Public Engagement Small Grant Scheme Application - Round 11 (November 2020) [Deadline: 1-Dec-2020; 17:00]

Before completing the form, please read the guidelines in full: https://www.kcl.ac.uk/study/doctoral-studies/doctoral-training/training-themes/communication-and-impact/pe-small-grants

Applicants

Lead applicant

Name:	Miguel Xochicale (MX)
Career stage:	*Research staff*
Job title:	Research Associate
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Faculty:	Life Sciences and Medicine (FoLSM)
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Telephone:	07442817616
Role in the project:	Integration and management of the project

Co-applicant(s) details including their roles in the project

You may add up to 4 co-applicants in total.

Name:	Shu Wang (SW)
Career stage:	*PGR*
Job title:	PhD student
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Telephone:	07743881642
Role in the project:	Lead for 3d-printing of foetus
Contact type	Co-applicants

Name:	Fang-Yu Lin (FL)
Career stage:	*Research staff*
Job title:	Research Associate
Dept:	Surgical and Interventional Engineering (SIE)
Faculty:	Life Sciences and Medicine (FoLSM)
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Telephone:	07751494884
Role in the project:	Lead for developing foetal surgery simulation activity.
Contact type	Co-applicants

Relevant experience of the team

Relevant experience of the team: (up to 100 words)	The team has more than 5 years' experience with Public Engagement (PE) with scientific research. For instance, MX engaged with families at four science fairs, developed and delivered interactive engineering demonstrations for young adults attending the University of Birmingham's open days. SW has engaged young people across London with her research into the applications of 3D printing in health care and life science. Finally, FL has engaged visitors with his research in medical physics in New Scientists Live 2017 and 2019 and attended the associated PE training at UCL and KCL.

Title of the project

Project title:	Finding a fETus with UltraSound (FETUS)

Detailed description of the project

Detailed description of the project *(up to 500 words)*
The aim of the project is to increase the awareness of young people, living in Southwark and Lambeth with the involvement of The Young Persons' Advisory Group (YPAG), on what research engineers do and the impact they make to society. We will achieve this through creative and interactive public engagement activities that explore our research in the areas of surgery and interventional

engineering (e.g., soft materials, mechanics and robotics). Similarly, we aim that young audiences get a better understanding of the diversity of jobs in healthcare, as well as develop their interests in STEM areas.

Our team work with fetal medicine experts to improve the diagnosis and treatment of babies before birth. This is a challenging area because they are small and inaccessible where they develop in the womb. Over a one-hour workshop, participants will have first-hand experience through three activities of the current and future challenges of surgical and interventional engineering: a) guess the age of a baby before birth (fetus) (b) play with a placenta phantom and (c) play with a simulator to tracking needles that are used to access the fetus with ultrasound. To make a memorable PE experience, participants will then be awarded with souvenirs of 3D printed fetal phantoms or 3D printed key rings.

The anticipated outcomes of the project are the creation of mutual benefit between young audiences and research engineers by (a) encouraging young audience to pursuit a career in STEM and (b) improving communications and project managements skills of research engineers. In addition, such activities will help to engage with other researchers and clinicians that might spark collaboration and the potential usage of the current activities in future events targeting other type of audiences.

Detailed description of the PE activities.

Guessing the age of a baby before birth

Aim: To let the audience appreciate the age and the size of the baby and the challenges of techniques to visualise them.

Activity: Participants will choose one 3D-printed fetus from a box containing 10 different gestational ages and guess the age. This is an opportunity to facilitate conversations about fetal development and the difficulties that clinicians face to visualise the fetus in the womb.

Examination and localisation of needles

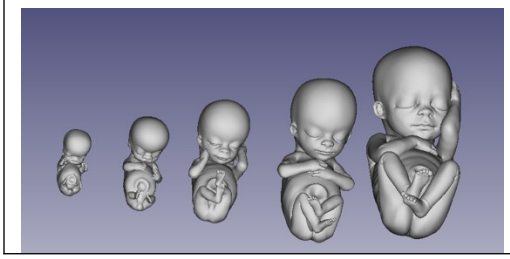
Aim: To familiarise the audience with technical terminology and let the audience to experience the difficulties of ultrasound-guided needle insertion procedures.

Activity: The audience will simulate a clinical procedure of guidance of ultrasound imaging by inserting a needle in the simulation chamber, mimicking the pregnant abdomen and womb, which consists of a fetal phantom, a placenta phantom and an umbilical cord.

Simulating ultrasound-guidance procedures

Aim: To provide both explanation of technical terminology and first-hand experiment of ultrasound-guided procedures to localise and track the needle tip.

Activity: Through a game of localizing the needle, participants will insert the needle in the phantom to then do post-localisation in the transparent phantom and see how close they were the simulation and its real position.



NOTE. The following figures are not meant to be submitted but will be shared to the organisers of the call.

Figure 1. Foetus of different gestural age (a) computer generated model of different gestational age and (b,c) 3D printed foetus.

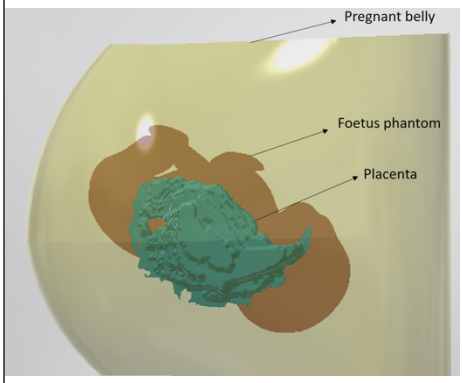
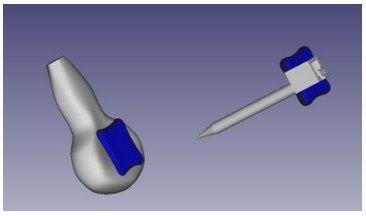


Figure 2. Foetal surgery simulation chamber, which consists of a foetus phantom, a placenta phantom and a pregnant belly.



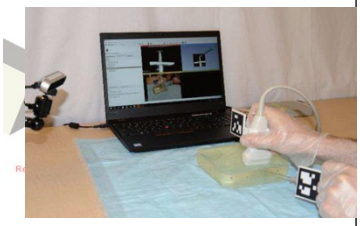


Figure 3. Ultrasound needle simulator: (a) computer generated models for ultrasound probe, needle, and sensors and (b, c) potential view of the ultrasound simulator using 3dslicer and medical devices.

Please describe what you want to achieve through your activity and how you will achieve this

Please describe what you want to achieve through your activity and how you will achieve this *(up to 250 words)*
The primary goal of the project is to increase awareness of young people in the career opportunities for areas of surgical and interventional engineering. We will achieve this by creating interactive and engaging activities that give students a tangible example of the work in their field. Through these activities, we also aim to increase their knowledge of 3D printing and surgical interventions in engineering. • The project also aims to develop skills in the researchers. Firstly, by explaining complex concepts of engineering to young people, the researchers will improve their communication and presentation skills. • Secondly, by providing researchers with first-hand experience of managing a small team and a budget, the researchers will increase their project management skills. • Thirdly, by delivering workshops to young audiences, research engineers will have better understanding of their perspectives of the technology in surgical and interventional engineering.

Audiences

Audience(s) for the project: *List the groups to whom you will target your activities. (up to 100words)*
Activities in this project are mainly targeted to young audiences (14 to 16 years old GCSE age) in Lambeth and Southwark. Throughout the development of the activities, we will consult the British Research Council's Youth People's Advisory Group (YPAG). We will host the workshop at the King's Health Partners (KHP) summer school, led by the National Institute for Health Research Guy's and St Thomas' NHS Foundation Trust Biomedical Research Centre. Similarly, we will work with the centre for medical engineering's public engagement team to identify and connect with local state school with pupil premium.

Estimated number of people

Estimated number of people who will be engaged through the project:
50 The number of participants for the activities can be of a minimum of 4 persons to a maximum of 8 persons (considering the impact of COVID-19 where participants need to wear face mask and separated 1m). Then, if such activities are running monthly for 6 months, the PE activities estimate to impact around 50 people. Three activities are planned with a total time of around 60 minutes (such activities can continuously be running over a one-hour session).

Project link to your research and benefice

How will the project link to your research and benefice: (a) the audience, (b) you and (c) your research? *(up to 250words) please avoid repetition of previous questions.*
Through the development of the PE activities, • research engineers will link their backgrounds in 3D-printing, mechanics and robotics to deliver interactive activities for young audiences in the context of surgical and intervention engineering, • young audiences will increase their awareness of the careers in the future

of medicine and will be beneficed with understanding of principles of robotics, photoacoustic, computer science, medical imaging, and its clinical applications in the context of ultrasound needle tracking,

- researchers will inspire others to follow up or create similar innovative experiences by sharing their experiences via blogs in websites of the School of BMEIS or other sites,
- the development of the technology, by research engineers in the current PE project, will potentially be published in peer-review scientific journals with the idea of sparking collaboration with other researchers within and outside the school.
- finally, researchers, while developing this project, will improve their skills in communication, project management and evaluation to gain experiences to explain better their future proposals to funders.

Project Timeline

Project timeline: (dates and milestones)
Please note that the project should be complete within 12 months of notification of funding (up to 100 words).

The project consists in the following monthly milestones:

1. [JAN-FEB] 3D printing for phantom development
2. [MAR-MAY] Developing the technology for interactive activities of the ultrasound-guide simulator (if possible, with involvement of the YPAG).
3. [JUN-JUN] Pilot and refinement of PE activities (if possible, with involvement of the YPAG).
4. [JUL-NOV] Delivery of the project which involves demonstrating activities to young audiences in events at KHP summer school, YPAG and local stage schools.
5. [DEC-DEC] Evaluation of the interactive activities through surveys to participants, different schools and different events.
6. [MAR-DEC] Publication (preparation, review process and submission of the manuscript)

Evaluation plans

How do you plan to evaluate your project: (up to 200 words)
Considering the timeline of the project, we will evaluate both (a) its progress and (b) the delivery of the activities. A. project evaluation: • Monthly meetings are planned to evaluate the progress of the project to be able to prepare plans with actions lists to be followed up. B. activities evaluation: • Participants will be asked to raise of their hands on (1) how enjoyable and (2) interactive the activities were for the case of group evaluation. • A 5 minutes survey will be run at the end of the PE activities asking about the impact on educational activities they receive from the PE activities for the case of individual evaluation, • Researchers will also be evaluated with a 10 minutes survey on the impact they made to the audience and how they benefit from doing PE activities. NOTE. In case of a pandemic environment, the team will make the necessary changes for its evaluation and its delivery (e.g., add distance separation of participants, reduce the number of participants or do a virtual workshop).

How will you share your learning with others?

How will you share your learning with others? *(up to 100 words)*
Considering that researchers are part of the Ultrasound needle tracking project which is part of the GIFT-Surg project, the experiences will be shared via blogs describing the experiences of both young audiences and research engineers by sharing photos of the audiences in the PE activities to our colleagues within King's College London and other institutions related to the project. Similarly, the project will be a legacy project that will lead to its continuation or improvement in coming years.

Financial details

Please note that the maximum funding per grant is £1000. Outline your total budget and provide a breakdown of your costs.

Outline budget

Item	Cost
Phantom fabrication materials for 3D printing foetus, e.g., Gel Wax, PVA, resin and silicone rubber.	£300
Materials for ultrasound needle tracking simulator and accessories (2 LPMS-B2 Series Inertial Measurement Unit, 3D-printing probe and needle, Magnets, screws, and tape)	£300
Materials for simulation chamber and accessories	£300
Catering and travel expenses for young people advisory group, during a consultation workshop	£100
TOTAL	**£1000**

References and useful information for the application

1. Read the application guidance (PDF, 172KB)
2. Complete this online application form by **17:00 GMT** on **Tuesday 1 December 2020**

Completed application forms should be sent to doctoraltraining@kcl.ac.uk