



STUDENT NURSES EXPOSED TO SUSTAINABILTY EDUCATION CAN CHALLENGE

PRACTICE: A COHORT STUDY

STUDENT NURSES EXPOSED TO SUSTAINABILTY EDUCATION CAN CHALLENGE

PRACTICE: A COHORT STUDY

NURSING SUSTAINABILITY IN PRACTICE

Original research article

Jennie ARONSSON

Lecturer in Adult Nursing, School of Nursing and Midwifery, University of Plymouth, Plymouth, Devon UK. Tel: 01752 586585 Email: jennie.aronsson@plymouth.ac.uk

Daniel CLARKE

Lecturer in Adult Nursing, School of Nursing and Midwifery, University of Plymouth, Plymouth, Devon UK. Email: daniel.clarke@plymouth.ac.uk

Jane GROSE

Honorary Research Fellow, School of Nursing and Midwifery, University of Plymouth, Plymouth, Devon UK. Email: jane.grose1@plymouth.ac.uk

Janet RICHARDSON (contact author)

Emeritus Professor, School of Nursing and Midwifery, University of Plymouth, Plymouth, Devon UK. Email: janet.richardson@plymouth.ac.uk

Contributions

Jennie Aronsson: analysis and interpretation of data; drafting the article and revising it critically for important intellectual content; final approval of the version to be submitted.

Daniel Clarke: analysis and interpretation of data; revising the article critically for important intellectual content; final approval of the version to be submitted.

Jane Grose: data collection; analysis and interpretation of data; revising the article critically for important intellectual content; final approval of the version to be submitted.

Janet Richardson: the conception and design of the study; acquisition of data; analysis and interpretation of data; drafting the article and revising it critically for important intellectual content; finalising and submitting the paper.

ORCID: 0000-0002-4759-9722

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1111/nhs.12734

No conflict of interest has been declared by the authors.

ABSTRACT

Climate change will adversely impact on the health of populations and on the ability of healthcare systems to deliver appropriate and timely care. Furthermore, resource scarcity requires nurses to practice in more sustainable ways. This study investigated the extent to which student nurses reported that they were able to apply their knowledge of sustainability in clinical practice following educational sessions on relevant topics.

Students were exposed to scenario-based sustainability education in year 1, 2 and 3 of their three-year programme. Data were collected using a questionnaire which asked participants if they were able to implement sustainable practice. In year 2 121 students, and in year 3, 68 stated they made a change or challenged practice as a consequence of learning about sustainability. Barriers preventing them from challenging unsustainable practice were lack of confidence and resistance to change. Year 3 students were more able to influence unsustainable practice than those in year 2.

This study indicates that sustainability sessions, focussed on aspects of clinical relevance can support nurses to implement change; barriers remain that require confidence-building for the students.

Key words

Sustainability, climate change, survey, cohort study, scenario-based learning

INTRODUCTION

Climate change is said to be the most urgent public health threat of the 21st century (Costello et al., 2009). For example it poses health risks related to extreme weather events such as safe drinking water, clean air and changing patterns of infectious disease (Watts et al., 2018). Additional effects of climate change include compromised mental health, the health consequences of forced migration, political instability and conflict; the effects are more likely to impact on vulnerable populations such as the sick and poor (Solomon and LaRocque, 2019). Furthermore, through significant greenhouse gas emissions, the use of toxic materials and the production of vast amounts of waste, delivering healthcare contributes to climate change, and thus adverse health outcomes (Gibbs et al., 2017; Richardson et al., 2016).

Nursing has currency as a profession that promotes the health of individuals, and by extension, that of society in general (Goodman and Richardson, 2010). This is particularly relevant as we increasingly witness the limits of the Earth's resources, acknowledging at the same time the significant adverse impacts the delivery of healthcare has on the environment (World Bank, 2017). The nursing profession is committed to protecting health and wellbeing and promoting social justice. It therefore has a duty to contribute to climate change adaptation (reducing vulnerability to the harmful effects) and mitigation (reducing or preventing greenhouse gas (GHG) emissions).

Nurses are frontline professionals equipped with the knowledge and skills to respond to constantly changing health and social care needs at a population level across a range

of settings. This suggests that they are well placed to take a leadership role in addressing climate change (Goodman, 2013). The International Council of Nursing (ICN) position statement on 'Nurses, climate change and health' (2018) calls for 'nurses to take immediate action to build climate resilient health systems'. In order to be responsive as nurse leaders, the ICN recognises the importance of embedding 'the concept of sustainability in nursing practice as well as climate change-related knowledge into nursing curricula and in post-registration continuing education' (p4). Nurses will require the knowledge, skills, competencies and confidence if they are to be proactive and meet this challenge. However, barriers to do so include a reactive working culture, where the focus is to manage disease rather than prevent illness and promote health (Anaker et al., 2015). Power (2016) suggests that whilst already qualified nurses may be absorbed within existing working cultures, student nurses could be better placed to act as change agents who can challenge existing practice and realise improvements. This requires an emphasis within nurse education on critical thinking and change agency, which should be expected from higher education institutes. Additionally, in order to challenge practice on issues in relation to climate change and sustainability, student nurses need to be knowledgeable about the topic (Felicilda-Reynaldo et al., 2018).

Universities in the UK have recently highlighted the scale of the climate crisis (see: The Conversation, 2019). A review of sustainability pedagogies and their potential use in higher education (Cotton and Winter, 2010) highlights the need for students to be given time to explore potentially challenging subjects, and to critically evaluate information, identify potential sources of bias, and reflect on their own views and prejudices. This

requires a range of teaching strategies, for example role-play and simulation, group discussion, debate, case studies. Sterling (2007) presents a model based on whole systems thinking as a basis of paradigm change in education for sustainability; the model requires a shift in assumptions (leading towards greater compassion), distinctions (leading toward greater understanding of connectivity), and intentions (leading towards systemic wisdom and action that is more integrative and ecological).

This is entirely consistent with an integrative and holistic theories in nursing (see for example George 1995). The challenge, therefore, is to develop an appropriate educational approach to introducing sustainability to nurses and healthcare professionals in a way that shifts assumptions and intentions, thus leading to proactive consequences in nursing clinical practice.

Sustainable healthcare has been included in nursing curricula across different European countries and evaluated positively by students in terms of generating reflection and learning related to environment and health issues, as well as critical thinking (Álvarez-Nieto et al., 2018). Different teaching methods have been used, including interprofessional learning, in order to make the subject relevant to practice etc (Grose et al 2015; Richardson et al 2017). However, what is currently missing from the literature is an understanding of the extent to which these educational approaches, and the knowledge gained, are translated into practice.

METHODS

The aim of this study was to provide sustainability education to undergraduate student nurses and midwives, and explore whether students were able to apply their sustainability knowledge and to challenge unsustainable nurse practice (if they experienced this) during clinical placements.

A cohort study method was used to collect data on two occasions following exposure to sustainability educational interventions that were designed to be relevant to the nursing undergraduate curriculum (Richardson et al 2019); this paper reports on the inductive content analysis of open-ended questions included in the survey.

Theoretical model

Education related to climate change underpinned by evidence is based on the (simplistic) premise that once people acquire updated and valid scientific data, their attitudes, values and behaviour will change (Gonzalez-Gaudiano and Meira-Cartea, 2010 p15). However, attitudes and behaviour are determined by a range of factors impacting peoples' lives, and these will contribute to the extent to which education provides the motivation to bring about the desired changes. This study is based on social learning theory in the context of education for sustainability (Wals, 2007); for a sustainable future, society as a whole needs to recognise, embed and enact social learning towards an ecological world-view (Sterling, 2007). It is supported by nursing educational approaches, for example scenario-based learning, founded on situated learning theory, providing opportunities for active learning, valuing contextual

knowledge, and bringing students closer to other realities of their profession (Errington, 2011).

Educational intervention

The educational intervention is based on a previous research program and is explicitly designed to emphasise the relevance of climate change and sustainability to nursing and midwifery (Grose et al. 2015; Álvarez-Nieto et al., 2018). The definition of sustainability used within this educational program is: *‘Designing and delivering health care that meets today’s health and health care needs of individuals and populations without compromising the ability of future generations to meet their own health and health care needs; this requires the provision of health care that recognises and respects the dependence of our health on the earth’s ecosystems, without resulting in unfair or disproportional impacts within society.’*

All three educational interventions are outlined in detail in Table 1.

In the first year the intervention focused on a case study scenario of a family in a situation where health and healthcare are compromised due to climate change and resource issues.

The second-year session was delivered alongside clinical skills practice and was based on an interruption to supply of important healthcare products, and challenges to the sustainable disposal of clinical waste (Grose and Richardson 2013a, 2013b). Previous studies, based on more than 600 students demonstrated significant changes in knowledge and attitudes toward sustainability and climate change following this particular session (Richardson et al 2017; 2019).

The session in the third year presented students with a clinical scenario of a patient manifesting symptoms that related to an outbreak of *Escherichia coli* (E.coli), drawing links with environmental changes and how these might impact on water quality).

Sample

First year undergraduate student nurses and midwives were invited to participate in the study at the start of their undergraduate program in September 2014. Consent was obtained for data collection to take place during years two and three using questionnaires with open-ended questions. Students' names were required on the survey in order that they could be matched to surveys completed in subsequent years; individual students were not identifiable in the data analysis. We recognise that the potential power relationships between academic and student may have had some influence on responses. However this is likely to have been negligible; the academics delivering the sessions were not involved in student assessments and the feedback requested on the questionnaires related to clinical practice not the teaching. Ethical approval for the study was provided by the Faculty of Health and Human Sciences research ethics committee of the University of Plymouth (*Reference number: 18/19-1126*)

Data collection

Data collection took the form of self-completion questionnaires constructed of open-ended questions in order to understand what might inhibit or facilitate student nurses to change or challenge clinical practice. These were handed out following the sustainability scenario sessions detailed above in year 2 and 3 only. This data was not collected in

year one as students had no experience of clinical practice at this time. Participants were asked to respond to the statement 'I feel unable to challenge unsustainable practice in my work environment', and if they reported that they were unable to challenge unsustainable practice they were asked to 'briefly explain why you have felt unable to challenge practice'. Participants were also asked to respond to the statement: 'As a consequence of learning about sustainability in my course I have made a change (or challenge) to practice', and if they responded positively, they were asked to 'please state in brief what this is'.

Data analysis

Comments from the open-ended questions were tabulated according to the questions asked and the student year. These comments were subjected to inductive content analysis using the approach described by Elo and Kyngas (2007). This involved three main phases: preparation, organising and reporting. The preparation phase entails familiarisation with the data by reading it over and over again; this was done by two members of the research team (JA and DC,). In phase two of the analysis the open coding, categorisation and abstraction were undertaken independently by the same two members of the research team (JA and DC, supported by JR) This phase comprises interpretation by researchers as to which 'sub-categories' belong to the same 'generic' category and subsequently, generation of 'main' categories that provide meaningful description of the phenomenon in question (Elo and Kyngas, 2007). Credibility was established through dialogue between the researchers (Graneheim and Lundman, 2004), with a fourth team member (JG) providing additional analysis in order to arbitrate over any variation in interpretation and provide further confirmability (Polit and Beck,

2018). Once the main categories were agreed on, they were allocated a weighting by dividing their occurrence by the total number of categories. This was undertaken in order to illustrate the relative importance (weight) of the student responses for each main category.

The results are outlined and discussed below. In this phase of the analysis the main categories are conceptually and empirically anchored, with the aim to provide trustworthiness of findings (Elo and Kyngas, 2007). Figure 1. Provides an example of the abstraction process based on Elo and Kyngas (2007).

Insert Figure 1

RESULTS AND DISCUSSION

Of 240 participants completing the questionnaire in year 2, 200 responded to the comment 'I feel unable to challenge unsustainable practice in my work environment', and provided comments on why they felt unable to challenge unsustainable practice.

One hundred and ten of the 145 participants in year 3 provided comments. Four main categories were identified through the thematic content analysis.

- Lack of confidence
- Resistance to change in practice
- Practicalities
- Student attitude

In many cases, a comment from a student would pertain to more than one category. To provide a weighting to each main category, their occurrence (for each year respectively) was divided by the total number of categories in that year. This provides an indication of the relative importance of these issues in this student group and is presented in Table 2.

Insert Table 2

In year 2, 121 students who felt that they had made a change or challenged practice as a consequence of learning about sustainability provided a comment; for participants returning the questionnaire in year 3, 68 provided this information. Two main categories were identified: Changed own practice; and, Influenced practice of others. Some students' comments overlapped with both these categories. The weighting of these categories is presented in Table 3.

Insert Table 3

Where participants were invited to provide additional comments, only two students provided data. Both responses related to the way that the educational session was delivered, indicating that the seminar group discussion was engaging.

Students who felt unable to challenge practice in year 2 and 3

Participants reported that they felt unable to challenge unsustainable practice in the clinical setting for a range of reasons, the most common reason was lack of confidence.

Lack of confidence

The UK Nursing and Midwifery Council (NMC) professional standards for nurses, midwives and nursing associates (NMC, 2018) stipulate that nurses must be able to challenge poor practice. The most frequently reported barrier to challenging unsustainable practice in both year 2 and year 3 student nurses was lack of confidence. Perry (2011) defines confidence as a self-perceived measure of one's belief in one's own abilities, which depends on a range of factors. The current study identified four subordinate 'generic' categories under this main category:

- Afraid to challenge (without providing reason as to why)
- Power imbalance/hierarchy
- Lack of knowledge
- Relationships/collaborative working

Within the first generic category, students voiced that they felt unable to challenge unsustainable practice but could not identify why. This might indicate a general lack of self-esteem, which according to Perry (2011) is an antecedent to confidence and belief in one's own abilities. Ibrahim (2011) argues that student nurses need to possess high self-esteem and assertiveness in order to be able to fulfil their professional role; Perry found that first and final year nursing students were more assertive than second year students. Congruently, the current study found this generic category more often in 2nd year students than in 3rd years.

“Feeling uncomfortable to challenge staff” (year 2 student nurse)

“Difficulty approaching subject” (year 2 student nurse)

“Felt uncomfortable challenging the individual” (year 3 student nurse)

The most commonly mentioned generic category in both year 2 and 3 was ‘Power imbalance/hierarchy’. This was often related to the student role:

“Power difference – I’m only a student” (year 2 student nurse)

“As a student, I feel that my ideas or opinions are often wrong. I feel worried to challenge people in practice” (year 2 student nurse)

“I find it hard as a student to challenge staff; however, I am becoming more confident and feel as a staff nurse I will be able to do so.” (year 3 student nurse)

Perry (2011) mentioned both situational role and ‘instructor’ influence as antecedents to confidence. Begley and White (2003) found that fear of negative evaluation was a factor associated with self-esteem in nursing students, this factor decreased over the three-year nursing programme. This might be related to the socialisation into the nursing profession (*ibid*). Indeed, in the current study, year 3 student nurses mentioned their transition into nursing more often than the year 2 students did.

“I think I will feel more confident when qualified” (year 3 student nurse)

Lack of knowledge’ was another generic category within this main category. Perry (2011) emphasises the importance of knowledge to develop confidence; this will grow

during the nursing programme as a result of education. In the current study, this was more commonly mentioned by second year students:

“I am not sure I am correct myself” (year 2 student nurse)

This may suggest that the educational intervention promoted confidence through increased knowledge over the 3-year period of undergraduate studies.

The last generic category within this main category related to collaborative working:

“Because it would make me feel uncomfortable working alongside colleagues if they don’t agree” (year 2 student nurse)

“Feel it would put me in an awkward position with a colleague” (year 3 student nurse)

These responses highlight the challenge of collaborative working, a cornerstone in nursing as stipulated in the UK NMC Code of Conduct (NMC, 2018). Other studies on student nurses’ experiences in practice has highlighted that relationships with nurses, as well as interdisciplinary relationships pose a challenge in clinical placements (O’Mara et al., 2014). Levett-Jones and Lathlean (2008) found that student nurses did not challenge poor practice due to fear of being alienated, or not belonging.

Resistance to change in practice

The second most frequently mentioned barrier to challenge unsustainable practice in both year 2 and year 3 student nurses was attributed to resistance to change in practice. Three subordinate 'generic' categories were related to this main category:

- Work culture/norm
- Policy
- Staff attitude

The most commonly mentioned generic category was 'work culture/norm':

"Often too much of 'we have always done it like this' culture" (year 2 student nurse)

"No one likes change, people set in their ways" (year 3 student nurse)

This category relates to an organisational culture which does not value evidence-based practice, but supports ways of working that are based on traditions/routines – an issue which is widely documented in nursing (Solomons and Spross, 2011). In order for healthcare to respond to the needs of service users now and those of future generations, ways of working need to adapt to the changing environment. However, our study suggest that nursing staff do not feel supported in such adaptations – in this case, sustainable ways of working. Hunter et al. (2015) suggest that practitioners feeling out of control leads to resistance to change and suggest that appropriate leadership of facilitation for change might be the solution. Students acting as change agents might be a way for change to happen – or the development for future leaders through ecoliterate nursing graduates.

Other comments related to policy or staff attitudes:

“Over controlled infection control” (year 2 student nurse)

“It doesn’t seem to matter to most people and therefore I feel silly bringing it up in practice” (year 3 student nurse)

Anaker *et al.* (2015) found that climate and environmental issues were not prioritised by registered nurses working in a lifesaving, hectic and economically challenging context. Preventing infection was one of the foci mentioned in this study and reinforced in the present research. Comments about sustainability not mattering can, again, be related to this not being the first priority in clinical practice.

Practicalities

The third most common barrier mentioned was related to practicalities – either lack of time, or lack of facilities. This was a relatively small issue compared with *confidence* and *resistance to change in practice*, but worth commenting on as some of these barriers may be easy to address. Some of the quotes from students include:

“The tools needed for recycling are not there” (year 2 student nurse)

“Low priority for busy nurses involved in nurse settings” (year 3 student nurse)

In previous research in health and social care, confusion about different systems for recycling highlights the complex information members of hospital staff have to consider (Manzi et al 2014). Key to improving this is to have a strategy which all staff are trained

in and able to use. In this research participants clearly reported some difficulties in recycling; pressure of work is unlikely to improve this situation. Therefore Practice-based systems, for example those applied to waste management and recycling, need to be easy to use and relevant for the specialism. .

Student attitude

A minority of students did not see sustainability as a priority, or felt that practice was already sustainable:

“When learning it is difficult to challenge sustainability as at the time the concern is learning” (year 2 student nurse)

“Furthermore some placements are quite sustainable and I have not felt it necessary to challenge” (year 3 student nurse)

Anaker et al. (2015) found that registered nurses focused on tasks that were more directly linked to patient care than climate and environmental issues. Nurses supporting students during their practice placements have a crucial role in the professional socialisation of students (Ousey, 2009). Thus attitudes such as not prioritising sustainable ways of working are likely to be passed on to students.

Students who felt able to challenge practice in year 2 and 3

Students indicating that they were able to challenge practice provided details of how they had changed their own practice and had influenced others.

Changed own practice

The majority of students in both year 2 and 3 stated that as a consequence of learning about sustainability they had changed their own practice in terms of waste disposal/recycling, or by ensuring sustainable use of equipment. The latter often related to glove use.

“Ensure the correct waste is put into the correct colour bag – some confusion regarding this previously” (year 2 student nurse)

“I use rubber gloves only when dealing with bodily fluids. Use a maximum of 3 paper towels to dry hands” (year 2 student nurse)

“Not always automatically using gloves – only use when an appropriate barrier is needed” (year 3 student nurse)

The focus here is on practical skills that students have learned, which suggests that instrumental approach to learning has taken place (Goodman and East, 2013). This is a good start for a more encompassing change as such a behaviour change will be noted and may be adopted by others as part of the professional socialisation process (Ousey, 2009).

Influenced others

Students also commented on how they would influence others by challenging their behaviour, or educating them on sustainable practice. The proportion of students mentioning this was higher in 3rd year than in 2nd year students.

“I educate others about plastic/oil and what can be done to help” (year 3 student nurse)

“Went to a trust meeting and suggested money saving ideas mainly based on sustainability that all the staff seemed completely unaware of” (year 3 student nurse)

This change over time might reflect the growth in confidence and socialisation into the nursing profession discussed earlier, as well as successful development of student agency within the nursing programme. Power (2016) argues that empowering students to become critical thinkers and agents of change potentially leads to improved frontline healthcare delivery. This is reflected in professional standards of nursing (NMC, 2018) which require registered nurses to act as leaders to improve healthcare.

LIMITATIONS

This study investigated the extent to which student nurses reported that they were able to apply their knowledge of sustainability in clinical practice following educational sessions on relevant topics. A limitation of the study is the reliance on self-report measures that do not allow for a more in-depth exploration of the factors that might limit or enable the application of knowledge to clinical practice. Furthermore, as the study

required self-reporting, it did not measure actual change; observational studies would be required to draw any conclusions regarding specific changes in practice, and if any changes could be sustained over time. Further studies are required to support this, using, for example interviews or focus group discussion; this might also provide validation for and further development of the open-ended questions

RELEVANCE FOR PRACTICE

Providing educational sessions focused on the relevance of climate change and sustainability to health and healthcare in undergraduate courses can lead student nurses to challenge unsustainable clinical practice. Topics on climate change, sustainability and health could be linked to current nursing curriculum in order that students see the direct relevance to their professional practice. For example, focusing on waste management and sustainable resource use during clinical skills sessions, and integrating the health impacts of climate change into global and public health.

Furthermore, similar educational interventions need to be integrated into clinical environments in order to overcome the barriers sustainability aware students face in attempting to practice sustainable healthcare. This could be by way of induction programmes for new staff and continuing professional development sessions.

Nurses can provide a strategic leadership role as seen by the International Council of Nursing position statement in 2018. As the changing climate and potential limits to resources continues to impact on health and healthcare delivery, nurses will need appropriate and relevant educational input in order to respond to the challenges they will face within their local communities.

CONCLUSIONS

Climate change is impacting on health and the way we deliver healthcare. Nurses will need to be able to respond to new challenges at both a policy and practical level. This study indicates that sustainability sessions, integrated into nursing undergraduate curriculum and focussed on aspects of clinical relevance can support nurses to implement change and challenge unsustainable practices. However, barriers remain that require confidence-building for the students and increased awareness within the workforce in general.

As a consequence of being exposed to sustainability scenario sessions student nurses and midwives felt able to change their own practice. This was particularly evident in the area of waste management and the use of resources. They also felt they were able to influence others. The main barriers preventing student nurses and midwives from challenging unsustainable practice in the clinical area were lack of confidence and resistance to change. Therefore more work is needed to explore ways in which climate change and health, and sustainable healthcare can be fully integrated into clinical practice, and be fully supported by managers and clinical mentors.

REFERENCES

Anaker, A., Nilsson, M., Holmner, A. and Elf, M. 2015 Nurses' perceptions of climate and environmental issues: a qualitative study. *Journal of Advanced Nursing* 71(8), 1883-1891.

Álvarez-Nieto, C., Richardson, J., Parra-Anguita, G., Linares-Abad, M., Huss, N., Luisa Grande-Gascón, M., Grose, J., Huynen, M., López-Medina, I.M. 2018 Developing digital educational materials for nursing and sustainability: The results of an observational study. *Nurse Education Today* 60, 139-146
<http://dx.doi.org/10.1016/j.nedt.2017.10.008>

Begley, C.M. and White, P. 2003 Irish nursing students' changing self-esteem and fear of negative evaluation during their preregistration programme. *Journal of Advanced Nursing*, 42(4), 390-401.

Costello, A., Abbas, M., Allen, A., Ball, S., Bell, S., Bellamy, R., Friel, S., Groce, N., Johnson, A., Kett, M., Lee, M., Levy, C., Maslin, M., McCoy, D., McGuire, B., Montgomery, H., Napier, D., Pagel, C., Patel, J., Puppim de Oliveira, J.A., Redclift, N., Rees, H., Rogger, D., Scott, J., Stephenson, J., Twigg, J., Wolff, J. and Patterson, C. 2009. Managing the health effects of climate change: Lancet and University College London Institute for Global Health Commission. *The Lancet*, 373(9676), 1693–1733.

Cotton and Winter 2010.

It's_not_just_bits_of_paper_and_light_bulbs_A_review_of_sustainability_pedagogies_and_their_potential_for_use_in_higher_education.

<https://www.researchgate.net/publication/285906719> (accessed 23/07/2019)

Elo, S. and Kyngas, H. 2007. The qualitative content analysis process. *Journal of Advanced Nursing* 62(1), 107-115

Errington, E.P. 2011. Mission possible; using near-world scenarios to prepare graduates for the professions. *International Journal of Teaching and Learning in Higher Education* 23(1), 84–91.

Felicilda-Reynaldo, R.F.D., Cruz, J.P., Alshammari, F., Obaid, K.B., Rady, H.E.A.E.A., Qtait, M., Alquwez, N. and Colet, P.C. 2018. Knowledge of and attitudes toward climate change and its effects on health among nursing students: A multi-Arab country study. *Nursing Forum*, 53(2), 179-189.

George, J.B. Betty Neuman. 1995. In: George J.B (Ed) *Nursing Theories: The base for professional nursing practice*. Prentice Hall, London UK pp 281-300.

Gibbs, C., Fernandez, A. and Callanan, M. 2017. Nursing and the barriers to sustainable health care: a literature review. *British Journal of Nursing* 26(22), 1230-1237.

Goodman B. 2013. Role of the nurse in addressing the health effects of climate change. *Nursing Standard*, 27(35), 49-56.

Goodman B. and East, L. 2013. 'The 'sustainability lens': A framework for nurse education that is fit for the future. *Nurse Education Today* 34, 100-103.

Goodman B and Richardson J. 2010. Climate Change, Sustainability and Health in UK Higher Education: The Challenges for Nursing. In: Jones P., Selby D., Sterling S. *Sustainability Education: Perspectives and Practice Across Higher Education*. London, Earthscan pp 109 – 131.

Gonzalez-Gaudiano, E, and Meira-Cartea, P. 2010. Climate change education and communication: A critical perspective on obstacle and resistance. In: Kagawa, F. and Selby, D. (eds.) *Education and Climate Change: Living and learning in interesting times*, New York: Routledge pp 13-34.

Graneheim, U.H. and Lundman, B. 2004. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Education Today* 24, 105-112.

Grose, J., Richardson, J. 2013a. Managing a sustainable, low carbon supply chain in the English National Health Service: The views of senior managers. *Journal of Health Services Research & Policy*, 18(2), 83-89.

Grose J., Richardson J. 2013b. Strategies to identify future shortages due to interruptions in the healthcare procurement supply chain: a method from the English National Health Service. *Journal of Health Service Research Policy and Practice*. 19/1(19-26), 1355-8196 <http://hsr.sagepub.com/content/19/1/19>

Grose J., Doman M., Kelsey J., Richardson J., Woods M. 2015. Integrating sustainability education into nursing using an interdisciplinary approach. *Local Economy* 30(3), 342-351.

Hunter, L., Magill-Cuerden, J. and McCourt, C. 2015. 'Oh no, no, no, we haven't got time to be doing that': Challenges encountered introducing a breast-feeding support intervention on a postnatal ward. *Midwifery*, 31, 798-804.

Ibrahim, S.A.E.A. 2011. Factors affecting assertiveness among student nurses. *Nurse Education Today*, 31, 356-360.

International Council of Nursing. Nurses, climate change and health. Position statement published 2018 (<https://www.planetaryhealthnow.org/now/2018/10/30/international-council-of-nurses-statement-on-climate-change-and-health>) Accessed 9th April 2019

Levett-Jones, T. and Lathlean, J. 2008. Belongingness: a prerequisite for nursing students' clinical learning. *Nurse Education in Practice* 8(2), 103-111.

Manzi, S., Nichols, A. & Richardson, J. 2014. A non-participant observational study of health and social care waste disposal behaviour in the South West of England. *Journal of Health Services Research & Policy*. 19(4), 231-235.

Nursing and Midwifery Council (NMC) 2018. The Code: professional standards of practice and behaviour for nurses, midwives and nursing associates. Available at: <https://www.nmc.org.uk/standards/code/> (Accessed: 14/05/2019).

O'Mara, L., McDonald, J. Gillespie, M., Brown, H. and Miles, L. 2014. Challenging clinical learning environments: experiences of undergraduate nursing students. *Nurse Education in Practice*, 14(2), 208-13.

Ousey, K. 2009. Socialization of student nurses – the role of the mentor. *Learning in Health and Social Care*, 8(3), 175-184.

Perry, P. 2011. Concept Analysis: Confidence/Self-confidence. *Nursing Forum*, 46(4), 218-230.

Polit, D. F. & Beck, C, T. 2018. Essentials of Nursing Research: Appraising Evidence for Nursing Practice. 9th Edition. Philadelphia: Wolters Kluwer.

Power, J.J. 2016. Nursing and medical students as agents of change in health care: Impact of schools core values and culture - a discussion paper. IOSR Journal of Nursing and Health Science 5(6), 181-186.

Richardson, J., Heidenreich, T., Álvarez-Nieto, C., Fasseur, F., Grose, J., Huss, N., Huynen, M., López-Medina, I., Schweizer, A. 2016. Including sustainability issues in nurse education: a comparative study of first year student nurses' attitudes in four European countries. Nurse Education Today 37, 15-20.

Richardson, J., Grose, J., Bradbury, M., Kelsey, J. 2017. Developing awareness of sustainability in nursing and midwifery using a scenario-based approach: Evidence from a pre and post educational intervention study. Nurse Education Today 54, 51-55

Richardson, J., Clarke, D., Grose, J. and Warwick, P. 2019. A cohort study of sustainability education in nursing. International Journal of Sustainability in Higher Education 20(4), 747-760.

Solomons, N.M. and Spross, J.A. 2011. Evidence-based practice barriers and facilitators from a continuous quality improvement perspective: An integrative review. Journal of Nursing Management 19(1), 109-120.

Solomon, C.G. and LaRocque, R.C. 2019. Climate change – a health emergency. The New England Journal of Medicine 380(3), 209-211.

Sterling S. 2007. Riding the storm: towards a connective cultural consciousness. In: Wals A.E.J (ed) Social learning towards a sustainable world. The Netherlands, Wageningen Academic Publishers. pp 63-82.

The Conversation <https://theconversation.com/universities-have-alerted-us-to-the-scale-of-the-climate-crisis-now-they-must-lead-in-showing-society-how-to-solve-it-117805>
(accessed 13/08/2019)

Wals A.E.J (ed) 2007. Social learning towards a sustainable world. The Netherlands, Wageningen Academic Publishers.

Watts N. et al. 2017. The Lancet Countdown on health and climate change: from 25 years of inaction to a global transformation for public health. The Lancet [http://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736\(17\)32464-9.pdf](http://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(17)32464-9.pdf)
(Accessed 13/12/2017)

World Bank. 2017. Climate-Smart Healthcare: Low carbon and Resilience Strategies for the Health Sector.

<http://documents.worldbank.org/curated/en/322251495434571418/pdf/113572-WP-PUBLIC-FINAL-WBG-Climate-smart-Healthcare-002.pdf> accessed 9th April 2019

Accepted Article

Table 1 Summary of educational interventions

Educational intervention year 1	Educational intervention year 2	Educational intervention year 3
<p>The session focuses on a case study scenario of a family when health and care is compromised due to climate change and compromised resource issues. Although fictitious, the case study is based on actual research on climate change and health; it includes real events that resulted in supply change challenges and the issuing of a medical device alert. The materials include a lecture with relevant short video clips, group activities, and additional references and resources (full details can be found at https://open.plymouth.ac.uk/lo gin/index.php see Topic P1_B1 Introduction: The relevance of sustainability and climate change to nursing and healthcare).</p>	<p>In the session, students are challenged to make connections between items they use in clinical practice that are made from natural resources (such as oil and cotton), and potential challenges to clinical care if the natural resource was no longer available (see this short film by way of example http://youtu.be/zlFT2Dbg08o). Full details of how to run this session, together with associated research can be found at https://open.plymouth.ac.uk/lo gin/index.php P2_B1 Sustaining the global environment: strategies to minimise clinical waste in healthcare, download the <u>Health Environment and Resources Toolkit File</u>.</p>	<p>Students are presented with a clinical scenario of a patient manifesting symptoms that related to an outbreak of Escherichia coli (E.coli). A short lecture was followed by group discussion that linked the potential for an increase in the spread of waterborne disease with climate change. Students were required to design a programme to manage the outbreak, including dealing with potential attention from the media. They were also invited to discuss how they could develop a wider public health awareness campaign. Following this they considered how climate change and damage to the environment (e.g. flooding, soil degradation) might impact on health (see https://open.plymouth.ac.uk/lo gin/index.php P3_B1 E-Coli outbreak and links to climate change).</p>

Table 2 Weighting for main categories for students unable to challenge practice in year 2 and 3

Main category	Weighting year 2	Weighting year 3
Lack of confidence	66%	53%
Resistance to change in practice	29%	38%
Practicalities	4%	8%
Student attitude	1%	1%

Table 3 Weighting for main categories for students able to challenge practice in year 2 and 3

Main category	Weighting year 2	Weighting year 3
Changed own practice	86%	76%
Influenced practice of others	14%	24%

Figure 1. Example of the abstraction process – based on Elo and Kyngas (2007)

