

## Supporting change for sustainability in Dentistry

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**Abstract.** This article, firstly, reviews various initiatives over the last decade across Higher Education Institutions that are aiming to increase awareness of sustainability starting from making campuses green to educating for sustainable development. There is strong support from the Head of School of Dentistry at the University of Manchester and faculty buy-in to foster understanding and awareness of social and environmental sustainability among dental graduates. If plans to be made to further awareness of the principles which underpin sustainable development among dental students, we need to establish the baseline – where are we standing from?

The second part of this article will therefore explore data collected during the first Sustainability Talk about students' perception of sustainability and their awareness of the benefits for dental practices to go green. 140 students from year 3 and 5 took part in the Sustainability Talk in September 2014 and data was collected using 'clickers'. Data revealed that environmental aspects of sustainability are familiar to students on Dentistry courses at the University of Manchester. Analysis of data alludes to variations in perceptions among year 3 and year 5 students.

A forum to bring together dentists, dental businesses (e.g. Colgate, Dentsply), academics and students should be considered. The debate should encompass Education for Sustainable Development and how to effectively deliver it within the current dental curriculum.

**Keywords:** sustainable development, environmental issues, dentistry curriculum, student attitudes

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*Perspective: Educational vision*

*Fields: Social processes and structures*

*Issues: Educational processes, Healthcare*

## 1. Introduction

As the UN Decade of Education for Sustainable Development (ESD) concluded in December 2014, it is imperative to review whether or not there is evidence to suggest that there is, as was the intention, an increasing environmental consciousness amongst practitioners across all disciplines. This article focuses specifically on how we can ensure that dental students acquire both the content knowledge and an awareness of the latest dental technologies to help them run both sustainable and profitable dental clinics.

Drawing on findings and recommendations from UNESCO (UK National Commission for UNESCO, 2013) and the Higher Education Academy and National Union of Students (Drayson et al 2013; Drayson et al 2014) the first part of this article will report on initiatives across Higher Education Institutions (HEIs) that are aiming to increase awareness of sustainability. The Higher Education Academy recommends that 'academics work with the wider academic community to build materials and approaches to embed sustainable development across curriculum and subject-specific disciplines where appropriate' (Drayson et al 2013, 5). The second part of this article will therefore, explore responses to the developing professional interests in delivering eco-friendly dental care in the UK and the fast growing trend for eco-dentistry in the U.S. using the School of Dentistry at the University of Manchester as case study.

## 2. Sustainable Development and Higher Education Institutions

The concept of Sustainable Development (SD) emerged almost three decades ago and it is centred around efforts to develop a more resource-efficient economy. One of the key findings of the 2014 report about 'Student attitudes towards and skills for sustainable development' by HEA & NUS underlines that

'two thirds of the surveyed students believe that SD should be included in their university courses – a belief consistently reported since the first survey taken in 2010-11' (Drayson et al 2014, 3).

The first stage of SD was about buildings and organisational change. Large investment in SD can be seen across the university campuses in the UK and US into buildings with many sustainability features, e.g. Department of Anatomy from University of Aberdeen, the College of Pharmacy of University of Rhode Island, Tufts University School of Dental Medicine. Furthermore, a prevalent number of universities also engage in sustainability through activities to make campus greener, such as sustainable travel, carbon and waste reduction, planting trees and vegetable gardens, promoting the use of refillable bottle and energy management. Needless to say, that these activities involve a community of staff and students. In addition a number of universities have created a dedicated sustainability office, for instance The Green Impact team at the University of Manchester. All these organisational efforts are captured by the People & Planet University League.

A similar initiative to P&P emerged in 2006, one year earlier, in the U.S., when the Association for the Advancement of Sustainability in Higher Education (AASHE) presented its first annual Campus Sustainability Leadership Award. To date 300 universities and colleges mainly in the U.S. (STARS Dashboard 2014) are using the Sustainability Tracking, Assessment & Rating System™ (STARS) to measure their overall sustainability performance and the best showcase their sustainability achievements on the AASHE website.

A second stage of SD is about creating students, who are motivated to act sustainably in their personal and professional lives. Educating for sustainable development is 'fundamentally about values, with respect

at the centre: respect for others, including those of present and future generations, for difference and diversity, for the environment, for the resources of the planet we inhabit' (UK National Commission for UNESCO 2010, 14). The Natural Sciences courses have strong sustainability curriculum content (Stewart, 2010; Horvath, Stewart and Shea 2013), but there is still uncertainty whether other disciplines foster Education for Sustainable Development (ESD).

### **3. Sustainability in Dental Education**

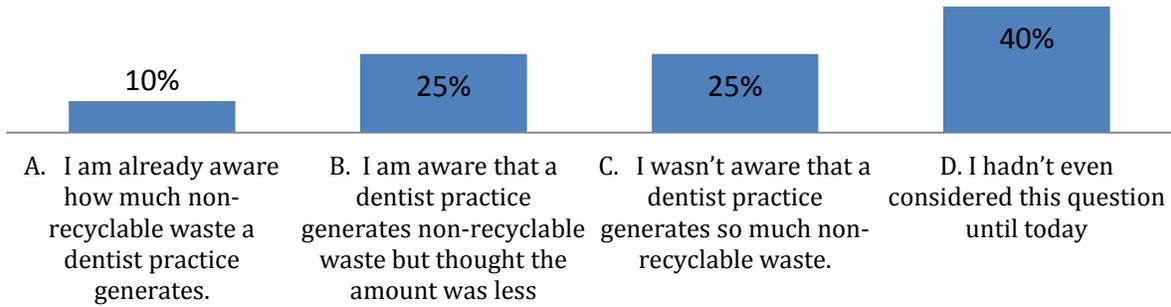
Educating dental students for sustainable development takes on an even higher significance with the projection of 8.1 billion people on the planet by 2025 (UN, 2013). 8.1bn people multiplied by 32 teeth – it is a lot of work for dental professionals! On the other hand many environmental resources such as energy, clean water and soil are dwindling at a faster rate that can be replaced. According to data from the Eco-Dentistry Association 'between 66 and 75 % of the 120,000 U.S. dental offices still use traditional X-rays and require disposal of 4.8 mil lead foils and 28 mil litres of X-ray fixer every year' (Pockrass, 2010). If we take into consideration the other world's largest and populous economies such as China, the UK, Brazil, Russia and India, the amount of harmful waste generated by dental practices is overwhelming. For that reason students on dentistry courses need to acquire both: content knowledge and awareness about 'dental technologies' that help to reduce waste, save energy, how to 'operate an eco-friendly practice and make a difference to the bottom line' (Holland 2014, 10).

Faculty members at the School of Dentistry at the University of Manchester are conscious of the fact that the Dentistry curriculum is very tight and the addition of a new class session focusing solely on topics related to the environment, sustainability and social responsibility is unfeasible. Thus ESD should

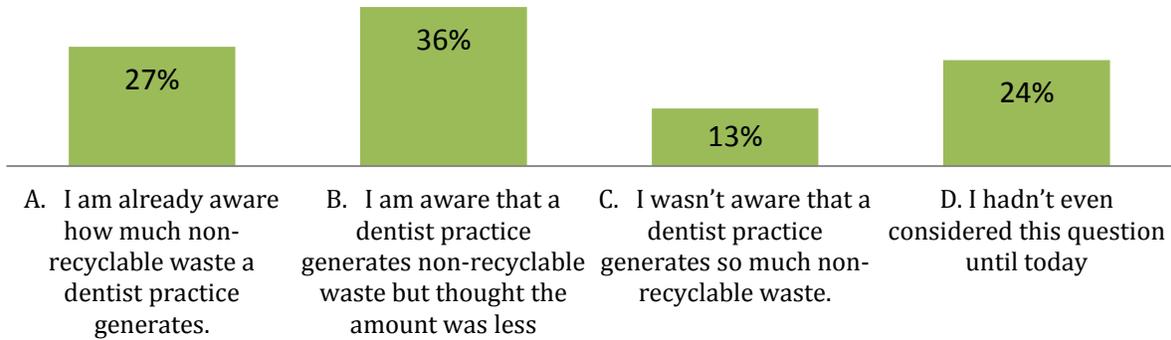
be taken forward as a holistic approach. In addition, the School also recognises the third key finding of the 2013 report by HEA & NUS that 'a desire to learn more about SD increases as respondents progress through their studies' (Drayson et al 2013, 4). Therefore before starting the audit of its curriculum the School decided to find out the level of sustainability awareness amongst year 3 (Y3) and year 5 (Y5) dental students. Data taken together with other evidence will give faculty the opportunity to guide change.

#### ***The data collecting process***

Around 140 students from Y3 and Y5 attended the Sustainability event in September 2014, which aimed not only at surveying students but also to spread the word about sustainable best practices in Dentistry and NHS. The author is familiar with a number of publications (Herreid 2006, 44; Hoekstra 2008, 331), which discuss the efficacy of clickers as a useful data gathering tool for conducting education research. As a result The PowerPoint presentation was converted into an interactive demonstration using TurningPoint software and 'clickers' were used in order to capture students' responses. All students voted simultaneously and the presenter was closing the poll manually in 1 minute. The presenter did not encourage students to discuss their answers with each other, although it is possible, that some students had an opportunity to see how their neighbouring peers were voting. All questions were the multiple-choice questions and the 'attitude' questions had 5-point unipolar rate-scales. It is important to point out that responses cannot be linked to individual participants, thus all voting was absolutely anonymous. The response rates to all questions were high, but varied from 88% to 100% because some students refrained from answering certain questions. The collected data can only be streamed as data provided by Year 3 (Y3) and Year 5 (Y5) students.



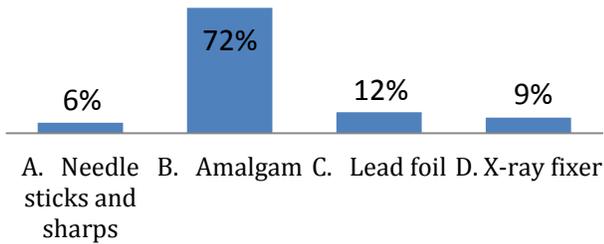
**Figure 1. Year 3 responses to the question ' How aware are you about the amount of waste generated by a typical dental practice?'**



**Figure 2. Year 5 responses to the question ' How aware are you about the amount of waste generated by a typical dental practice?'**

Before the talk students were asked to self-rate how environmentally conscious they are. Only 33% of Y5 and 13% of Y3 indicated that they 'very concerned with environmental issues in my community'. Nonetheless, 19% of Y5 and 16% of Y3 disagreed with the statement 'I think that I am better informed about environmental issues than most other people'. That shows a definite need for further events/initiatives, which promote environmental aspects of sustainability. 68% of Y5 and 78% of Y3 students showed familiarity with the term sustainability. This provides direct evidence of their ability to define sustainability. Data allude to variations in the level of awareness between Y3 (figure 1) and Y5 (figure 2) students as regards to the

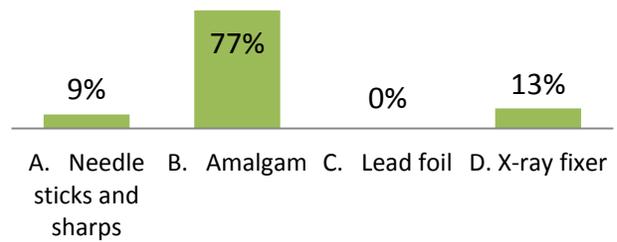
amount of waste a typical dental practice generates. Y5 students, who will graduate in 9 months and join dental practices across the UK as general dental practitioners, showed a greater level of awareness (27% and 36%) than Y3 students (10% and 25%). Furthermore, a predominant majority of students agreed that dental amalgam has the most potential for harm to the environment. The level of awareness is slightly greater amongst Y5 students (77%)(figure 4 compared to figure 3). Still almost half of students (Y3 and Y5 combined, see figure 5) indicated that they are either slightly or not at all aware of waste management and handling regulations applicable to dental practices in the UK.



**Figure 3. Year 3 responses to the question "Indicate which dental material has the most potential for harm to the environment"**

A number of simple options, which dentists can and should implement if they would like to run eco-friendly dental practices, were presented, e.g. switching to a dry dental vacuum pump instead of wet pumps. That move will allow saving over 190 liters of clean, drinkable water per year! The other solutions include installation of an amalgam separator or converting to digital radiography. If our graduates will consider implementing these solutions, then as a consequence a dental practice does not have to deal with the disposal of lead foils and toxic x-ray fixer from conventional x-rays and to release mercury into the public sewer waters.

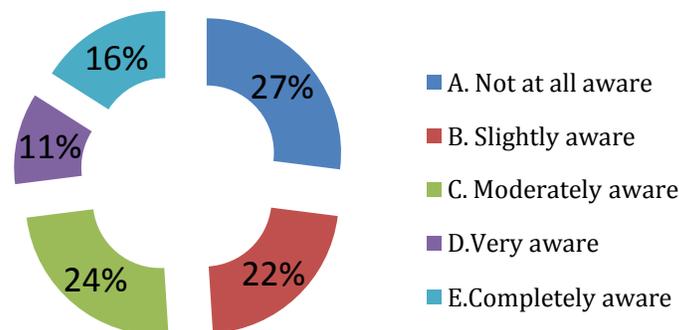
Since 2012 dental experts and the European Environmental Bureau (EEB) have campaigned about a phasing-out of the use of mercury in dentistry, both in the EU and



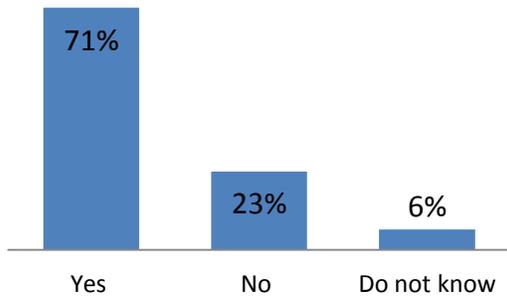
**Figure 4. Year 5 responses to the question "Indicate which dental material has the most potential for harm to the environment"**

around the world. In January 2013 the mercury treaty (UNEP 2013) was finalized, and included important provisions to reduce and eliminate mercury pollution by means of phasing down the use of dental amalgam (mercury fillings) in the EU countries.

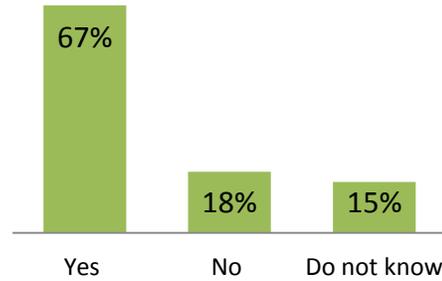
The University Dental Hospital of Manchester enforces the separation of amalgam (mercury) before water is discharged. A large majority of our students understands that even if a dentist identifies a practice as mercury-free because they no longer place amalgam, s/he needs to have an amalgam separator. However, 23% of Y3 (figure 6) and 18% of Y5 (figure 7), who answered 'No', are still under misconception that if a dental practice is classed as 'mercury-free', then it does not need to have an amalgam separator.



**Figure 5. Responses to the question: 'Are you aware of waste management and handling regulations applicable to dentists?'**



**Figure 6. Year 3 responses to the question "Does a mercury-free practice still require an amalgam separator?"**

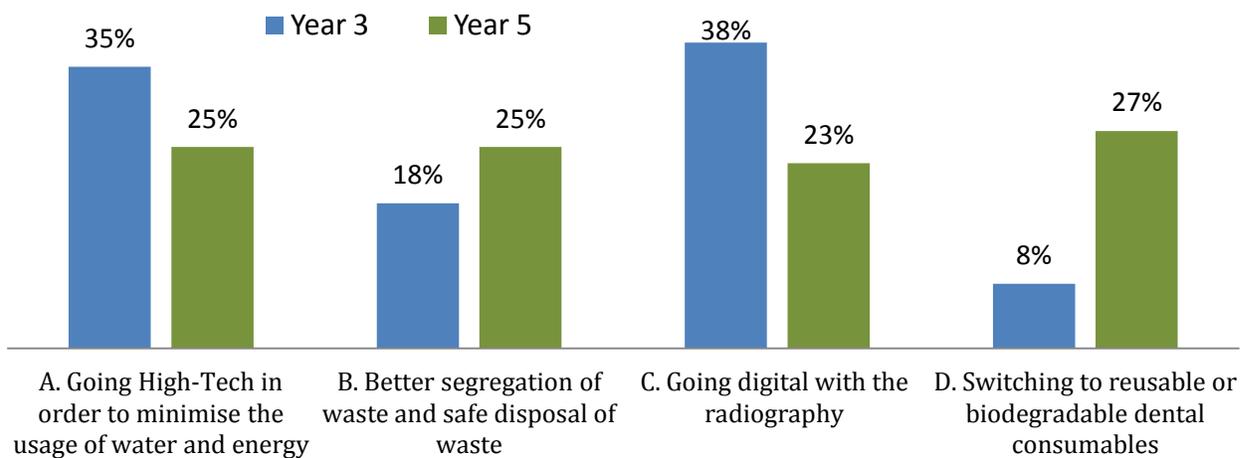


**Figure 7. Year 5 responses to the question "Does a mercury-free practice still require an amalgam separator?"**

As a part of the talk attention was also drawn to the cost-saving solutions from switching to energy efficient lighting and equipment, recycling with an eco-conscious waste management company and converting to reusable cloth.

At the end of the session students were asked to indicate which of the discussed solutions of 'making a dental clinic more eco-friendly' would they be most likely to implement in their future place of work. Y3 students (figure 8) signalled their preference for High-Tech Dentistry: using of a dry pump, the LED lamp in a chair unit, A-rated appliances in a dental

practice (option A) as well as opting for digital radiography (option C). Arguably digital imaging and a purchase of a new dry pump or a new chair-unit have a significant up-front cost, however, once installed; a dental practice can save money in the long-run. Y5 students (figure 8) did not show preference for a particular solution. It is interesting to note that in contrast to only 8% of Y3, 27% of Y5 indicated that they are most likely to implement in their dental practice the use of reusable sterilization pouches or biodegradable consumables as well as bulk-buying of prophylaxis paste.



**Figure 8. Responses to the question: 'Preferences for a particular sustainable solution'**

#### 4. Conclusions

The analysis of data is useful in identifying any educational needs, which can be addressed in the due course. The publication of a Sustainable Development Strategy for the NHS in January 2014 following drives all NHS providers to work towards becoming environmentally responsible with medical waste. As some students were uncertain about correct waste segregation, it would, therefore, be prudent to reinforce their knowledge and understanding about dental waste disposal, management and compliance. This was chosen as the follow-up topic for the next session in semester 2.

Environmental aspects of sustainability are familiar to dental students at the University of Manchester, however, data shows that there is still a great deal to do in an effort to foster understanding and awareness of sustainability within the Dental curriculum. For instance, to talk about the legal requirements relating to sustainability, to look into 'green' dental materials, to explore ideas that forward ethical issues and green skills at work.

In essence ESD is 'Education that equips students with the competencies and attributes that can enable them to contribute to a more sustainable future'. (Bone and Agombar 2011, 9) If Dentistry is aiming to become Green, then the next question should be: what should dental students be learning in relation to environmental and social responsibility? Below are areas where faculty members from the School of Dentistry are increasing opportunities for undergraduate students to learn about sustainability:

- Environment: the principles of prevention of dental disease - including social and environmental factors; legislation relating to sustainability of dental hospitals and dental practices; traditional vs digital X-rays; waste recycling;

- Society: providing dental services in Community clinics; manage special care patients and the elderly; promoting Volunteering Experiences in developing countries to Year 4 students;

In September 2015 all of The Manchester Dental School's first year students will take part in the Sustainability Challenge and explore issues of sustainability with students from other disciplines and Schools across the University.

It is therefore envisaged that academics and practitioners will engage in an informed discussion on how to help dental students to learn more about sustainability, so that later on in their professional career they will commit to using 'new innovations that will make the practice even more profitable and more environmentally sound' (Feuerstein 2013)

The author hopes that readers will engage further in this important topic by sending comments and examples of their own experiences in response to this article.

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