Crowdsourcing: A Novel Tool to Elicit the Student Voice in the Curriculum Design Process for an Undergraduate Diagnostic Radiography Degree Programme

Janice St John Matthews [*1 #], **Leslie Robinson** [2], **Fiona Martin**[3], **Philip M. Newton**[*2], **Andrew J. Grant**[*2]

[1] Department of Allied Health Professions, Faculty of Health and Applied Sciences, University of the West of England, Bristol, BS16 1DD

[2] Research in Health Professions Education, Swansea University Medical School, Swansea, Wales, SA2 8PP

[3] Clever Together Lab Ltd

Author to whom correspondence should be addressed; Janice.Stjohn-Matthews@uwe.ac.uk

***Title Page (with author details)**

ABSTRACT

Introduction: Stakeholder participation in healthcare curriculum design is an important aspect of higher education with stakeholders including students, staff members, clinical partners, healthcare organisations, patients and members of the public. Significantly, student co-creation, of the curriculum , has become increasingly important. Yet there is limited research which addresses how to engage this group in design processes.

Methods: This paper represents the first phase of a three stage action research spiral whereby the authors evaluated the use of a novel tool for curriculum design processes, anonymised crowdsourcing. This initial phase was open to all students enrolled on an undergraduate diagnostic radiography programme in the UK. To confirm the reliability of the crowdsource design an established eight point crowdsourcing verification tool was applied.

Results: Twenty-three unique ideas were generated by participants, 40 comments made and 173 votes cast. Inductive analysis of the comments generated five themes. These included: the role of technology enhanced learning; simulation activities; patient focused curriculum; mental wealth (resilience) authentic assessment approaches. An evaluation of those who had and had not engaged highlighted areas of improvement for the administration of the second and third iterations which will include a wider pool of participants.

Conclusion: This study from a single programme offers lessons for others wishing to adopt and develop the approach elsewhere.

Implications for practice: Several ideas elicited by the crowdsource have been considered by the curriculum design team and will be implemented in the 2020 curriculum thus demonstrating the impact on local education practice of this research approach.

INTRODUCTION

BACKGROUND

Curriculum is described as a sequence of learning and experiences [1]. It includes the programme aims, intended learning outcomes, syllabus, assessment, learning and teaching methods [2]. Stakeholder involvement in health professions' curriculum design is a university, regulatory and professional body requirement [3, 4, 5]. The term stakeholder refers to anyone who has an invested interest in a programme including students, staff members, clinical partners, healthcare organisations, patients and members of the public.

Within Higher Education (HE) student co-creation, the collaborative development of new concepts, solutions, products and services together with University staff, has become increasingly important [6]. This is distinct from the more standard and passive student evaluation and feedback mechanisms that almost every HE programme will have in place. It is suggested that working this way may increase student satisfaction by allowing the institute to better understand and meet their local learner needs[6]. This observation is supported by three published case-studies of co-created

curricula within HE in the UK, Ireland and the USA [7]. The advantage to the learner is that they gain more responsibility as they become a facilitator of their own learning. For HE it offers an opportunity to create unique services designed by local students.

A UK professional body for University Educators (The Higher Education Academy, now AdvanceHE) proposed a *'Student Engagement Through Partnership Framework'* which identifies four areas of partnership [8].

- Learning teaching and assessment
- Subject-based research and inquiry
- Scholarship of teaching and learning
- Curriculum design and pedagogic consultancy

It is proposed by the authors of this AdvanceHE report, that engaging students in curriculum design and pedagogic consultancy is perhaps the least developed area of student partnership across a spectrum of subject fields [9]. This trend is echoed in published radiography education literature whereby there is paucity of research pertaining to involvement of the student stakeholder group. This contrasts the research available on other stakeholder involvement in diagnostic radiography curriculum design [10-14]. Evidence based group consensus and forecasting tools described within these studies include focus groups, interacting groups, the Delphi method and nominal group technique. Each has advantages and disadvantages [15]. Specific challenges of using these traditional tools when engaging the student body include uncertainty around whose voices have been heard, managing large numbers and defining where the expertise lies i.e. with the academic and/ or stakeholder [16].

A tool that could be adopted to address the structural challenges of including students in curriculum design is crowdsourcing. Crowdsourcing works through an institution outsourcing a function normally performed by an employee or group of individuals [17]. Here crowdsource users, known as the crowd, form a community who undertake a task which typically involves the pooling of knowledge resources. Subsequently, the crowdsourcer can use to their advantage the knowledge and expertise that a large number of users brings to the task [18]. Crowdsourcing involves a call (open or targeted), with the crowd working through a pre-determined activity. Providing this on-line means individuals are not confined to physical space and set times [19]. The crowdsourcer can recruit from a wider and therefore more inclusive and representative pool thus addressing potential challenges with traditional group techniques. Benefits of being part of a crowdsource for participants can range from economic benefit, social recognition, the benefit of an improved system or product and/ or the development of individual skills. The crowd can be anyone interested in completing the task or it can be a purposively sampled group. The crowdsourcer who defines the parameters dependent on the task being undertaken [20].

A narrative literature review was undertaken on the role of crowdsourcing in health professions education[21]. A key finding was that there is no published research examining crowdsourcing in healthcare curriculum design. The tool has however been used in other parts of the healthcare education continuum including instructional material design[22,23,24], lesson planning[25], the assessment of basic non-complex surgical skills and the recruitment of students onto a surgical training programme[26-38]. On finding a gap in the literature pertaining to crowdsourcing a healthcare curriculum, the search was extended to education in other disciplines. This yielded an unpublished thesis which crowdsourced student ideas in developing a town planning degree in the USA. Here the creativity of the crowd was highlighted as having a positive impact on the final agreed curriculum design. One example was an idea to teach students improvisational comedy techniques to prepare them to respond on their feet in adversarial public meetings [39].

The research presented in this paper is the first iteration of an action research project which sought to include practitioner, patient, public and learner voice in the curriculum design process- figure one.

In this paper we present findings of phase one whereby student participation was sought in the coproduction of a revised, relevant BSc (Hons) Diagnostic Radiography training programme at the University of the West of England (UWE), Bristol United Kingdom. At UWE, Bristol, until now, students have not been formally included in the five yearly curriculum design process although UWE does hold regular termly Student Representation Staff Forum (SRSF) meetings where curriculum structure is regularly discussed and reviewed by students and the academic team. Currently there are three elected representatives per cohort. Across the year groups there are nine representatives who represent 172 learners.
The purpose of the research was to determine if crowdsourcing could be an adjunct to the standard local curriculum design processes to enhance the design process in the following ways
i) determine if crowdsourcing would be accessed by students
ii) determine whether ideas the crowd contributed would be included to the new curriculum
iii) evaluate learners' reasons for engaging/ not engaging with the tool

METHODOLOGY & METHOD

To explore the application of the proposed alternate tool a pragmatic research approach was adopted as there is no commitment to particular epistemological or ontological assumptions. Instead a key principle of a pragmatic approach is that it is appropriate for research that is practically useful [40]. Action Research, defined as inquiry that is undertaken by or with insiders to an organisation or community, was carried out [41]. This is a reflective process and is orientated to some action or cycle of actions that an organisation or community have taken, are taking, or wish to take to address a particular problematic situation [42], in this case an institutional and regulatory requirement to revise the curriculum every 5 years. This results in changes within the setting or within the researchers and participants themselves [43]. This approach has been previously used to inform pre-registration radiography curriculum design involving clinical partners at another UK HEI [44].

THE CROWDSOURCE

If crowdsourcing is not carefully planned, it can result in large amounts of data that are not helpful in solving the problem. Hence to support the planning process the Estelles-Arolas & Gonzalez-LadrondeGuevara[20] crowdsource verification tool was applied to the crowdsource design. This tool states there are eight characteristics to a crowdsource.

About the crowd:
1. Who forms the crowd
2. What the crowd has to do
3. What the crowd gets in return

About the initiator (crowdsourcer):
4. Who the crowdsoucer is
5. What the crowdsourcer gets in return for the work of the crowd

About the crowdsourcing process:
6. What type of process is it
7. What type of call
8. What medium is used

The Crowd

The crowd was asked to discuss their thoughts on how the local diagnostic radiography programme could be updated. To start the conversation, four challenge questions were required. To support an

evidence-based approach to the creation of these questions, we referred to a national survey of UK radiology managers which sought to ascertain the *"fitness for purpose"* of recent diagnostic radiography graduates [45]. The resultant themes from this survey were: the current curriculum content and structure; diversification in the role of the radiographer; professionalism and the need for improved resilience. These topics therefore formed the basis of the final four challenge questions:

1. Is there anything we should stop, start of so differently in the updated programme?
2. What do UWE, Bristol need to include in an updated diagnostic radiography programme to support your career aspirations?
3. What technical skills should a newly qualified diagnostic radiographer have?
4. How can a diagnostic radiography training programme help you in supporting your mental wealth?

Participants could 'comment' on these initial 'questions', they could add new 'ideas' and/ or 'vote' on the ideas or comments of other crowd members by using a simple like/ dislike symbol (thumbs up/ thumbs down). One advantage of using a digital data collection tool meant the data were already transcribed [46]. Convenience sampling was undertaken with all students enrolled on the preregistration
BSc (Hons) Diagnostic Radiography programme at UWE invited to partake (n=172). The call to participate was undertaken electronically via email and notices on the virtual learning environment (BlackBoard™). Flyers were also distributed to the Year 1 students on placement and they were verbally reminded of the activity during a clinical link visit. Tweets to highlight the activity were sent via the first author's personal (@jstjohnmatthews) and departmental (@UWE_AHP) accounts. There was no financial incentive for the crowd to engage with the activity. The reward being solely the opportunity to take part in the shaping of an updated curriculum.

The Initiator/ Crowdsourcer

This was the lead author of the paper acting on behalf of the UWE BSc (Hons) Diagnostic Radiography programme team. The lead author was not part of the curriculum review group for the 2020-2025 programme however they had taught on the programme previously as a Senior Lecturer and had been part of two previous programme curriculum reviews. The programme team received the ideas and comments generated from the current student body via the lead author.

The Crowdsourcing Process

An online data acquisition approach was adopted for this study and data were acquired using the CleverTogether™ crowdsourcing platform [47]. This platform has been commissioned by organisations including the Department of Health, Health Education England and NHS Trusts [48-52]. The platform offered an asynchronous on-line engagement, open 24 hours a day, seven days a week whereby participants could join the conversation as many times as they wished. Whilst contributions to the platform were visible to other contributors, personal details were anonymised thus ensuring ideas were treated by others on merit, not on the person expressing them. The crowdsource lasted two weeks (25th June 2019 to the 07th July 2019). The crowdsourcing platform consisted of a launch page whereby the project information, a participant information leaflet, ground rules and additional reading resources were available. The page included a "sign up" function. The sign-up process included a gateway questionnaire to capture demographic information and a tick box to confirm participants had understood the participant's information leaflet thus consenting to be part of the study alongside abiding by the ground rules. Participants were then taken to the page which contained the four challenge questions on which they were asked to either add their own personal idea or leave a comment on the ideas posted by others. There was also the opportunity to vote using a *"thumbs up"* or *"thumbs down*" button for each idea or comment. The first author logged in every day to moderate the on-line space. The project welcomed tricky and heated ideas. However, the ground rules stated that, personal, abusive or offensive content would not be tolerated and the

lead author had the ability to remove a group member if the issues were ongoing.

ETHICS

The research was approved by Swansea University Medical School research ethics committee (SUMS 2019-0013) where the lead author is a Doctorate candidate. It was ratified by UWE (HAS.19.05.185) where the research was undertaken.

DATA COLLECTION & ANALYSIS

Objective 1. Determine if the crowdsource would be accessed by students

Quantitative data captured included the number of students invited to participant, how many students logged in and how many contributed by adding ideas, comments and/or votes. Prior to entering the online space participants were asked to identify their year group via the gateway questionnaire and were allocated a unique user number. We were unable to map participant to user number thus maintaining anonymity. Individual user numbers highlighted the time a participant logged in, their level of contribution and how often they did so.

Objective 2. Determine if ideas contributed by the crowd would be adopted

An inductive approach was taken to analyse the qualitative data generated through the ideas and comments made by the participants. This meant that the themes identified were strongly linked to the data generated [53]. To ensure rigour, a 15-point checklist of criteria was used to ensure a systematic approach to this activity [54]- table one. To further enhance the rigour of the themes generated the first and fourth article authors blind-coded the data independently. A critical friend telephone call followed to encourage the first author to reflect upon the multiple and alternative interpretations of the data as they emerged [55]. Data were then shared with the UWE programme team and curriculum changes documented.

Objective 3. Evaluate learners' reasons for engaging/ not engaging with the tool

Diagnostic radiography students were invited to complete a follow-up experience evaluation questionnaire. This qualitative, semi-structured, questionnaire asked those who had taken part to note what they liked/ disliked about the activity and to explain their motivations for participation. This questionnaire was sent to all those who had been invited to participate in the crowdsource. The questionnaire asked those who had not taken part to give their reasons why.

RESULTS & DISCUSSION

Objective 1. Quantitative data

One hundred and seventy-two undergraduate diagnostic radiography students were invited to partake with 27 contributing. This represented 8 students from year 1, 12 from year 2 and 7 from year 3. A further 8 observers consisted of the listed authors and further members of the CleverTogether™ team. All 27 students were deemed active contributors adding comments, ideas and or votes. Twenty-three unique ideas were generated by participants, 40 comments made to the challenge questions and ideas generated and 173 votes cast. This nominal data is presented in table two. No students were on the university campus site as the year one students (2018 intake; n=61) were on placement away from the University, year two students (2017 intake; n=61) were on holidays and year 3 students (2016 intake; n=50) had completed the degree programme and were awaiting HCPC registration prior to commencing first posts. Students logged in from across the UK and Ireland. This data demonstrates that students from all three programmes have participated at various times exhibiting an improvement on the traditional system.

Objective 2. Qualitative data

Four themes emerged from the data. Although this quantitative data is useful in ranking the most

discussed and most commented ideas, table three, crowdsourcing focuses on the qualitative data analysis so that ideas that do not score highly are also reflected on as part of the process. The corresponding curriculum actions for consideration can be found in table four.

Curriculum content.

A strong theme identified from all the year groups was patient centred care. Ensuring a pedagogy that is centred around compassionate care can be difficult in a technical and process-driven discipline such as radiography [56]. Tension exists with an increased focus on technology and the academic aspects of education potentially impacting the importance of "softer skills" of caring in the curriculum [57]. Yet UWE students spoke of the need for individualised care

"What can be appropriate for one patient doesn't mean it'll work for another so I guess it's about using good communication via treating patients as individuals getting to know them"

Year 1 learner. Even when students did not agree on the depth to which some subjects were taught, i.e. training in CT; MRI; ultrasound, as they saw their immediate careers in plain imaging, students acknowledged that an understanding in these areas supported them in providing information to patients.

"Having an understanding of each modality is helpful when patients ask for information regarding them when they are in your care, and for deciding if you would like to go into that pathway". Year 2 learner

Care can be considered an intangible asset in a curriculum i.e. a contributory aspect to the success of higher education that are deemed important, yet are not easily measurable or quantifiable [58]. Whilst it is beyond the objectives of this study to identify where exactly compassion is being promoted in the current curriculum, good practice has been highlighted by the crowd. The existing programme has a strong emphasis on reflective practice, using service user stories, using standardised patients for imaging simulations and role-modelling by academic staff. These activities are acknowledged in literature as opportunities that enable a compassion focused pedagogy [59] and will continue in the updated curriculum.

Students discussed the need to have more teaching on specific patient groups including imaging larger patients, supporting patients with dementia and end of life patients.

"So that students can practice imaging larger patients, and feeling for their bony landmarks before they go on placement. Or be able to practice on larger patients before placement.": Year 3 learner

Subsequently simple changes will be implemented. In response to the students' comments about curriculum content relevance we will overtly advise learners how module learning outcomes and module content aligns with the specific regulatory requirements and standards of proficiency for radiographers [3]. This will be achieved through messaging on the virtual learning environment and making a note at the beginning of individual lectures. Teaching on specific patient groups will be further developed for all year groups in the theory and simulation activities already delivered. These changes will incorporate involvement of service users in the design and delivery of individual teaching sessions.

Assessment and feedback.

Assessment within the clinical environment was the most discussed and most rated idea, table three, with the crowd agreeing that they were unhappy on how time in clinical placement is currently graded. The current mechanism of assessment is embedded in a thirty-credit placement module delivered in year one, year two and year three of the programme. This module consists of a pass/fail clinical portfolio alongside a presentation which is graded. Students did not believe the

presentation was an authentic way to measure placement achievement.
1
"Students can excel in placement which is reflected in the weekly comments and end of placement review, however, nerves on the presentation can yield an overall lower mark.": Year 3 learner
"I understand it is hard to quantify placement but there should be some weighting towards final mark.": Year 2 learner]

It is understandable that concerns relating to grading in practice would be highlighted as clinical placements are a core component of radiography education. Locally, UWE students will spend 42 weeks of their degree in this setting. Literature pertaining to grading in practice highlights that it is a balancing act between grading in practice and managing this against grade inflation within the University setting. It has been agreed that the reflective presentation will remain in Year two with a self-audit of practice being introduced in Year three. This has been designed with clinical partners and will be aligned to Band 5 competency requirements.

Academic Support
The theme of academic support centred around the experiences of learning in the clinical setting. The crowd noted support on placement varied and the need for themselves as trainees to develop their *"mental wealth"* (resilience). Students at UWE spend 14 weeks per year in a single clinical placement block. These are supported by a visit once a month form an academic staff member who travels to the placement site. The crowd highlighted the importance of positive feedback in the learning environment and support from peers and clinical colleagues. However the crowd observed that there was a stigma to disclosing to the clinical placement and University if they were not coping.

"Getting good feedback whether that's through pebble pad or comments or a fist bump always means a lot to me because someone else has taken the time to point out the good things in practice that I may not be aware of. It's empowering to have another person celebrate the little things you do that make a difference!": Year 1 learner

"We have the three visits during the placement but it is hard to tell them that you are finding difficult as they feel you are not fit to work.": Year 2 learner

Mental health challenges whilst on placement described by this group are echoed by previous research with UWE, Bristol and London City University therapeutic radiography students whereby a lack of communication, understanding and consistency by clinical supervisors were listed as impacting support on placement. Armstrong-James et al. suggest that additional training for clinical educators on providing well-being support to students may be of benefit to clinical supervisors [60]. This intervention has since been developed as part of the Office for Students Strategic Interventions in Health Education Disciplines (SIHED) work [61]. In the new curriculum, the programme team plan to access this resource alongside raising awareness of the University level *"Mental Wealth Strategy"* [61] to students and clinical educators.

Learning Environment
Creating engaging lectures through technology enhanced learning was the second most discussed idea and the third highest rated amongst the crowd. On the whole the curriculum was deemed to have practices that learners found helpful including recording of lectures, the use of flipped classrooms and the use of on-line quiz software to test knowledge formatively. This approach has been part of the curriculum for a number of years and previous satisfaction has been evidenced [63]. However there was a request from the crowd to extend this to all modules.

"I believe it would be quite simple to make them (lectures) more engaging. For example, our anatomy and physiology classes had pre and post tests for us to complete at home. I personally

found this very useful and it helped me engage with the learning material": Year 3 learner

The need for more simulation training was perceived as a way of increasing confidence whilst working with patients.

"More time in the X-ray room before going out on placement would be beneficial for many.": Year 3 learner

"To gain confidence not only in their ability to achieve a good diagnostic image.": Year 1 learner

Radiographers require a careful balance of technical and soft skills hence there is a need to include pedagogical approaches to support students in transferring theory learnt to practice. Literature suggests simulation is a valuable pedagogical approach in teaching both of these skills and increasing confidence [64]. A recent purchase of a CT scanner at UWE means the programme will create enhanced learning opportunities via CT simulation alongside existing plain imaging simulation opportunities.

Objective 3. Post crowdsource survey

Eighty-three questionnaires (48%) were returned. Sixty-one of these were from students who did not partake in the crowdsource because they: did not have time, missed the emails or they thought it would be too technical. One participant noted that they did not think the platform was inclusive to those with dyslexia. Of the 12 (37% of participants) who had been part of the crowdsource reasons to participate included: altruism, wanting to support the development of the updated programme and wanting to be part of something "ground breaking".

This research relied on students volunteering their time to contribute. Online volunteering is a broad term derived from prosocial motivation [65]. Prosocial behaviour refers to ''voluntary actions that are intended to help or benefit another individual or group of individuals'' [66]. These can be characterised by different types of motivations: altruism, egoism, collectivism, and principles [67]. In this study altruism, the desire to increase the welfare of others, and collectivism, the desire to increase the welfare of one's community, were cited by the crowd as reasons to be involved. Crowdsourcing allowed the design team to offer a democratic process to all students including those geographically dispersed due to holidays or placement. Participants engaged from across the UK and Ireland, across the two weeks at various times from early morning to late at night. An email from one learner stated:

"This crowd page [sic] *is perfect where students can voice directly rather than going through a student representative, therefore the opinions are not going to be communicated through another student"*

Limitations

One consideration of this research is the power dynamics of the crowdsource initiator as an educator and the crowd as students. One way to engage with a genuine partnership practice is to nurture the power-sharing relationship through reflecting, accepting partnership as a process with uncertain outcomes, engaging in ethical partnerships, enacting partnership for transformation and fostering inclusive partnerships [68]. Whilst teaching staff have expertise in the courses they teach, students are experts in the experience of being a student and have an overview of their programme of study. Hence these values of where expertise lies were upheld by the UWE BSc (Hons) Diagnostic Radiography programme team who recognised that everyone in the crowd had something to contribute and they as educators needed to be open to ideas offered.

The generalisability of findings of an Action research project beyond the local context is difficult even more so when student partnership working seeks to specifically address local provision[8]. However, we believe that some of the qualitative findings will be of interest to radiography education

providers, academic and clinical, as per priority 25 of the UK "College of Radiographers Research Priorities" for the Radiographic Profession: *"Evaluating the education and workforce requirements to meet future service needs"* [69]. Also, the novel use of crowdsourcing as a tool to support student partnership working will be of interest to those outside the radiography subject field as it adds to the limited empirical research on the role of students in curriculum and pedagogical reviews.

Finally, whilst on-line methods can be effective in reaching particular portions of the population, obtaining representative participation requires integrating other forms of participation [70]. As this was a novel tool in the arena of curriculum development on this occasion we were not able to integrate the crowdsource into local university curriculum processes. Hence for this first iteration of the wider study, the crowdsource ran in parallel to the current curriculum review process-figure one.

CONCLUSION

For this study the authors, through adopting crowdsourcing, sought to improve student involvement in a curriculum design process Using action research offered an opportunity to undertake reflective inquiry with the goal of improving understanding and practice. A total of 27 students contributed to this study. Several ideas shared have been considered by the curriculum design team and will be implemented in the 2020 curriculum thus demonstrating the impact on practice of this research approach. This study represented the first stage in a three iteration action research continuum. Iteration two and three will be expanded to include more participants.

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