# Education for Sustainable Healthcare: Theory into practice

Dr Sarah Walpole, Hull York Medical School / Sustainable Healthcare Education network, Centre for Sustainable Healthcare

Dr Frances Mortimer, Sustainable Healthcare Education network, Centre for Sustainable Healthcare

July 2016

# Introduction

Global environmental changes are having profound impacts on human health, including through air and water pollution, forced migration and diminished food supplies (Watts et al. 2015). Human health depends on the health of ecosystems (Lang & Rayner 2012). The NHS is responsible for roughly 5% of UK environmental emissions (SDU 2013).

The Sustainable Healthcare Education network was founded in 2009 to develop and deliver teaching to prepare future health professionals to address these challenges. In 2013, a national consultation identified priority sustainability learning objectives (henceforth PLOs, see appendix 8) for medical students and doctors (Thompson et al. 2014).

##### 1. Describe how the environment and human health interact at different levels

##### 2. Demonstrate the knowledge and skills needed to improve the environmental sustainability of health systems

##### 3. Discuss how the duty of a doctor to protect and promote health is shaped by the dependence of human health on the local and global environment

Future health professionals need to be competent to inform, advocate and act to address environmental determinants of health and to manage transition to sustainable healthcare services. A systematic review about the learning needs of future doctors related to ecosystems found that medical students and health professionals lacked knowledge and understanding of the relationship between health, healthcare and environmental change and did not feel confident to put sustainable healthcare into practice (Walpole et al. 2015).

Building on existing research on learning needs of medical trainees, this research project aimed to trial and investigate the development and effectiveness of pedagogies for teaching on environmental sustainability.

# Aims

This project aimed to:

1. Facilitate participants from six medical schools to develop new teaching about sustainability to implement at their institution
2. Evaluate progress and challenges in implementing teaching on sustainability
3. Evaluate the effectiveness of pedagogies employed for facilitating learning on sustainability through student feedback and educator feedback
4. Recommend effective approaches to the development and implementation of education for medical students about environmental sustainability, and inform further research on this topic

# Methods

A nine-month programme outline was developed with advice from an expert in sustainable healthcare education[[1]](#footnote-1) and from an expert in medical education evaluation research[[2]](#footnote-2), including aims, structure, participants, working methods, evaluation methods and timeline. A brief introduction to and outline of the programme was sent to members of the Sustainable Healthcare Education network, along with an application form.

All applications were reviewed by the researchers according to predefined selection criteria in three areas: diversity and strength of the team (whether it included students as well as medical school faculty), motivation and identification of opportunities to develop new teaching, and commitment of the team to full participation in the programme. Eight schools were selected to take part in the programme. All schools were informed of whether or not they had been successful in their application.

A date was set for a face-to-face seminar, and in advance, all participants were asked to:

1. Identify and meet with their team
2. Read the detailed PLOs, case studies and resources which were emailed to them[[3]](#footnote-3) and discuss them with their team (teams could divide up the resources and each review one or two and present to the others)
3. Identify sustainability initiatives and champions within the university and hospitals locally that they could link to
4. Discuss with their team and other colleagues at the medical school any opportunities and strategy for implementation of new material
5. Identify at least two sessions that could be implemented at the medical school

The seminar ran as follows:

* Opening questionnaire, introductions, interactive training on the purpose of education for sustainable healthcare and the priority learning outcomes around which the programme is based
* Discussion of pedagogies for teaching, strengths and weaknesses of existing teaching plans, linkage of sustainability to existing curricular topics
* Development of one existing teaching session, one new teaching session or an overall approach for each medical school, with support from research team
* Trial of new materials,
* Discussion and provision of existing teaching materials to facilitate development and delivery of teaching
* Discussion of the programme, including evaluation methods, questions from participants, questionnaire feedback, close

Online participants were connected via ‘skype’ prior to the start of the workshop in the room. They were introduced to the seminar, and given information about the first task. They then took part in the introductions in the room before working with the other online group to complete the first activity.

Participant observation and questionnaires during (on paper) and after the seminar (online using ‘surveymonkey’) were used to collect data.

After the seminar, participants were encouraged to work with the other participants from their school – their sustainable healthcare education team (SHE team) – to develop and deliver new teaching. Three months after the seminar day, participants were asked to complete a questionnaire, including questions about whether they have delivered the teaching, any challenges faced and reflections on the process of developing and delivering teaching. Data was collected using ‘surveymonkey’.

Participants were also invited to join a videoconference call in order to share their experiences, feedback, ask questions and discuss issues with other medical schools. Record of key issues discussed during these calls was made by the call facilitator who was one of the researchers.

Evaluation forms for students and educators were developed by project coordinators, and all educators were invited to give feedback on the student evaluation forms, which were then adapted. After implementation of teaching, evaluation forms were distributed to students and to educators. Results were collated and medical schools were sent a write up of the results of their implementation and evaluation to verify.

# Results

## Applications from medical schools

Applications were received from 11 medical schools. Eight were chosen to take part.

Opportunities identified by medical schools who applied included, senior support, strategic alignment, curriculum reviews forthcoming, modules which were under review and availability of teaching staff and/or timetable space for new teaching sessions.

## Evaluation of face-to-face seminar

Online questionnaire evaluation was received from ten educators and six students; two participants from each of the eight medical schools. Over 75% or respondents rated all aspects of the seminar and the programme so far as good or excellent, this included communication about the programme, educational materials sent in advance of the seminar, organisation of the seminar, education provided during the seminar and preparation to implement new teaching.

Free text responses showed that participants found the seminar useful because of the learning about the challenges and approaches used in other medical schools, as well as education about the sustainability learning outcomes and their relevance to their teaching (appendix 3). While some schools felt that the pre-course materials were useful, others felt that more reference should be made to the pre-course materials during the seminar, or conversely that there was too much repetition of the pre-course tasks during the seminar. This highlights the range of needs and preferences of the educators and students participating in the programme.

As facilitators, our notes from the face-to-face seminar included the following:

“*Friendly and engaged group, mixing and having interesting conversation straight away. We held the ‘go around’ introductions until the group had done a simple exercise to begin to meet each other and get a sense of each other. We felt that this would make the ‘go around’ more memorable.*”

As facilitators, we noted challenges and benefits of online participation. A benefit was that one school would not have been able to be involved without the possibility of participating from their own medical school due to other local commitments. More members of their team were able to join the session; some participants joined for only a part of the day. Online participation reduced the associated carbon emissions of long distance travel to the seminar. The disadvantages of having online participants was that they were not as easily able to network with other participants and they may not have felt as much part of the team. Overall we found that having two remote groups was beneficial, as they were able to work together over skype for group tasks.

There was good engagement with all tasks. All participants managed to produce a plan or outline of what they would do during the programme. We found that the presentation of plans by each medical school was very effective, as evidenced by the active listening demonstrated by other participants and the feedback and questions offered. We noted that:

“*Participants commented on each other’s plans, made suggestions, and networked and identified where there were similarities between their plans and they could support each other’s work.*”

## Evaluation of follow up calls after the seminar

One month after the seminar we spoke to all schools by phone or skype. Schools had all made some progress on planning or implementing new sessions (appendix 4). As call facilitators, we noted the challenge of scheduling a call for many different educators and of using time on the skype call effectively. We scheduled three calls in order to talk to all schools, and we had to have one separate telephone call with an educator who could not attend. We wanted all schools to have opportunity to contribute and feedback about their progress, and for this to be balanced with time to allow interaction, comments on each other’s progress and discussion about differences and similarities between plans, challenges and opportunities in different schools.

Three months later, we tried to have further follow up calls to support teams and evaluate progress. At this stage we were having great difficulty engaging with two teams and we only managed to speak to six teams, but all those who we spoke to were able to join a skype call and hear from other participants. We found that the collaborative call was more useful at the early design stage of the project. At this later stage of the project, most schools were already started with implementation and had less flexibility to explore and incorporate new ideas.

## Implementation and evaluation of new teaching

Seven of the eight schools involved in the project were successful in implementing new teaching. The teaching implemented was of a range of different formats and lengths, including single lectures, student projects linked to a clinical placement, ‘student selected components’ (or ‘student selected modules’, henceforth SSCs) and an addition of reference to sustainability within an existing teaching session.

During programme development, challenges of evaluation were discussed, in particular the challenge of identifying the impact of different pedagogies given the wide variety of other factors that affect the process and outcomes of teaching (i.e. identifying why differences between outcomes arise). Another challenge would be collecting sufficient data given time limitations and the remote locations of participants. To maximise the potential for effective evaluation, it was decided that evaluation would focus on which pedagogies are most effective, rather than which content is most engaging for students. Information was nonetheless collected about intended learning content (which PLOs were addressed) to inform an understanding of how effective the teaching had been. Evaluation was limited to an assessment of acceptability and effectiveness of teaching. To enhance understanding of which pedagogies were effective, educators were also asked to identify variables (such as characteristics of the medical school, student cohort or teaching environment) that could or were considered to affect the outcome of teaching.

We aimed to collect feedback from students and educators at all eight medical schools. The discussion below outlines findings from five schools that provided educator and/or student feedback through the project evaluation forms. Two schools collected both student and educator feedback on the online surveymonkey form developed for this project. Three schools provided educator feedback to this project informed by student feedback collected locally. Of these three, one was not allowed to distribute an external evaluation survey to students because of a lack of prospective ethical approval, and two did not want to risk sending too many evaluation forms to students.

For the remaining three schools, one had not offered new teaching and the remaining two sent some details of the teaching by email. For further details of the teaching that was planned in each school, see appendix 5.

### Medical school 1 – First year lecture, Third year group session, and Fourth year group session

Three new sessions were introduced at this medical school. Student feedback could not be collected, but the lecturer provided feedback including improvements that could be made.

#### First year lecture

This medical school added a new 45-minute lecture for first year medical students. The lecture addressed PLOs one and two:

##### PLO1: Describe how the environment and human health interact at different levels

##### PLO2: Demonstrate the knowledge and skills needed to improve the environmental sustainability of health systems

and the educator commented that “*content had a strong clinical angle which the made it relevant to the module - and to students at the start of their first clinical foundation module.*”

The educator was satisfied with the selection of learning outcomes, planning and structure of the session, delivery and content, but was dissatisfied with student engagement. The educator suggested that student engagement could be enhanced by timetabling the session earlier in the day and as a small group session rather than a lecture.

The educator suggested that the session be linked to prior or future sessions to avoid the perception by students that it is an “*isolated / one off session*”, and to ensure that students grasp key concepts, which “*may have been too complex for students*”.

#### Third year sustainable healthcare large core group session

A new hour-long large group core session was introduced in year three. Again, this session introduced sustainable healthcare concepts and took a clinical angle, addressing PLOs one and two.

For this session, two student members of the SHE team were present in the audience. They gave positive feedback, saying that they thought the session was made clinically relevant by the inclusion of a case study of a patient with a non-communicable disease. The limitations of feedback from students with an interest and involvement in sustainable healthcare education are recognised; this feedback is not necessarily generalizable to the rest of the student population. Full educator feedback was not received for this session.

#### Fourth year primary care large core group session

A new large group core session lasting one hour was introduced in the primary care module that runs in year four at this medical school. The SHE team lead introduced the session by giving a background to sustainable healthcare. A local GP and sustainability lead for a local Clinical Commissioning Group then presented about various ways that they are introducing sustainability into healthcare locally. This session addressed PLOs two and three:

* PLO2: Demonstrate knowledge and skills for improving the environmental sustainability of healthcare
* PLO3: Discuss how the duty of a doctor is shaped by the dependence of health on the environment.

Evaluation was carried out by distributing the medical school’s evaluation forms and by educator feedback on this project’s evaluation form. The educator described evaluation forms from the medical school as “*generally very positive*”, and student feedback informed the educator feedback, but no further information is available about the student feedback.

The session focused on application of sustainability to clinical practice and made only very brief reference to wider environmental change such as climate change. The educator suggested that using local examples of good practice is particularly engaging, and is an approach that could be taken at other medical schools:

“*Good to have [a] clinician to provide clinical 'hook'. Made it relevant to their practice and to the rest of the module by ensuring that content had examples of local practice in primary care.*”

The educator who developed the session met with the module leader to ensure that this session was in line with rest of teaching in this module, and was satisfied with all aspects of the session, from planning to delivery to engagement.

Two suggestions were given in educator feedback. Firstly, that the session was scheduled too late in the year and the degree course and it would have been better to introduce the concept of sustainable healthcare earlier. The fact that students only received teaching on sustainable healthcare within a primary care module may have led to students having difficulty identifying links between sustainability and secondary care. The educator described this topic as being its own ‘language’, highlighting the need to introduce it earlier and across the curriculum. A second suggestion was that the session would have been better if taught in small groups to allow more interaction and engagement, however this would have been difficult to achieve due to limited capacity of teaching staff who have relevant expertise.

### Medical school 2 – Third year lecture and case-based small group discussion, First year SSC

After consideration of different possibilities for implementation of new teaching based on the expertise of the team of educators, this medical school introduced a new lecture and a case-based discussion for third year medical students.

#### Lecture and case-based discussion

The one-hour lecture introduced concepts underpinning PLO2 and PLO3

* PLO2: Demonstrate knowledge and skills for improving the environmental sustainability of healthcare
* PLO3: Discuss how the duty of a doctor is shaped by the dependence of health on the environment.

and encouraged students to consider their role in delivering sustainable healthcare. The facilitated case-based discussions (one-hour session, which was repeated three times for different groups of students) allowed students to develop and challenge their own ideas around a range of core issues within sustainable healthcare practice (PLO3). The teaching was followed up by a (non-compulsory) reflective submission describing an aspect of clinical practice that students had observed or been part of that they recognised as an area for improvement in relation to the principles of sustainable practice.

The team developed four problem based learning-style cases covering; drug waste in the community, surgical/anesthetic waste, hospital food procurement and waste and patient transport. The team collated relevant resources (including research articles, newspaper articles, and case studies) and made these available via the virtual learning environment (VLE) to support small group discussions. The discussions were facilitated by members of the SHE team and the sustainability group from the local hospital trust. At the end of the facilitated discussion session, each small group was asked to produce and present to the rest of the group a short summary of their reflection and ideas with regards to the specific case they discussed.

Student feedback was collected locally and educators then completed the project feedback form. Educators reported that student feedback was extremely positive, and students enjoyed the opportunity to explore a different aspect of healthcare provision. Students enjoyed the enthusiasm of the staff involved in delivering and facilitating the sessions.

Educators reported that positive aspects of the new session were that it provided a learning opportunity for the whole cohort, and that potential clinical "role models" as well as other relevant stakeholders (such as local hospital sustainable development team) were involved in the teaching. They reflected that facilitated small group discussions worked very well, which was possible due to the relatively small student cohort. The involvement of a range of stakeholders - clinical, academic and local hospital policymakers - was also a real strength of the programme.

Students reported that the timing of the session at the end of the year, close to assessments, was unfortunate and possibly impacted upon the lack of engagement with the follow-up reflective activity. Educator feedback also recognised this problem but felt it was unavoidable given the short timescale to develop, schedule and deliver the session. The team plans to address this issue for the coming academic year and introduce teaching opportunities into earlier years of the programme. Highlight The Th

#### Student selected component

This medical school also offered a first year SSC (short literature review on the impact of air pollution on health – PLO1) relevant to environmental sustainability, but unfortunately no students selected to undertake the SSC.

Interestingly, following the year three teaching intervention described above, a number of year three students enquired about the availability of year three SSCs on environmental sustainability and healthcare. The SHE team of educators therefore hopes to develop and offer SSCs to future student cohorts after they receive the core teaching sessions.

**Highlight**

### Medical school 3 – First year SSC, second and third year SSC and two first year lectures

Medical school 4 introduced a new SSC for first year undergraduates, and two first year lectures to enhance the sustainability perspective.

#### First year SSC

For the SSC, after meeting with a tutor to discuss learning objectives, students chose their own essay title and wrote a description of their essay. They submitted a one-page essay outline half way through the SSC, and a ten-page essay at the end. Forty hours of learning time were allocated to the SSC. There was potential for students to address any or all of the three PLOs.

Four out of five students provided feedback on surveymonkey. Students commented that they enjoyed the SSC overall. They enjoyed the flexibility to choose their own project title and felt that they were directed to useful resources to inform their project work. Three students commented that they could see the relevance of sustainability to their future practice and would be more environmentally conscious; in contrast, one student said that they could not see the relationship between the topic of sustainability and their medical degree.

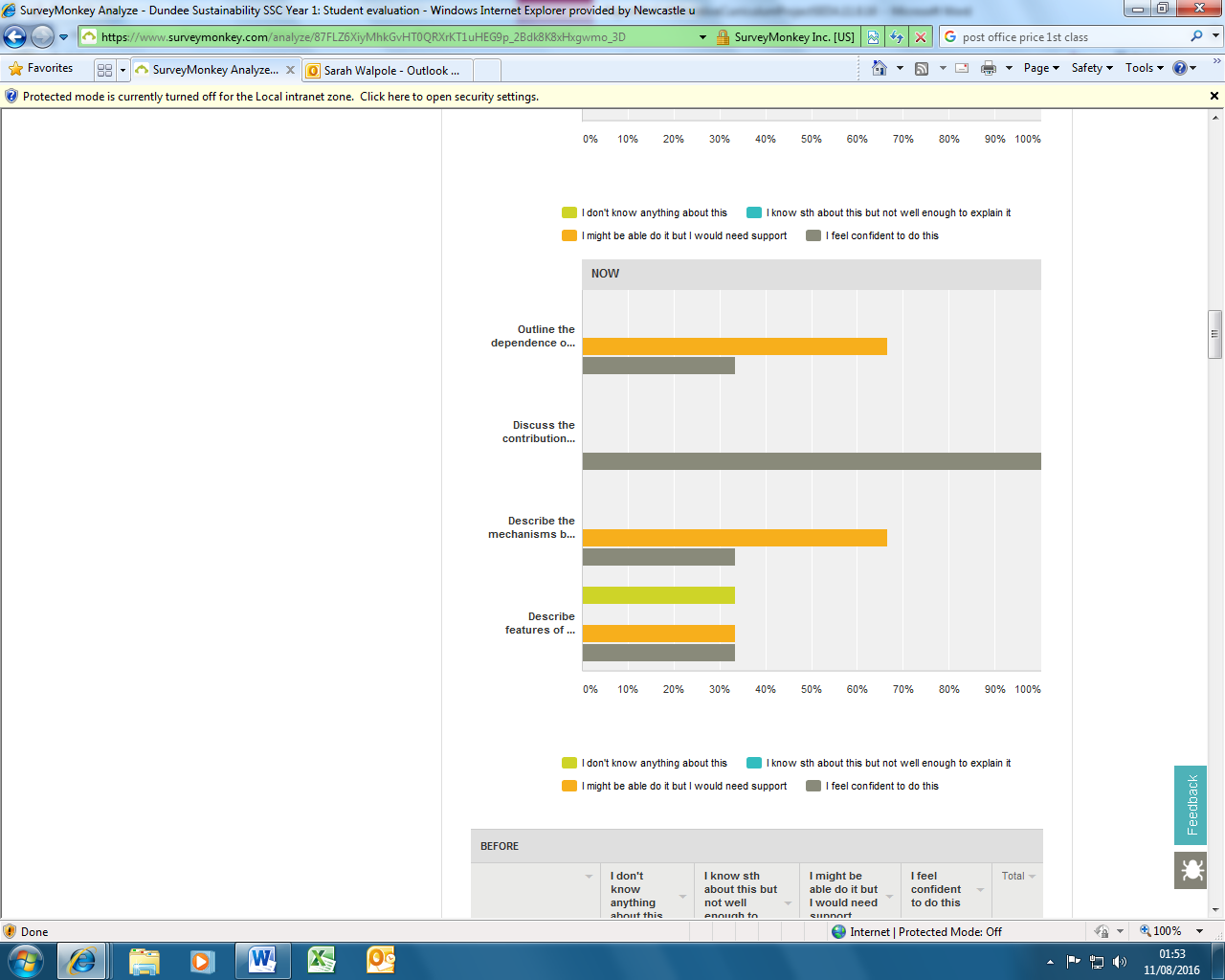
“*Learning about the impacts of environmental change on the NHS was very useful as it is something that I will be directly affected by in the future.*”

*“The learning on my SSC topic I don't think I'll use again as it was so specific and doesn't relate to the course very effectively.”*

The student who did not see the relevance of the learning to their future practice commented that they gained useful generic, essay writing skills. Another student also said that they had learnt useful research skills.

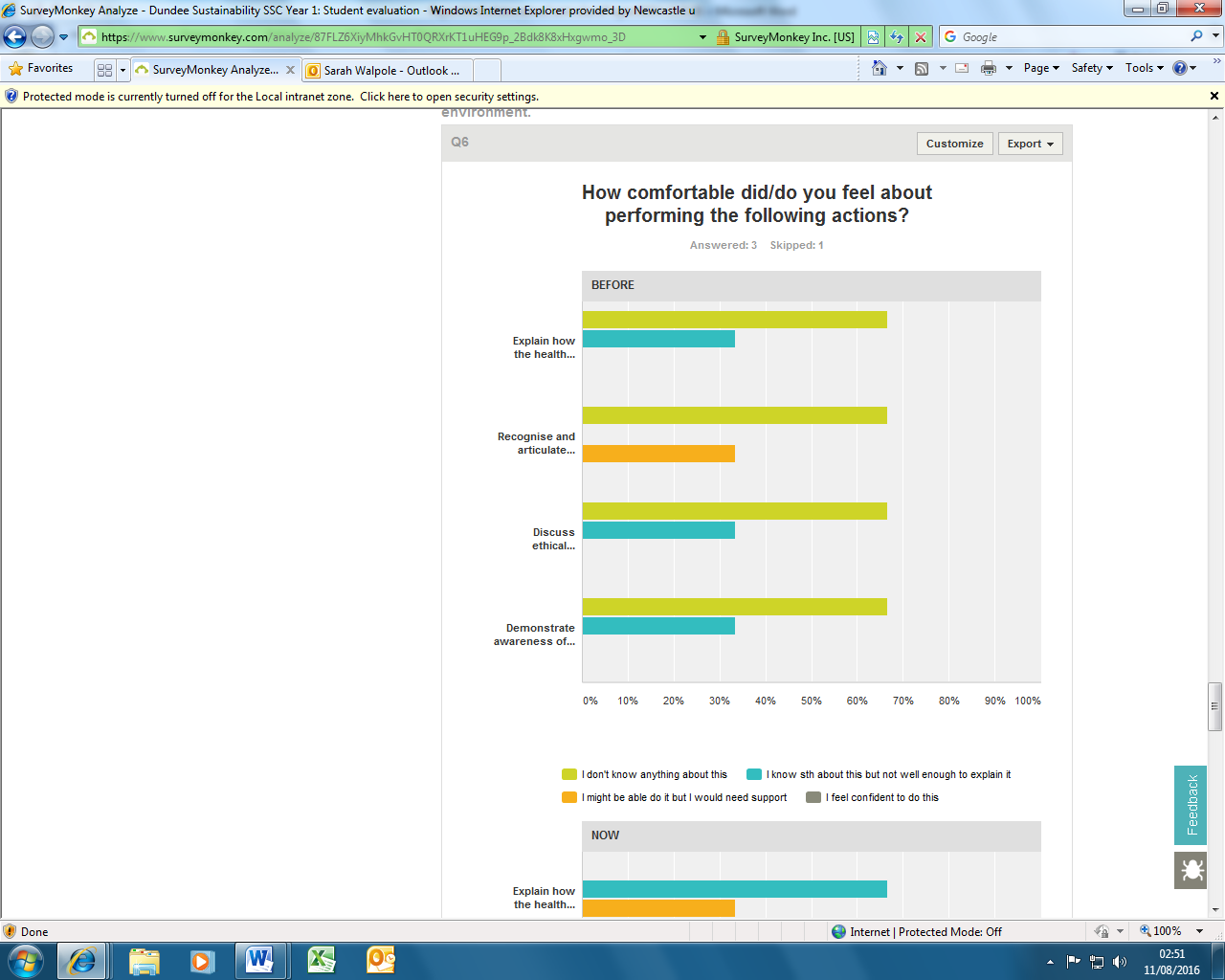
Students’ suggestions for improvement were to relate the teaching to their local NHS trust and to provide more opportunities for interaction with other students to enable ideas sharing. They suggested that more opportunities to meet with the supervisor and receive more guidance on project structure and expected outcomes would have been beneficial.

Of the three students who answered questions about their knowledge and understanding before and after undertaking the SSC, all answered that they had increased in knowledge and understanding of all three learning outcomes (see graphs).







Educator feedback was that this SSC was relatively easy to run and did not demand a significant amount of time to facilitate. The educator felt that a short seminar and discussion at the start of the SSC might be an improvement and is considering this for next time. The educator was satisfied with planning, delivery, content and student engagement in this SSC.

#### First year lectures

Two first year lectures were developed to include a sustainability perspective. A lecture on respiratory disease included teaching about air pollution and water and sustainability, and a lecture entitled “How to live forever” included teaching on climate change and the environment. Local feedback was collected from the 143 students attending these lectures, and the educator was satisfied with all aspects of the lectures, but recognised that the environment was not the main focus of either lecture.

Educator feedback on these lectures was that they were well received. Although climate change was not addressed in great depth, the lecturer felt that sufficient attention was paid to this topic in line with medical students’ learning needs. The educator was satisfied or very satisfied with the planning, delivery, content and engagement with both of these lectures, and felt that there were no notable contextual factors that influenced the outcome.

#### Second and third year SSC

This session was designed but unfortunately did not run. The educator commented that there was overprovision of two-week SSCs and therefore by converting this to a four-week SSC there may be opportunity to run it next year.

### Medical school 4 - Fouth year Health Promotion SSC

An existing course was adapted to pilot a primary-care based quality improvement (QI) project, integrating sustainable healthcare. Forty-six students were allocated to six GP practices, given a theme related to improving sustainability (e.g. shift to electronic communication; reducing smoking among COPD patients) and asked to make an improvement using QI methodology. GP educators were offered briefing on sustainable healthcare and its relationship to QI, however only one GP took up this opportunity. Other GP educators were briefed through written materials.

Students received eight hours of teaching of which two to three hours were about sustainability, and they spent an additional six to 12 hours in self-directed learning.The learning outcomes covered were:

* PLO2: Demonstrate knowledge and skills for improving the environmental sustainability of healthcare
* PLO3: Discuss how the duty of a doctor is shaped by the dependence of health on the environment.

Some students also attended an existing fourth year lecture on sustainable healthcare which is delivered by external lecturers.

Students were expected to plan and implement a QI project over five months. They could choose one of three topics to present on: efficiencies in being paperless; social prescribing and health promotion interventions; or the environmental impact of the GP practice.

#### Results of student evaluation:

Twenty-one of 46 students completed online questionnaires about the sustainability component of the SSC. Their responses indicated a significant increase in knowledge and confidence across the two intended learning outcomes (PLOs 2 and 3).

Summing student self-evaluation scores across all five domains of PLO2, 72% of responding students (n=20) reported that, before the session, they either “didn’t know anything about this” or “knew something about this but not well enough to explain it”. Following the teaching, this had changed significantly, with 66% reporting either that they either “might be able to do this but would need support” or “feel confident to do this”.

****

Similarly, students reported that their confidence in discussing the ethical dimension of sustainable healthcare (PLO3, which was not intended to be taught) had increased following the SSC. Across the four domains of PLO3, 74% of responding students (n=19) reported that, before the teaching, they either “didn’t know anything about this” or “knew something about this but not well enough to explain it”; whereas 83% reported that, following the teaching, they either “might be able to do this but would need support” or “feel confident to do this”.

Areas to improve upon were highlighted by student feedback, which discussed a lack of interest in sustainability, difficulty in understanding the concept and application of sustainability in QI and difficulty designing and completing a project in a short time frame.

Qualitative feedback suggested that, while some students were interested and engaged by the sustainability aspect of the course, others did not see the relevance of taking a focus on sustainability in their QI project. These students focused on the development of generic QI skills. Students did not report that including a sustainability focus in the SSC had detracted from development of generic QI skills.

Some students found it difficult to design an achievable project, and would have preferred to implement an improvement project in a setting with which they were more familiar.

Some reported that they would have liked more structure and support or were unclear about the learning objectives for sustainability. This may have been due in part to variability in the levels of knowledge and engagement of GP tutors. Although sustainable healthcare briefing sessions had been offered to participating GPs, only three out of six had attended.

#### Educator self-evaluation

Educators reported that positive aspects of the project were that there were practical outcomes which were useful for the GP practices, and that both students and GPs valued working on sustainability. Educators commented that students did not complain about the topic and accepted the rationale and opportunity to address sustainability. After reading the student feedback which highlighted that not all students had grasped the relevance of sustainability, one educator discussed the challenge of engaging students:

“*Establishing relevance and importance is an ongoing issue. Once you are on the ‘I get it’ side of the fence, it is sometimes really hard to identify with students that are on the other side of the fence.*”

Similar to the students, educators recognised the impact of time limitations. It was difficult to complete a QI project within the available timeframe. Another challenge that educators recognised is that of measuring the quality and effectiveness of QI projects when “*relying on qualitative outcomes rather than quantitative measurable data.*”

The medical school team have reflected on the positive outcomes as well as areas for improvement in future years. Educators commented that GP placements have provided a useful opportunity to plan and do a QI project and that this approach could be transferable to other medical schools.

At this medical school they plan to increase the number of students doing QI projects during their GP placement year on year. They were therefore very receptive to feedback from students. They plan to set clearer guidelines about the measures that will be used to evaluate QI projects. Students will plan outcome measures in advance so that most students should achieve measurable improvements, and those who do not can reflect on reasons for this. The educators also suggest that more pre-briefing, perhaps including e-learning, could help to prepare both GP practices and students for this project, and the medical school have already started to pre-brief GPs for the next year.

****

****

### Medical school 5 – Third year SSC

At this medical school, an SSC was designed to address all three PLOs through a variety of lecture, seminar and project-based teaching. The SSC was allocated 30 hours of study time.

Four students selected the SSC (and a fifth joined partway through the course). The sessions on the SSC were:

1. Science of global warming (delivered by SHE team lead) & The potential health impacts of rising temperatures (delivered by SHE team student representative)
2. Waste management at [local acute Trust] ( head of waste management );
3. Behind the scenes: a trip to the combined heat and power plant at acute Trust. Energy consumption and management (Head of Estates at acute Trust).
4. What should we leave our grandchildren (guest speaker & debate)
5. Sustainable transport at [Trust] (sustainable transport manager)
6. DC cardioversion list: clinical management, resource and energy use for patients undergoing DC cardioversion.
7. Global perspectives: the demographic and population changes consequent on rising sea levels in low lying and delta regions in the world (visiting academic).
8. A comparative trip to a local sustainable building to see the fabric behind ground source heat generation for building management.
9. Quantifying the CO2e for a DC cardioversion
10. Student presentations and debrief

Student evaluation was collected using local evaluation forms, and the online evaluation form for this project could not be used. Student self-evaluation (about their understanding of the PLOs) and feedback on the session was collected at the end of sessions one to eight and shared by email with the researchers for this project to inform evaluation.

Over the first eight sessions, self-evaluation scores across all three learning outcomes increased from “know a bit about this but not well enough to explain it” to either “might be able to do this but would need support” or “feel confident to do this”. Feedback suggested that students were motivated and engaged, and benefited from the small group, interactive format.

*“Group discussion was really good, lots of thought provoking statements and questions. Interactivity made understanding the basic science very engaging and more likely that I will remember it.*

*“really good small group session enjoyable and educational”*

*“Really interesting to look at the workings of a modern energy efficient building. Particularly good to look at windows [automated]. Really enthusiastic staff helped the whole experience.”*

The educator also collected informal verbal feedback from students at the end of the course. Students made comments that the benefits of the SSC were “*broadening our horizons*” and recognizing that there are “*no right answers here*”, and they questioned “*why have we not thought of this before*”. Students suggested that the SSC promoted a very different kind of thinking compared to other teaching that they receive during their medical degree, where there is always a right answer and the educations seems “*sanitized*”.

The educator was very satisfied with the planning, structure, selection of PLOs, content and student engagement on the course, and satisfied with the session delivery.

*“The students stated they were never bored, always interested and the variety of subjects covered was broad though not exhaustive. Their engagement in the project to carbon footprint the DC cardioversion pathway went particularly well. I was delighted when each of them had time in our last session to present an interesting topic. We had edible cutlery, the carbon intensity of beef rearing and the impact on healthcare delivery from rising sea levels in XX”*

The educator suggested that the dedication of the students made the work of teaching the SSC enjoyable, and highlighted that that SSC resulted in a tangible outcome (carbon footprinting of DC cardioversion) which the students have had opportunity to present.

*“At the end I believe we went further than I could have imagined at the outset, had a super group of hardworking interested students who will present our DC cardioversion data at the sustainability symposium.”*

## Evaluation of this collaborative curriculum development programme

Six out of eight schools provided feedback on this programme as a whole. Of nine individual respondents, eight were educators and one was a student.

Participants were asked to rate the following aspects of the programme as ‘poor’, ‘adequate’, ‘good’ or ‘excellent’: communication from programme leads, facilitation of collaboration with other teams, educational materials provided, initial seminar, group calls and preparation to facilitate implementation on new teaching. For all aspects, the majority of responses were ‘good’ or ‘excellent’. Only for group calls was one rating of ‘poor’ given. The participant who gave this rating did not provide further feedback about how the calls could be improved, however the researchers recognised that improvements could be made to the group calls. Acting as facilitators, the researchers found that it was challenging to ensure that all participants had time to present their progress update and challenges, but also to go into sufficient depth on questions and issues raised to stimulate interest and learning of participants. Smaller group calls, with a maximum of four schools and a focus for each discussion (e.g. how to address a particular challenge) might be one solution to improve group calls.

#### Identifying collaborators and building capacity to develop and deliver teaching

Respondents highlighted improvements that can be made in future collaborative projects. A number of participants said that building capacity of educators is crucial in order to disseminate education for sustainable healthcare. It was suggested that more time and other resources could be devoted to building the capacity of educators, which was beyond the scope and resources of this programme, but is a consideration for future:

“*The potential to have 'education for educators' workshops - providing some basic training/support for clinical educators who are interested in incorporating some sustainability education but unsure where to begin - might help them feel more prepared to do so”*

One respondent highlighted a particular challenge for teaching on sustainable healthcare is that it is a cross-specialty topic, and therefore there is no one group of specialists in which interest and expertise will be found:

*“For other subjects, it is much more straightforward to identify potential allies as they tend to be within the same discipline; however, for SHC, they could be from any speciality so can be more difficult to do this. I'm not sure whether this programme could have helped with this - other than to provide 'case studies' of how other schools have managed to build capacity?”*

#### Resources and limitations affecting outcomes

Participants suggested that resources could have provided more useful case studies and that lecture slides were not user friendly:

*“[would have liked to see] better prewritten resources. More information from programmes which were working about what exactly they did.”*

“*Used some existing materials to develop our own lectures etc - however, many of the lectures posted on the SHE website are not well put together.. needed a lot of work before they were useable - ended up being more work than just writing the lecture yourself from scratch”*

A number of participants said that time limitations were the greatest challenge in relation to this programme, with comments such as:

*“Shoe-horning it into an already over-full job plan”,*

“*Trying to coordinate group devoting adequate time/resources to objectives”*

One educator commented that the time pressure might have been less if the programme could have been started during or before the summer, rather than at the start of semester one when teaching is starting.

Respondents overall expressed that they were satisfied with the outcomes achieved through their work. One participant said that they had learnt *“how quickly courses can be implemented”.* Only one participant said that they had found implementing a new SSC much more work than expected and therefore the SSC could not continue.

#### Student engagement

Many educators commented that students had supported the implementation of new teaching, and/or that students had responded well and engaged well with new teaching. One participant was impressed at *“how supportive the students are when timetables are continually 'developing'.”* Only one educator had rated student engagement in one of their sessions as less than ‘good’; it was rated ‘average’ and the educator felt this may have been due to the session running at the end of a long day of teaching.

To better engage students, one educator suggested that focus needs to be on the local impacts of sustainability initiatives - through efficiency savings, better outcomes and reduced morbidity – so that students can see that their own individual efforts can have an impact.

*“I think we are missing a trick by not also selling a more local argument. I think this would help to pick up and involve students with a broader range of values. Survivalists as well as universalists?”*

#### Collaboration

Positive feedback suggested that involvement in a collaborative project has utility because it can motivate educators to prioritise a particular area of work:

*“Prompted to take action that otherwise would have sat on the back burner for longer.”*

*“This has been an inspirational programme that was well led. It has certainly pushed us further than we would have gone otherwise, and given us added gravitas when discussing sustainability teaching and learning with faculty.*”

Respondents suggested that being part of a collaborative project can help to give impetus to a topic, to highlight its importance to other medical school faculty and to support negotiations to find space in the curriculum:

“*Being part of this programme has been a really useful lever in my negotiations within the medical school as demonstrating that other medical schools are also implementing this teaching has been a powerful argument to support this teaching.!”*

In contrast, another educator commented that gaining support beyond the core team among medical school faculty was a major challenge: *“the buy in - it was at first seen as one of my pet extra projects.”*

Participants also recognised the limits to their collaboration. Unfortunately, time pressures meant that the benefits of collaboration did not extend much beyond being inspired by other participants, for example, despite early discussions about collaborating to develop theory and practice on various issues (e.g. student partnership), time was not found to do this.

*“I put collaboration with other teams as a 'good' but I don't think I had much space to collaborate further than we did (I loved hearing what they were up to at the orientation session, but beyond that I didn't have time to give or receive much input from them)”*

*“I didn't put my lectures on line so why would I expect anyone else to do so?”*

# Discussion

This project has highlighted the potential to stimulate and support teaching innovation through collaborative working. We expanded the number of schools accepted onto the programme from six to eight, because of the high level of interest and high quality of applications. Two aims of the project – engagement of six medical schools, and evaluation of progress and challenges in implementing new teaching – have been achieved. A third aim of evaluating effective pedagogies has been achieved to some extent, however challenges were faced particularly in the evaluation phase. The final aim of recommendation of effective approaches for developing and implementing new teaching and areas for further research has been achieved, as there has been some learning about barriers and opportunities to implementing new teaching and gaps in understanding about teaching pedagogies and student engagement have been identified.

### What teaching has been implemented, and will it continue to be delivered?

In terms of the effectiveness of this project at enabling the development and delivery of new teaching, the success of schools in implementing new teaching and the type, length and audience for teaching was very variable. Many participants commented that the programme provided motivation which led to implementation of new teaching that would not otherwise have occurred.

Two of the three schools that were not able to be involved in the evaluation – one due to no response from educators and one due to no new teaching being implemented – were the schools that had the most wide-ranging plans for implementing teaching across different modules. This implies that schools were more successful at implementing and evaluating teaching where they had a discreet, clearly defined plan, consisting of one or more sessions to add to an existing course or one SSC for a small group of students. Educators highlighted, however, that isolated teaching episodes have the disadvantage that students may not recognise how sustainability is relevant across all of the curriculum.

Whether the teaching that has been implemented during this project will continue to be delivered in coming years is not yet known. Some schools are clear about plans to continue their teaching sessions, while in other schools this looks less likely. The two schools where it is least likely that teaching will continue are the school where the main SHE team educator is leaving, and a school where no medical faculty are involved (the educator is a clinician educator). In at least three schools, there are plans to extend the teaching to reach more students, or to address new aspects of sustainability.

### What challenges were faced during the programme?

The major challenge for this project was time and resource limitations. Many aspects of the project required more time than anticipated. Recruiting teams took longer than expected, both in terms of schools preparing applications and in terms of time to advertise to, inform and respond to potential applicants. The application deadline was extended twice due to schools asking for more time. Lessons learnt from this were to allow more time for applications, and to avoid an application procedure during the summer months, particularly because July and August are difficult months for involving students. Engagement during the programme required more time than anticipated. Schools often required clarification of tasks during the programme. Response rates to emails were usually very low, and each email required at least one follow up email to elicit further responses.

Another major challenge was that this project aimed to implement teaching about a topic which many educators were not familiar with, or were not familiar with in the context of medical education. Due to some schools and participants having little experience of sustainable healthcare, a significant emphasis of this programme had to be on building understanding and capacity to teach about sustainability. This took resource away from the evaluation of new pedagogies.

#### Evaluation

Challenges were faced in terms of evaluation. Practical problems, including educators lacking time to respond to emails and send out the link to the evaluation form, was a barrier to sending student evaluation forms out at all schools. Some schools were obliged to use local evaluation procedures, therefore sending an external evaluation form would risk asking for too much feedback from students. Internal or external evaluation of teaching may yield different results due to the students feeling more or less inhibited to give their reflections or teaching, for example. One school could not participate in evaluation because ethical approval was not gained in advance, and in future this should be considered before beginning a project.

SHE teams had the freedom to develop teaching according to local opportunities and resources, which naturally led to very disparate contexts, pedagogies and content. We attempted to align evaluation using PLOs, but it was still difficult to compare results (and also the teaching in many cases did not align directly with the PLO domains). Evaluation of the effectiveness of different pedagogies was also limited because only three schools succeeded in collecting student feedback which could be analysed directly as part of this project. Those projects which did provide student feedback to the researchers were quite disparate, one being a QIP, one a dissertation-based SSC and one a structured, interactive SSC.

In terms of the lessons learnt from feedback, there was some limitation where feedback was only available from educators, and there was either no student feedback or student feedback was only conveyed in summary form by those educators who had delivered the teaching. Furthermore, feedback was collected at different time intervals after the teaching, between a few days after and a few weeks after, and later evaluation may provide different insights, depending on the retention and reflection on new concepts explored.

Qualitative evaluation inherently has limitations in terms of comparability between schools. Relatively small numbers of respondents gave feedback on each teaching intervention and response rates were between 20 and 80%, therefore the responses may not be representative of the perspectives of much of the student body.

### What lessons emerge about collaborative projects?

Collaboration was mainly through email and skype, but a face-to-face seminar at the start of the programme was very beneficial to allow relationship building between participants. Remote seminar participation was requested by one school. Although remote participation does not allow for the same informal discussion and personal interactions, it was very beneficial as it allowed two medical schools to attend without incurring very large time, financial and environmental costs. The challenge of this approach was that we needed to ensure that remote schools felt as much part of the programme as those attending in person for the seminar. Having two remote schools worked well, as they were able to do group work together over skype. Overall, the two schools who participated in the seminar remotely were as successful at implementing new teaching as other schools.

We were able to engage with medical schools with a wide range of previous experience of teaching on environmental sustainability. This brought challenges, such as the need to provide more information to bring schools with less experience up to date with the topic area, and to enable all schools to feel comfortable and confident working with the network. An advantage of this variety may have been that schools with less experience were able to identify possibilities and advance more quickly.

Collaboration between multiple medical schools had two main advantages. Firstly, it was found to be very motivating for participants. Secondly, being part of a collaborative multi-school project helped participants to highlight the attention being paid across the UK to this topic area, and to advocate for and negotiate space for this topic in their curricula.

Limitations to collaboration were recognised. Due to time constraints, collaboration was mostly sharing of experiences and ideas at an early stage in the project. Schools were not able to work together to develop teaching or pedagogies. Many participants commented in the final evaluation that they would like to know how other schools had progressed during the programme, highlighting that interest in the progress of other schools was maintained. Further work may aim to identify what types of interaction between SHE teams are most beneficial for education development, for example, whether collaborative working between schools that are working to develop similar format of teaching or between schools that are geographically closer and can meet in person more regularly.

### What lessons emerge about pedagogies for teaching on sustainable healthcare?

Both acceptability and effectiveness of teaching were assessed. Acceptability was generally high in both student and educator evaluation. Questions assessing knowledge and confidence of PLOs suggested that teaching was also effective. Due to reasons discussed above, including the diversity of teaching approaches, it is difficult to identify which pedagogies were most acceptable or effective.

Feedback suggested that students enjoyed having some flexibility to choose their own title or focus for their project work, but also valued support, structure and clear guidance on the outcomes required. For the topic of sustainability in particular, because it is new to many medical teaching programmes, it is necessary to ensure that core concepts are understood by students. Both educators and students highlighted the importance of establishing the relevance of sustainability to clinical work and to health outcomes.

Often this understanding of sustainability concepts and their relevance had to be established within a short time frame. There was a tension between conveying breadth and complexity of the topic versus allowing time for in-depth or applied work. Further research could investigate how best to deliver teaching that enables students to understand core sustainability concepts.

The findings of this project suggest that although some students may not be interested or engaged in sustainability, including a sustainability perspective (for example in QI work) does not necessarily distract from achieving other learning outcomes. Nonetheless, more work is needed to understand about effective approaches in core teaching, where students are less likely to be motivated and engaged.

# Conclusions

This project has highlighted the potential of a collaborative curriculum development model to motivate schools to design and trial new teaching. The majority of schools managed to implement new teaching, and many have seen teaching in an SSC as a pilot that will inform efforts to include teaching in core curriculum. Further research and teaching development might explore the most effective and efficient approaches to collaboration between medical schools, and how this can be supported over a longer timescale (years, rather than months).

Major challenges were faced in terms of engagement of schools and evaluation of teaching that was implemented. In terms of engagement of schools, given the packed schedules of many educators, more administrative time to run this project would have been beneficial, for example to enable sending reminders to respond to surveys or offer dates to join a conference call. To enhance learning about pedagogies for sustainable healthcare education, a future programme could be more standardised and evaluation forms would be pre-designed so that teams knew from the outset what the evaluation plan was.

Findings from this project were that many students are already very motivated and engage well with the topic of sustainability, while other students struggle to see the relevance. Motivated students (those who completed feedback) enjoyed having freedom to develop their own research projects, but liked a clear structure and goals to be provided. It is suggested by students and educators that a clinical focus to teaching helps to highlight to all medical students the relevance of sustainability to the role of a doctor. Future research might aim to collect feedback from a wider sample of students, and to use variations of one teaching session to explore the effectiveness of different pedagogies.

# References

Lang, T. & Rayner, G., 2012. Ecological public health: the 21st century’s big idea? An essay by Tim Lang and Geof Rayner. *BMJ*, 345(aug21 1), pp.e5466–e5466.

SDU, 2013. *Carbon Footprint update for NHS in England 2012*, Cambridge. Available at: http://www.sduhealth.org.uk/documents/Carbon\_Footprint\_summary\_NHS\_update\_2013.pdf

Thompson, T. et al., 2014. Learning objectives for sustainable health care. *Lancet*, 384(9958), pp.1924–5.

Walpole, S.C. et al., 2015. What do tomorrow’s doctors need to learn about ecosystems? – A BEME Systematic Review: BEME Guide No. 36. *Medical Teacher*, 10, pp.1–15.

Watts, N. et al., 2015. Health and climate change: policy responses to protect public health. *The Lancet*, 386(10006), pp.1861–1914.

# Appendices

## Appendix 1

Application form for medical schools – see attached

## Appendix 2

### Outline of seminar on 25th September

10am - Intros - 30 mins

* Outline of day
* Meet someone from another med school about what experience they have, have they delivered any teaching
* Offers of telling about another med school
* Names of everyone

1030 - Intro from us – 1 hour

* Programme – Sarah – 5 min
  + SEDA grant money - evaluation
  + 3, 6 and 9 months follow up
  + Natural groupings
  + Outputs and future grants
* SHE LOs – Frances – What medical school topics in the medical curriculum? How could it enhance student’s learning? Give example of QI teaching – 45 min
* Example from Leeds – Sarah – 10 min
* Pedagogies – different ways of teaching, (have examples ready - dragon’s den, visiting places) – up to 30 mins

1200 – Managing change – 45 min

* Thinking of the bigger picture, longer scale, blue skies
* Barriers
* Bringing colleagues onboard, Bring students onboard, Gaining support from above
* Strategic drivers – workstreams, who, how

1245 – Medical school group work intro – 15 min

* Set up one teaching element – SMART – What, when, to whom, by who, which LO,
* Present back – who, when, what, 5 mins from the session, e.g. intro or group work
* Interim feedback session

1300 – Lunch

1330 – Work with medical school

* Give evaluation

1430 – Presentation from each school – ten mins each – total 80 mins

1600 – The programme and beyond

What do we want from you? And how can we do this?

* Keep your group going
* Run new sessions
* Evaluate your sessions
* Inspire and share with others - Via the SHE network – informally and formally
* Work towards ongoing development and collaboration - grants and publication

## Appendix 3

### Free text responses about learning from the seminar

* The explanation of the concensus process leading to the 3 LOs being developed and (2) the explanation and discussion around the sub-headings/bullet points under each of the 3 LOs.
* Other medical schools' approaches to implementing teaching on climate change into their curriculums.
* I learned about initiatives in other medical schools, which was helpful in giving ideas about how we might implement teaching in our curriculum
* Better understanding of the relevance and how to implement this into teaching.
* All participants in same boat.
* Very useful to learn about the projects and work at other medical schools.
* Good to share idea and hear from students about what works for them
* The time, inspiration and energy to design our new teaching on sustainable healthcare
* The different ways to approach the task of introducing sustainable healthcare to medical education
* Good and valuable discussions and presentations of various ways to implement sustainability in healthcare teaching in a variety of approaches throughout the curriculum
* Met new people interested in working on env health issues, support for facilitating student-led educational developments
* Better understanding of the priority learning outcomes
* Time and space to consider the next steps for our organisation to take in teaching on an important area. Also it was very useful to get student experiences from other areas and to think through the importance of making the teaching clinician led.
* Great to learn what other schools are doing/planning
* That we have much better student engagement than some! That we are not behind, or doing worse than others. Pretty reassuring actually.

**Suggestions about improvements that could be made to the seminar**

* The latter half of the day where each medical school recounted their situation dragged on a bit. Coud this have been broken up or streamlined or cascasded in small parts throughout the day?
* No, I thought was good to think about things we could do but also develop them within the session itself
* No - this was particularly good. I felt really well prepared as new convert to sustainable healthcare, both in terms of getting up to speed with the concept, and in planning to particpate fully on the day (getting people on board, ensuring commitment for curriculum time etc.)
* None
* Start was a little slow and it may have been good to have this meeting earlier on in the summer so that we have more time to devise integrated teaching approaches and implement those during the year
* Was uncertain how we were supposed to have made use of pre-circulated resources; did not seem to have great application to seminar.
* In all honesty we had very little time together prior to the seminar, which impacted on how we used the time there - most of our time prior to attending was spent gaining approval to attend, without being able to consider what we would like to do very well.
* No
* You sent useful enough questions, but it was clear from the agenda that we would be revisiting most of those questions again. Perhaps thinking of some way to reduce the duplication?

## Appendix 4

### Follow up approximately one month post seminar

**23rd October – discussion with XX, SW**

Unfortunately the main medical school faculty member on the XX team has left her job, therefore a challenge is findings colleagues within the medical school to work with. XX has experience with the Royal College of anaesthetists. He was not able to attend the 25th September seminar, therefore he asked for a revision of the goals of the project. SW explained idea to implement at least 2 new teaching elements, and emphasised importance (as well as challenge) of evaluation as part of the project. XX was keen to receive the evaluation tool asap as this would guide the implementation of teaching.

**29th October meeting, facilitation by FM**

1. Progress reports

**Medical school A**

Anaesthetist - is helping.

Year 3 (Feb 2016) 1h lecture on sustainability wide focus then narrowed to NHS/medicine followed by 90mins group work: each group given a different case study of sustainable healthcare in two parts: ask students to come up with ideas before showing them what has been done. Students present back to main group. Over the rest of the year, students then write a 500 word reflective piece about either

* an example of good practice that they have witnessed or
* an example of bad practice and how that could be improved

Decided against waste walk - templates very technical, could be off-putting

Additional:

Proposing literature review SSC projects for Y1 SSCs

Feeding into curriculum review

**Medical school B**

Continuing approaches to course leads/theme leads/clinical tutors to integrate sustainability across core teaching.

Also exploring idea for a sustainability QI/audit tool for use on electives

Frances suggested more general template prompting reflection on TBL constraints and good practice

ACTION - XX to feed back about electives

ACTION - Frances/Sarah to arrange future Skype calls: to focus on

1. embedding content across core lectures (inc XX, XX)

2. electives (if enough interest from medical school teams)

**Medical school C**

Five students in Y4 to work together on a QI project throughout this year, working with a sponsor to address a problem plus a supervisor who gives tutorials on sustainable healthcare. This will be a pilot for potential roll-out next year in new curriculum.

**Medical school D**

Sustainability SSU for Y3 students over 10 weeks in spring/summer semesters. Lectures every Friday. Led by Dr XX, anaesthetist - anaesthetic focus; other ideas include bringing in the sustainability/energy team from the hospital; GSK external speaker re inhalers.

Assessed by a presentation on an aspect that has interested them.

Core teaching: aim to introduce one lecture into Y3 course “scientific basis of medicine”

ACTION - XX to post brief outline on SHE Network including SSU course outline

2. Sharing Resources

XX shared SSU outline

Frances shared resources for Green Nephrology case study:

<http://map.sustainablehealthcare.org.uk/green-nephrology-projects>

<http://sustainablehealthcare.org.uk/what-we-do/sustainable-specialties>

3. Barriers

Lack of planning time is main issue in XX - main tasks deferred until December/January eg. recruitment of facilitators

XX: Approaching clinicians - mixed response. Can be difficult for students to approach people on their own; also approaching via course directors / year directors / theme leads - good response from ethics theme lead

3. Evaluation

Frances explained proposals for aligning evaluation

- student self-evaluation (draft template as circulated at 25 Sep seminar)

- educator self-evaluation (not yet developed - would be good to make this as valuable as possible for educators e.g. for inclusion in their portfolio)

XX suggested that we encourage educators to release reflective pieces as blogs on SHE Network.

- assessment of written work (align marking schemes if possible)

- direct observation (align marking schemes if possible)

ACTION: XX to share PH registrar training portfolio template (re reflections on work placements)

ACTION: Frances to liaise with all med school teams re plans for evaluation of written/direct observation when they are ready for this

**4th November skype call, Frances Mortimer facilitating**

Attendees from four medical schools

1. **Update on and discussion of SSCs**

XX – have an SSC for 1h per week for 8 weeks. Challenging to make it interactive due to short time period. Used debate, involvement of students with a staff-led project, dragons den to pitch energy saving projects and presentation of ideas to a CCG lead. Thinking of involving students with carrying out interviews with key players (inspired by XX!)

XX – have four students on 1st year SSC which is focused around a literature review and essay writing. Are recruiting students for a mixed 2nd and 3rd year four week block SSC.

XX – have designed and will be running an SSC for 10 to 15 students, which will include students interviewing healthcare leaders among other sessions. They may visit a local trust that has a wind turbine (+ other sustainable build features?). They are going to hold a focus group about interprofessional learning and sustainability

XX – 10 week SSC, 3 hours every Friday. Will have talks for people who have worked delivering healthcare in different settings and with different challenges, e.g. in conflict or famine affected areas, a visit the combined heat and power source of the hospital to compare this with more sustainable builds, discussion of the Paris COP negotiations, seminar on anaesthetics and the environment.

**SSC main points**

* Lots of interesting and engaging approaches to teaching, including
* Useful to draw on local resources, in the form of speakers, sustainability initiatives
* Can engage students by challenging them to design, present and debate
* Through the programme and the evaluation, we will try to identify which strategies have worked well in which conditions (size of student group, prior interest of students, etc)

1. **Update and discussion about core teaching**

XX are going to implement new teaching about carbon addict in primary care in 3rd year. Useful approach to engage students about issues surrounding NCDs, behaviour change and long term care.

XX are about to undergo curriculum review, so may be able to feed sustainability into the review resulting in a change in approx. three years, and one that would be sustained.

XX developing ideas about where to integrate sustainability with core teaching

XX already addressing environmental topics within public health, due to meet to discuss implementation in other areas of the curriculum.

**Core teaching main points**

* Sometimes difficult to see where to implement the new teaching – selecting the part of the curriculum according to whether educators are open to considering this new approach and extent to which links between existing core curriculum topics and sustainability can be made clear
* Needing to balance the top down and bottom up approaches
* Trying to make changes and new teaching on sustainability sustainable in itself – need to get buy in from other faculty
* \*noted that we need to think about how to include sustainability within assessments (to date main examples are essay writing, presentations, and reflective logs, with one example of an MCQ)

**Action points and Next steps**

XX - SSC will start soon. Also trying to develop core teaching for the Scientific basis of medicine module, but may consider options for linking to other curricular topics. Happy to share SSC ideas through the SHE network.

XX are going to try and meet as a team in the next 2 weeks to discuss SSC and core teaching possibilities

XX are meeting with 17 interested students next week! (If any teams have ideas about how best to engage students please do share with the group via SHE network (perhaps you could send any advice XX as you have a large medical student team))

XX SSC already running and sustainability already addressed in PH and Primary care in fourth year. New session in year three will look at ‘carbon addiction’. Considering including interviews as a tool for learning in the SSC. XX has kindly agreed to send round details of the ‘dare to care’ initiative that the SSC draws on, and any other ideas for approaches to teaching.

Sarah and Frances – need to get evaluation tool finalised and sent out asap. Will support teams as you are trying to identify and develop new teaching. Sending some examples of how sustainability can be taught linked to different subjects may help. The discussion about assessment was cut short, so we need to revisit this at next call.

Discussion, Sarah and Frances

FM - It was a bit tricky to make the call useful to the participants – XX rang in as an observer (he’d like to be in a group with XX to discuss the cross-curriculum stuff) but for a while he was one of only 2 participants (with XX), so I got him to tell us about what XX are up to too. After a while the other two medical schools were represented by students, who were not aware of any particular barriers to discuss, and likewise it was a bit difficult to get much from them about evaluation.

I guess part of the value of the call is to encourage people at their end to get on with preparation, but it would be nice to make the calls really useful, and I think that may come down to focussing them around specific topics or types of teaching. But tricky when it’s so difficult to get people on the line at the same time as the most relevant others.

Would be useful to get any marking guidelines etc from other schools if/when you speak to them – even if just examples from other (non-sustainability) teaching. We will continue to develop evaluation

SW - Even moving to themed calls- which was the original intention, it's still really tricky to get the right people along. It seems from what you wrote that at least we have an update on where you are at.   
  
I wonder if we should abandon further skype calls at 6 months (maybe instead just do a brief chat with each med school) and plan now for a final skype in April? I could send doodle for April - no doubt a bunch of people would have plans change and not make it in the end, but hopefully people would try to keep diaries free?!

## Appendix 5

### Implementation of new teaching – see attached table

## Appendix 5

### Timetable

Project start, May 2015

* SW books educational seminar
* FM and SW develop information and invitation and contact medical schools via SHE network

June

* Selection of participating medical schools
* SW emails participants providing information about research project and asking them to prepare for the seminar
* educational seminar day outline and materials revised by SW

July to September 2015

* Teams for and have at least one meeting locally. Before the seminar, they should
  + collect information about existing teaching about sustainability at their medical school
  + review existing teaching materials available (from SHE 2015)
  + identify two opportunities to incorporate further teaching in their medical curriculum (it must be a setting or session where the PLOs can be linked to existing teaching and where they have the influence or agreement of the session organizer to trial new teaching)

25th September 2015

* Seminar day
  + Questionnaire about each medical school completed in advance on google document
  + Introductions to programme and participants, learning and gaining confidence to address sustainability, discussion of pedagogies and approaches to implementation, development and trial of new materials, plan for the rest of the programme
  + Participant observation and questionnaires to collect data during the seminar day.
  + Ideally, natural groupings will form during the seminar day, such that medical schools can work in pairs or in small groups

September to May

* Schools working on their own implementation
* SW and FM will evaluate field notes and evaluation forms from the seminar and identify any themes and suggestions to inform the programme going forward, and the write up
* Regular follow up calls with the group for support, also
  + End October 2015, 1 month post seminar - First conference call to check progress of teams and any challenges arising
  + End January 2016, 4 months post-seminar – second follow up call
  + End April 2016, third follow up call – most schools should have submitted an evaluation by this time, we will have chance to discuss any ongoing plans, including funding bids and publications
* Schools adapt and use the evaluation template to gain feedback from students about their new teaching sessions

July 2016

* Final follow up from teams, asking for feedback on the programme and the programme write up (analysis by SW/FM of data collected) by email
* Submission of project report to SEDA (Sarah Walpole), including write up of benefits and challenges of this collaborative mode of working (including discussion of working remotely, bringing together educators and schools with different levels of expertise and different approaches to teaching), development of and effectiveness of different areas of focus within the topic of sustainability, development of and effectiveness of different pedagogies used,

August onwards

* Any ongoing collaboration and/or reporting of this project

Participants can contact the research team at any time for support to deliver their teaching session.

Participants will be asked to return students’ evaluation forms and their own evaluation forms, completed immediately after their teaching session.

## Appendix 7

### Expenditure

#### Planned expenditure

Time release for supervision of material development, attendance at training day, supervision of analysis and write up, Dr Frances Mortimer, total for one day at ‘internal rate’: £300

Travel to training day in York, 13th July 2015 for 12 participants and three researchers, average cost £40pp: £600

Conference fee and travel to disseminate through oral presentation (will be supplemented by SW institution funds/personal funds): £100

#### Actual expenditure

Time release for supervision of material development, attendance at training day, supervision of analysis and write up, Dr Frances Mortimer, total for one day at ‘internal rate’: £300

Travel to training day in London for 14 participants and two researchers: £700

## Appendix 8

### Evaluated domains for the three priority learning outcomes

Priority Learning Outcome 1: Describe how the environment and human health interact at different levels

1. Outline the dependence of human health on global and local ecological systems, which supply essentials such as air, water and a stable climate.
2. Discuss the contribution of human activity and population size to global environmental changes such as climate change, biodiversity loss and resource depletion.
3. Describe the mechanisms by which human health is affected by environmental change, for example through changes in disease vectors, exposure to extreme weather, migration and reduced food security.
4. Describe features of a health-promoting local environment, in community and healthcare settings, to include access to green spaces, clean air and an active travel infrastructure.

Priority Learning Outcome 2: Demonstrate the knowledge and skills needed to improve the environmental sustainability of health systems

1. Define the concept of environmental sustainability.
2. Explain how trends in demographics, technology, climate and resource availability may affect our ability to provide healthcare into the future.
3. Describe, with examples, the different types of environmental impact resulting from healthcare provision, and how these may be measured.
4. Identify ways to improve the environmental sustainability of health systems - in individual practice, in health service management, and in the design of care systems.
5. Identify potential synergies between policies and practices that promote environmental sustainability and those that promote health.

Priority Learning Outcome 3: Discuss how the duty of a doctor to protect and promote health is shaped by the dependence of human health on the local and global environment.

1. Explain how the health impacts of environmental change are distributed unequally within and between populations and the disparity between those most responsible and those most affected by change.
2. Recognise and articulate personal values concerning environmental sustainability, given the relationship between the environment and the health of current and future generations.
3. Discuss ethical tensions between allocating resources to individual patients and protecting the environment upon which the health of the wider community depends.
4. Demonstrate awareness of organisational sustainability policies and the legal frameworks for reducing carbon emissions.

1. Stefi Barna, Sustainable Healthcare Education network [↑](#footnote-ref-1)
2. Anna Jones, SEDA [↑](#footnote-ref-2)
3. 1. ***Examples of teaching that has been developed***

   ***- PBL scenarios***

   *The attached PBL scenarios have been developed by a member of the Sustainable Healthcare Education network, and have been piloted at a number of UK medical schools.*

   ***- Tutor-led learning***

   *The attached pdf and powerpoint were developed by a medical student during an SSC, and used to deliver small group teaching sessions for other students in years 1 and 2.*

   ***- Online learning modules:***

   *Climate change and health: the basics of climate science and the impacts of climate change:* [*http://learning.bmj.com/learning/module-intro/climate-change-health-science-impacts-.html?moduleId=10017515*](http://learning.bmj.com/learning/module-intro/climate-change-health-science-impacts-.html?moduleId=10017515)

   *Climate change and health: the role of the health professional:* [*http://learning.bmj.com/learning/search-result.html?&moduleId=10017629*](http://learning.bmj.com/learning/search-result.html?&moduleId=10017629)

   *2.* ***A report discussing a diversity of approaches that have been used in medical schools***

   *3.* ***Examples of resources that can be used in teaching sessions – videos****:*

   *- Sustainable specialties video:* [*https://www.youtube.com/watch?v=KlT4kP8WSms*](https://www.youtube.com/watch?v=KlT4kP8WSms)

   *- Mental health video:* [*https://www.youtube.com/watch?v=AiOZkksMWeM*](https://www.youtube.com/watch?v=AiOZkksMWeM) [↑](#footnote-ref-3)