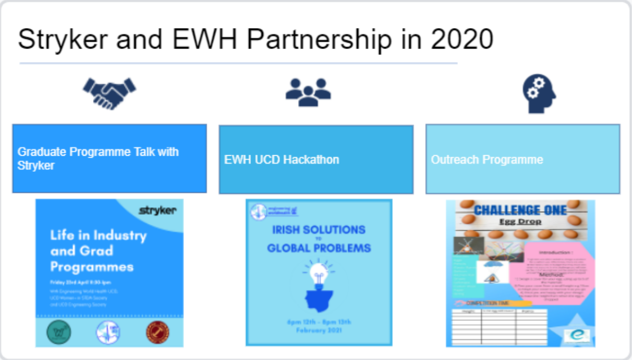
EWH UCD

APPLY NOW IN OUR BIO!

Appendix F: Sponsorship Deck – Resmed & Stryker Relationship Continuation Proposal



UCD ENGINEERING WORLD HEALTH



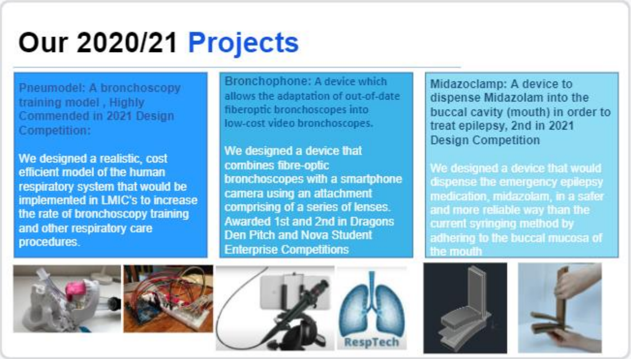
Stryker and EWH Partnership in 2020

Graduate Programme Talk with Stryker

EWH UCD Hackathon

Outreach Programme

stryker
Life in Industry and Grad Programmes
IRISH SOLUTIONS to GLOBAL PROBLEMS
CHALLENGE ONE
Egg Drop



Our 2020/21 **Projects**

Pneumodel: A bronchoscopy training model , Highly Commended in 2021 Design Competition:

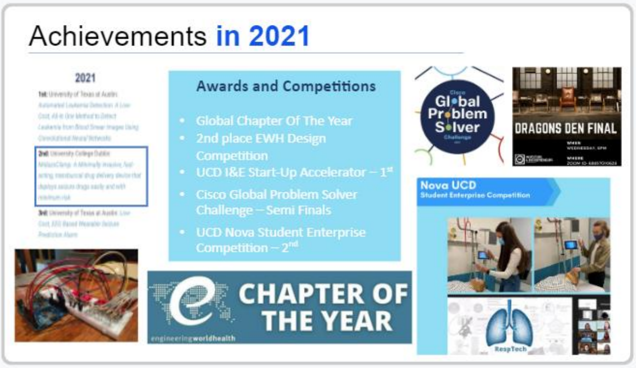
We designed a realistic, cost efficient model of the human respiratory system that would be implemented in LMIC's to increase the rate of bronchoscopy training and other respiratory care procedures.

Bronchophone: A device which allows the adaptation of out-of-date fiberoptic bronchoscopes into low-cost video bronchoscopes.

We designed a device that combines fibre-optic bronchoscopes with a smartphone camera using an attachment comprising of a series of lenses. Awarded 1st and 2nd in Dragons Den Pitch and Nova Student Enterprise Competitions

Midazoclamp: A device to dispense Midazolam into the buccal cavity (mouth) in order to treat epilepsy, 2nd in 2021 Design Competition

We designed a device that would dispense the emergency epilepsy medication, midazolam, in a safer and more reliable way than the current syringing method by adhering to the buccal mucosa of the mouth

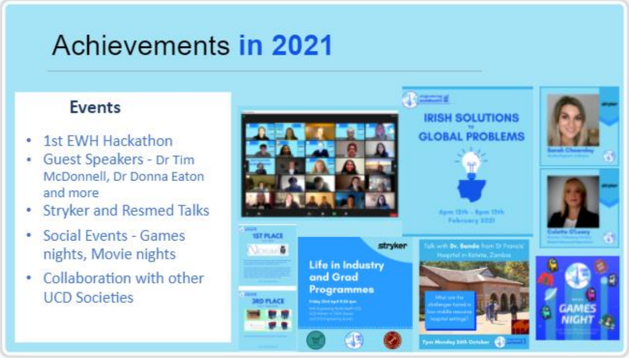


Achievements **in 2021**

Awards and Competitions

- Global Chapter Of The Year
- 2nd place EWH Design Competition
- UCD I&E Start-Up Accelerator – 1st
- Cisco Global Problem Solver Challenge – Semi Finals
- UCD Nova Student Enterprise Competition – 2nd

2021
Cisco Global Problem Solver Challenge
DRAGONS DEN FINAL
CHAPTER OF THE YEAR
engineeringworldhealth
Nova UCD
Student Enterprise Competition
RespTech

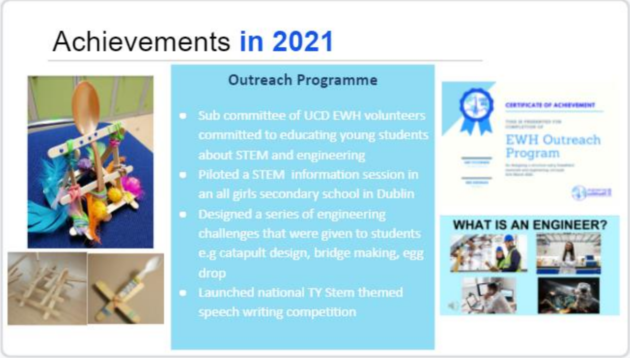


Achievements **in 2021**

Events

- 1st EWH Hackathon
- Guest Speakers - Dr Tim McDonnell, Dr Donna Eaton and more
- Stryker and Resmed Talks
- Social Events - Games nights, Movie nights
- Collaboration with other UCD Societies

IRISH SOLUTIONS to GLOBAL PROBLEMS
1ST PLACE
3RD PLACE
stryker
Life in Industry and Grad Programmes
GAMES NIGHT

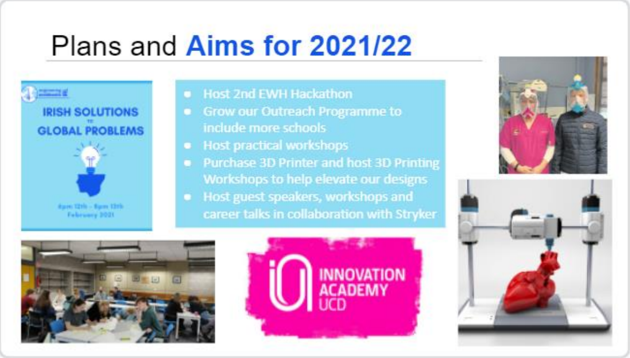


Achievements **in 2021**

Outreach Programme

- Sub committee of UCD EWH volunteers committed to educating young students about STEM and engineering
- Piloted a STEM information session in an all girls secondary school in Dublin
- Designed a series of engineering challenges that were given to students e.g catapult design, bridge making, egg drop
- Launched national TY Stem themed speech writing competition

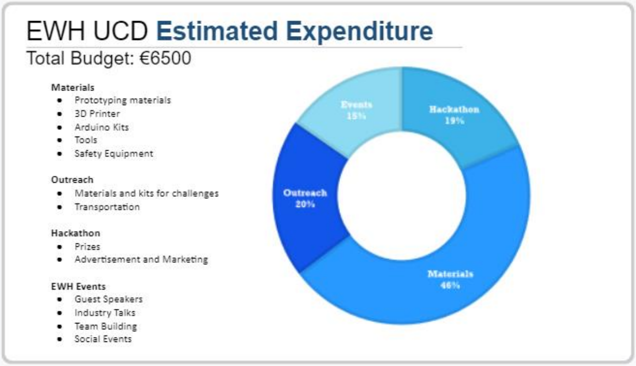
CERTIFICATE OF ACHIEVEMENT
EWH Outreach Program
WHAT IS AN ENGINEER?



Plans and Aims for 2021/22

- Host 2nd EWH Hackathon
- Grow our Outreach Programme to include more schools
- Host practical workshops
- Purchase 3D Printer and host 3D Printing Workshops to help elevate our designs
- Host guest speakers, workshops and career talks in collaboration with Stryker

IRISH SOLUTIONS
TO
GLOBAL PROBLEMS
INNOVATION
ACADEMY
UCD



EWH UCD Estimated Expenditure

Total Budget: €6500

Materials
- Prototyping materials
- 3D Printer
- Arduino Kits
- Tools
- Safety Equipment

Outreach
- Materials and kits for challenges
- Transportation

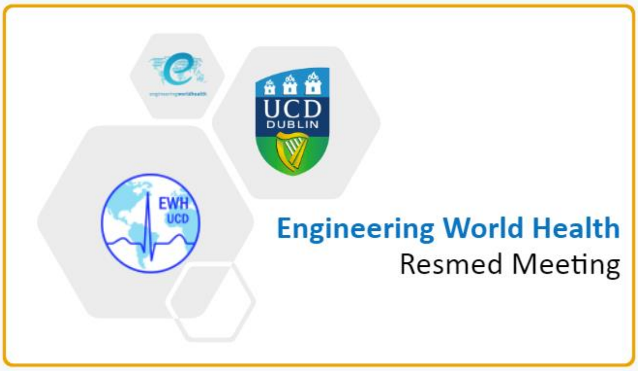
Hackathon
- Prizes
- Advertisement and Marketing

EWH Events
- Guest Speakers
- Industry Talks
- Team Building
- Social Events

engineering worldhealth UCD

- @Engineering World Health - UCD
- @ewh_ucd
- @ewhucd
- @EwhUcd

Stryker Deck



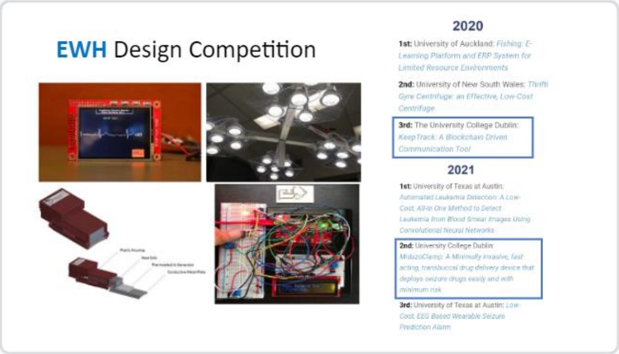
Engineering World Health

Resmed Meeting

EWH
UCD
UCD
DUBLIN

What does **EWH UCD** do?

CHAPTER OF
THE YEAR
IRISH SOLUTIONS
TO
GLOBAL PROBLEMS
6pm 12th - 8pm 13th
February 2021



EWH Design Competition

2020

1st: University of Auckland: *Fishing: E-Learning Platform and ERP System for Limited Resource Environments*

2nd: University of New South Wales: *Thrifti Gyre Centrifuge: an Effective, Low-Cost Centrifuge*

3rd: The University College Dublin: *KeepTrack: A Blockchain Driven Communication Tool*

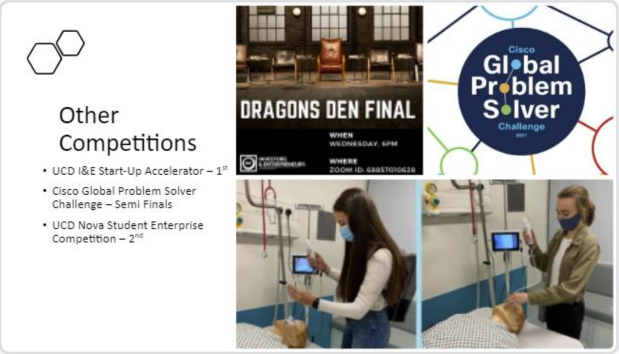
2021

1st: University of Texas at Austin: *Automated Leukemia Detection: A Low-Cost, All-in One Method to Detect Leukemia from Blood Smear Images Using Convolutional Neural Networks*

2nd: University College Dublin: *MidazoClamp: A Minimally invasive, fast acting, transbuccal drug delivery device that deploys seizure drugs easily and with minimum risk*

3rd: University of Texas at Austin: *Low Cost, EEG Based Wearable Seizure Prediction Alarm*

3

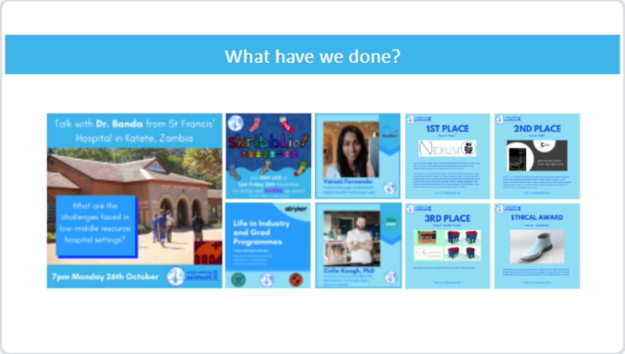


Other Competitions

- UCD I&E Start-Up Accelerator – 1st
- Cisco Global Problem Solver Challenge – Semi Finals
- UCD Nova Student Enterprise Competition – 2nd

DRAGONS DEN FINAL
WHEN
WEDNESDAY, 6PM
WHERE
ZOOM ID: 68857010628
Cisco
Global Problem Solver
Challenge

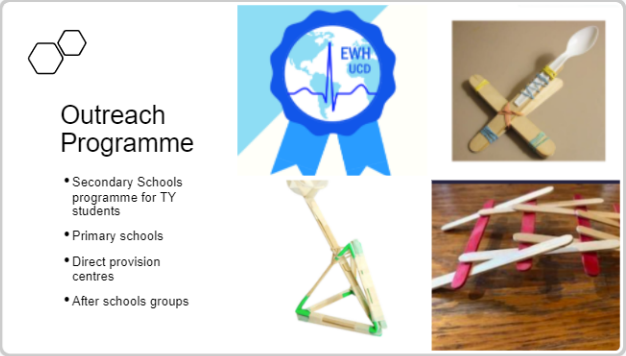
4



What have we done?

Talk with Dr. Banda from St Francis' Hospital in Katete, Zambia
What are the challenges faced in low-middle resource hospital settings?
7pm Monday 26th October
skribbl.io!
Varuni Fernando
stryker
Life in Industry and Grad Programmes
Colin Keogh, PhD
1ST PLACE
NEXUM
2ND PLACE
3RD PLACE
ETHICAL AWARD

5



Outreach Programme

- Secondary Schools programme for TY students
- Primary schools
- Direct provision centres
- After schools groups

6

Plans and Aims for 2021/22

DESIGN AND ITERATIVE THINKING
A Workshop delivered by Varuni Fernando from ResMed
ResMed
Tuesday
6th April
1-2pm
INNOVATION ACADEMY UCD

7

Thank You for Your Support!

engineering worldhealth UCD

@ewhucd

@Engineering World Health - UCD

@ewh_ucd

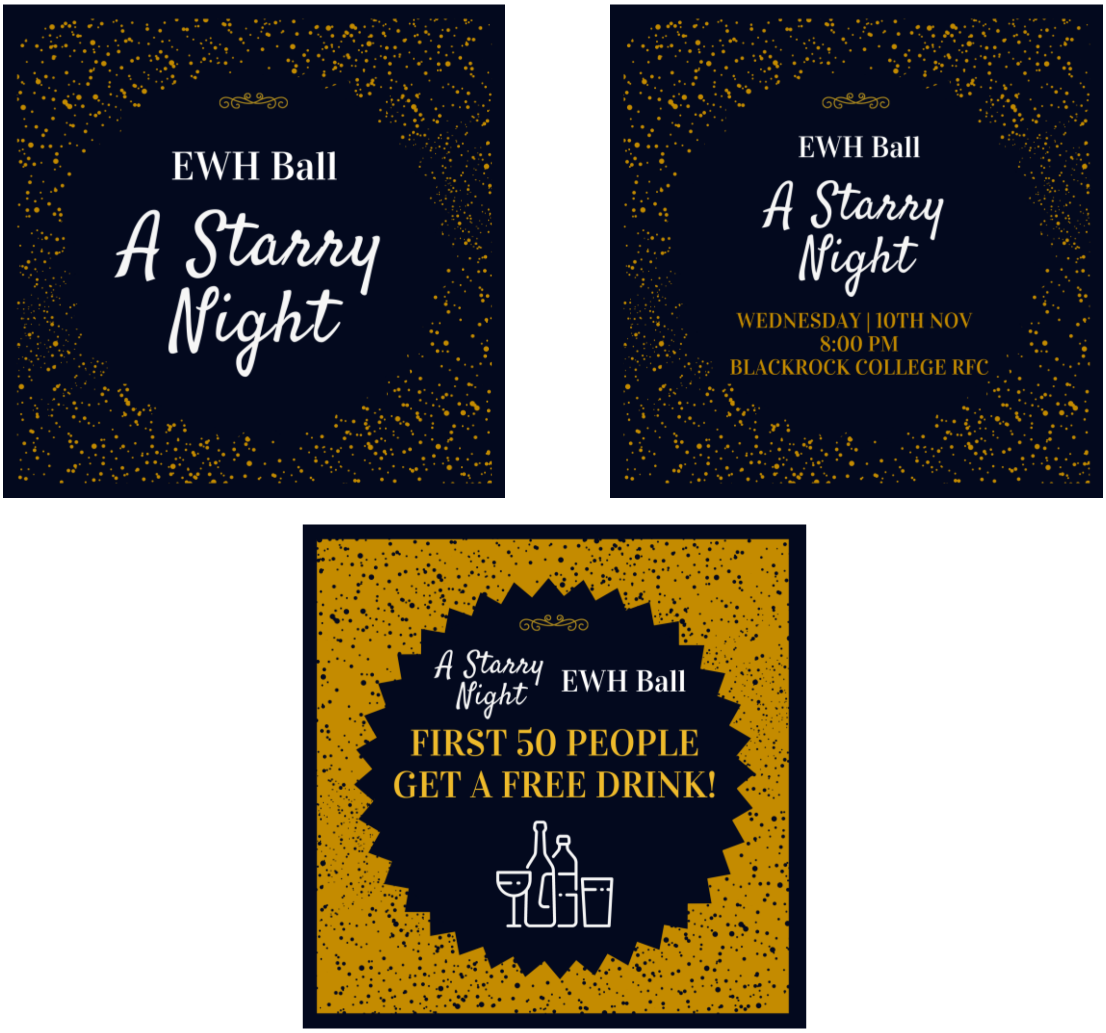
8

Resmed Deck

Appendix G: EWH Ball Graphics and Photos

EXIT
EWH ♥ BALL

Committee at the EWH “Starry Night” Ball

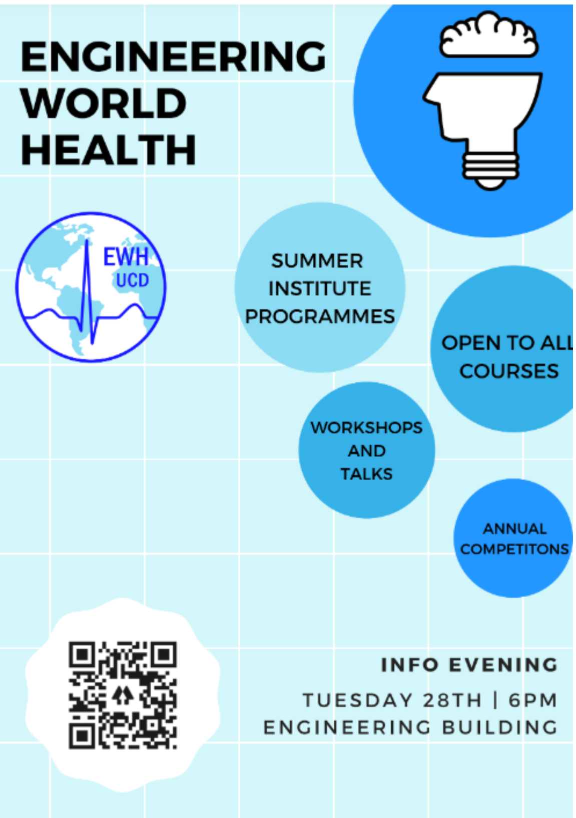

EWH Ball
A Starry Night
EWH Ball
A Starry Night
WEDNESDAY | 10TH NOV
8:00 PM
BLACKROCK COLLEGE RFC
A Starry Night
EWH Ball
FIRST 50 PEOPLE
GET A FREE DRINK!

Social Media Graphics for EWH Ball

Appendix H: Recruitment Campaign and Info Evening

ENGINEERING
WORLD
HEALTH

Clár Fógraí



ENGINEERING
WORLD
HEALTH

EWH
UCD

SUMMER INSTITUTE PROGRAMMES

OPEN TO ALL COURSES

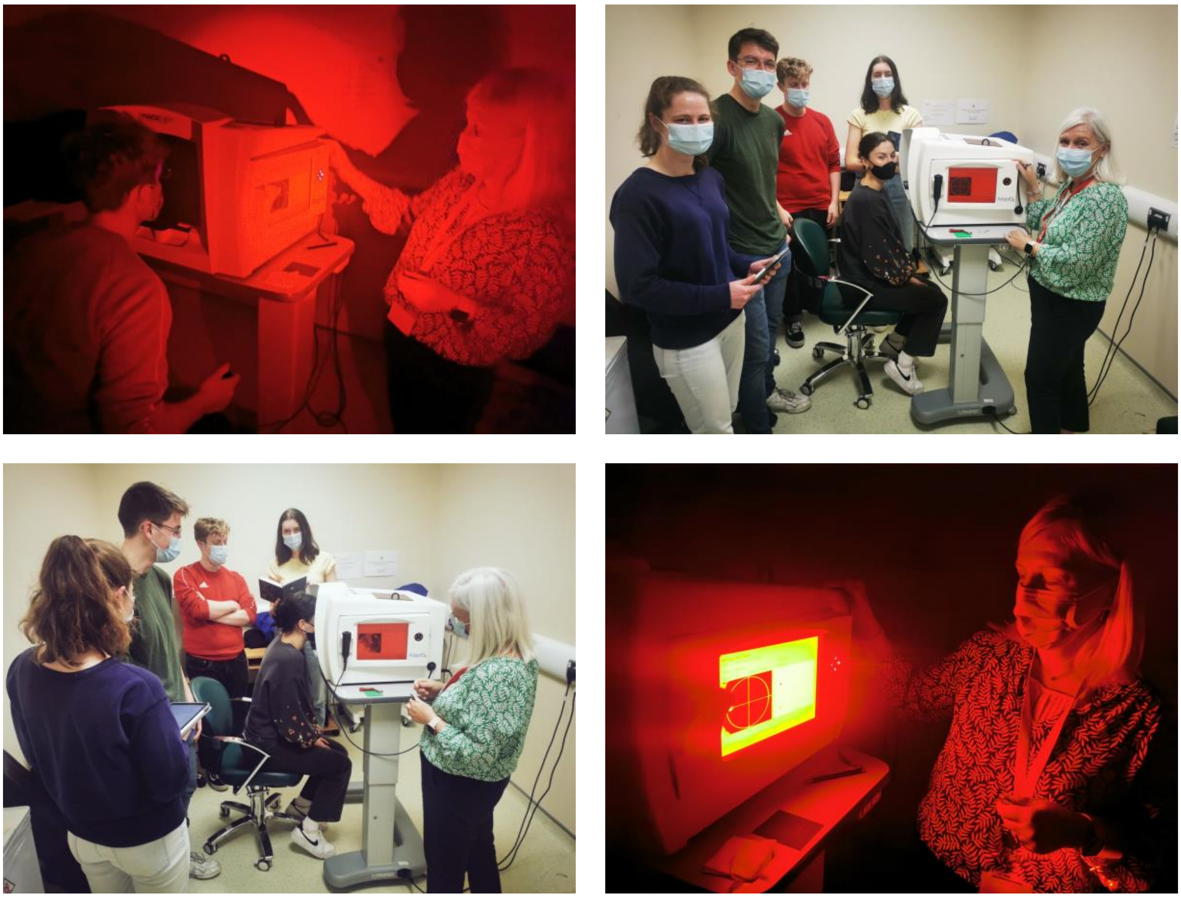
WORKSHOPS AND TALKS

ANNUAL COMPETITONS

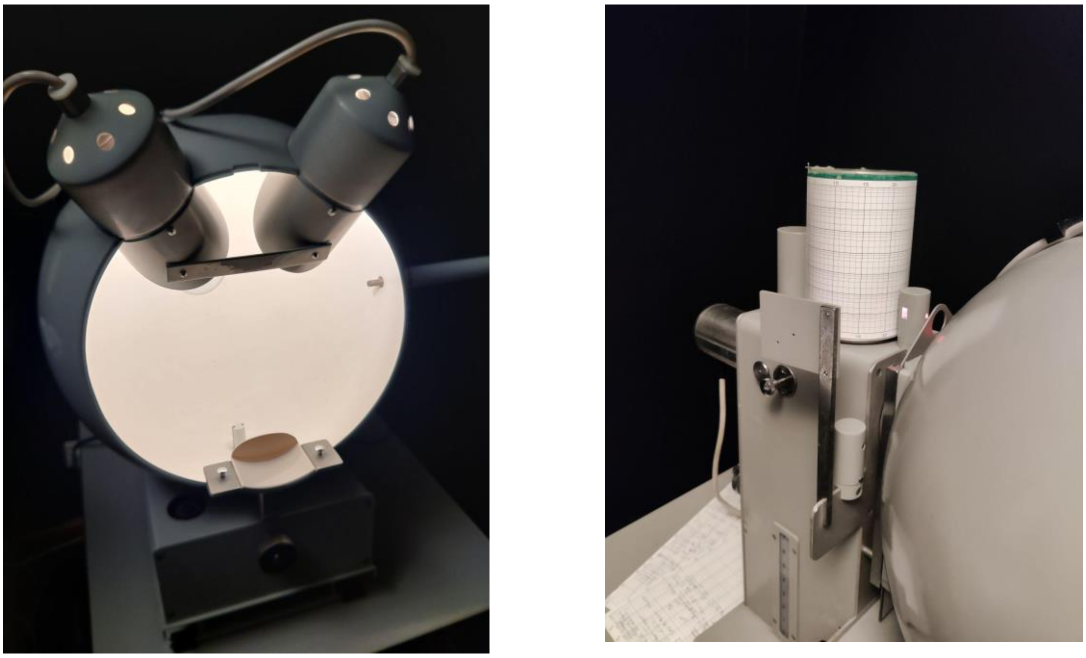
INFO EVENING
TUESDAY 28TH | 6PM
ENGINEERING BUILDING

Info Evening and Recruitment Posters

Appendix I: Design Team Visits to Royal Victoria Eye and Ear Hospital & Northern Ireland Clinical Research Facility



Northern Ireland Clinical Research Facility’s AdaptDX Machine



Royal Victoria Eye and Ear Hospital’s Goldmann-Weekers Machine