Re-thinking housing inspection and regulation: using 360 technology as a new approach in environmental health practice training

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Abstract

Front-line professions such as environmental health require practitioners to demonstrate competence in practice-based skills typically gained only through on-the-job experience. However, practice opportunities have been more scarce, owing mainly to austerity but also to the impact of the COVID-19 pandemic, so necessitating novel approaches to teaching and learning. 360 technology has recently emerged as a possible solution, but its potential for use in an environmental health setting, such as housing inspection and regulation, is virtually unknown.

This study involved the use of a 360-degree camera to record a simulated walkthrough and mock inspection of a two-storey house. These 'photospheres' were demonstrated to under- and postgraduate students, who were then surveyed online to explore their attitudes towards the use of this technology as a training method. Analysis of the questionnaire responses revealed four self-reported themes: experience of housing regulation and enforcement practice and training; experiences of 360 technology in housing inspection practice and enforcement; attitudes towards using 360 technology versus traditional photograph and filming methods for experiential learning, training and practice purposes; and attitudes towards the application of 360 technology for experiential learning and training purposes in housing inspection enforcement and regulation.

The results indicated that students found this a helpful and flexible tool, particularly valuing its immersive nature, both for initial training and continuing professional development (CPD) in housing inspections and interventions. It has wider applicability to other frontline professional practices and requires further development to help shape new forms of training.

Introduction

Many front-line professions, including environmental health, occupational health and safety and public health, require a practice-based, hands-on approach to learning (Lucchini *et al.*, 2018). In recent years, for various reasons (including austerity), many practice learning options have been withdrawn, but new technologies have been introduced, enabling exciting virtual learning opportunities. Such learning, however, requires considerable up-front thought and investment if it is to be able to replicate 'real-life' practice experience in initial learning and in continuing professional development (CPD) across an employment life course.

Many universities and other learning providers have struggled to find and secure suitable placement activities for their students (Nicola-Richmond *et al.*, 2017). Particularly hard hit has been training for environmental health practitioners who work in the housing sector and have a specific role in regulating conditions and management in privately rented housing. The private rented sector (PRS) has traditionally been regulated by Environmental Health Practitioners (EHPs) and other suitably qualified PRS regulators based in local authorities (LAs). However, for a range of complex reasons, fewer people are coming into and staying in the profession; consequently, LAs have found it more and more challenging to recruit and retain suitably qualified and dedicated EHP and other staff, with an inevitably deleterious effect on enforcement (Battersby, 2018).

The PRS, after several years' expansion, now counts for the majority of rental tenure and is where most poor housing conditions are found (see for example Stewart and Moffatt, 2022). In the context of the austerity measures facing the statutory regulators in LAs, as previously outlined, the workforce regulating the PRS lacks not just numbers of personnel but also the skills and competencies required for effective regulation, something adversely affected by the COVID-19 pandemic and little researched (Stewart and Jeavons, 2023). The PRS regulatory workforce has therefore become depleted, though attempts have been made to start training new front-line practitioners and to retain existing qualified staff by offering CPD learning opportunities in flexible and tailored ways.

For the purposes of this paper, we, by 'housing inspections', mean the skills and competencies to be able 1) to identify deficiencies either inherent in a building or a result of lack of maintenance or repair over time and 2) to demonstrate, in response, such familiarity with evidence-based health and safety issues as enables the proper application of the relevant regulatory framework. In other words, they are practical inspection or survey skills used to assess the condition of any privately rented dwelling – whether house, flat, house in multiple occupation (HMO) or, indeed, any lived-in permanent structure – and the regulatory knowledge to deal with deficiencies.

360 technology – a new form of 'practice' learning?

Research into other more practical areas of experiential learning, teaching and organisational training suggests that on-the-job experience is the most valuable form of learning (Smith, 2012). However, for a number of reasons, gaining access to practical experience is often difficult for student/graduate environmental health trainees, so hindering the development of core and technical competencies in key practical areas of the profession (Bowles, 2003).

Where such experiential learning cannot be accommodated, it is possible to make use of simulations, in-depth evaluations of case-studies, reference to previous work experience (Coldham and Armsby, 2016) and the examination of photographic evidence. These approaches do, however, need careful and expert consideration of content and method, as well as guidance as to how they could fit into a framework of required knowledge and abilities for different levels and functions within the profession.

Competencies relating to housing standards may be achieved through university education or various other training providers and need quite precise, action-oriented explanations of what someone needs to be able to do to achieve the standard. Perhaps the creation of a graduated scale of competency standards to match the hierarchy of skills in housing inspection roles would achieve shared understanding amongst university educators and training providers about just how much on-the-job experience is necessary at the various levels and where simulation might serve as a helpful alternative in preparing trainees for what they will have to do when appointed.

For environmental health housing practitioners, including those in training and education, one of the most challenging aspects of regulatory enforcement is gaining exposure to real-world scenarios, such as an actual housing inspection. Typically, this is done through classroom-based simulated case studies, using a mixture of descriptive text and still images only. The major weakness of this approach is that it does not necessarily provide those in training – such as environmental health students or recently qualified LA housing officers –with an in-depth, step-by-step understanding of how a housing inspection should be conducted. Equally, this way of teaching and training may also fail to develop the key practice-based skills expected of qualified housing officers when undertaking an inspection, because trainees cannot view and interact with the environment at will. Similar limitations of this approach have been identified by Hackney, McMaster and Harris (2003).

360 technology may offer a solution, with its alternative way of developing the acquisition of essential practice-based skills, core and technical competencies (Lau *et al*., 2018). Although the use of 360 technology for experiential learning and training is not a novel concept, the pandemic stimulated interest in how it might deliver complex, practice-based scenarios remotely and safely. It has been used elsewhere: Beese *et al*. (2021) found that video analysis can be a helpful and persuasive tool for risk assessment in many different occupational areas.

This paper focuses on the rather niche area of housing inspections. However, we have already created 'photospheres' (360-degree images) beyond this, with an eye to wider public health workforce training opportunities. This is indeed timely, given, for example, the Royal Society of Public Health's (RSPH's) recent publication (2024) on unlocking the potential of the wider public health workforce. This refers to the wider range of skills and knowledge required for a diversity of professions and explores what would support practitioners further in developing them; it looks at access points into public health and clear routes for career development; it also makes key recommendations to meet needs – including training, access to resources and education opportunities – and suggests how this learning might be evidenced in an inclusive, flexible and adaptable way. (360 technology may, therefore, have broader scope for

boosting emerging training regimes and competency frameworks, but that is beyond the purposes of this particular paper.)

Lockdowns changed student and existing practitioner expectations and experiences of other virtual learning approaches and led to rapid developments in learning materials. A new vision of future learning opened up: supportive, virtual and with timing to suit the learner. 360 technology enhances learning because it immerses a user in a simulated environment to a greater extent than traditional still images or film (Adnan *et al*., 2020). In an environmental health context, it allows current and future practitioners and students in training to identify various housing-related hazards in a safe, online environment based upon a real-world setting, not unlike the driving theory test.

To the researchers' knowledge, no recent research has attempted to use or evaluate the feasibility of 360 technology as an alternative approach to housing regulation and enforcement practice and training in England.

The aim of this research therefore was to explore attitudes to using 360 technology as an alternative approach to housing regulation and enforcement practice and training. More specifically, the research wanted to explore whether 360 technology could work effectively as a substitute for practice experience, that being often, for students and colleagues already in practice, limited or completely unavailable.

Methodology

To fulfil the aim of the study, a cross-sectional study design was adopted, involving the creation of a simulation of a housing inspection that would be carried out by an environmental health housing officer working for a LA, followed by a qualitative exploration of attitudes towards this. Ethical approval for the study was given by Middlesex University's Ethics Committee (Application Number: 21584) for the filming and online questionnaire stages. No human participants were recorded during the study; nor were any included in the 360-degree photospheres taken.

The researchers used a 360 camera (Insta360 Pro2) and tripod because this technology allows the end-user (the individual who views the 360 images known as photospheres) to become immersed in the simulated environment and interact with it in multiple dimensions, which cannot be replicated when viewing a traditional still image or video, both one-dimensional in nature. The Insta360 Pro 2 camera was chosen for this research because it has six high-resolution cameras with the ability to provide a ground-to-ground range of up to 300 metres and ground-to-air range of up to 1000 metres, with thirty frames per second preview. It also has x6 Micro SD Memory card slots and a large storage capacity.

Pilot recording was undertaken to plan out the simulated housing inspection and trial the camera set-up, recording settings and positioning. Formal recording took place in July 2022 in a two-storey house. The researchers recorded, in total, forty-five 360 photospheres of the front, side and back exteriors of the property from ground level, as well as the inside of the house (a walkthrough of each room and space) in order to replicate the natural walkthrough of a property by an EHP during a housing inspection, as shown in figures 1, 2 and 3 below.

Figure 1. A 360 photosphere of the external entrance and garden to the house used for simulation walkthrough housing inspection.

Figure 2. A 360 photosphere of the internal main staircase of the house used for simulation walkthrough housing inspection.

Figure 3. A 360 photosphere of the internal of the upstairs bathroom of the house used for simulation walkthrough housing inspection. (Note the simulated damp and mould hazard around the window frame.)

After the simulated house walkthrough, the recorded footage was transferred from the camera memory to a secure online cloud drive that only members of the research team could access for viewing and processing purposes.

To explore attitudes towards using 360 technology as an alternative approach to housing regulation and enforcement practice and training, the researchers surveyed two cohorts of current undergraduate and postgraduate environmental health students from a London University who acted as research participants in this study, using a cross-sectional Momentive Survey Monkey questionnaire in January 2023.

The participants were all at different stages of study and practice experience. Some had undertaken seminar sessions with a small mock house model or seen some 'Second Life'-type films with a 'gaming' feel. All participants saw some still photographs and two-dimensional (2D) films of housing conditions for comparison, although this was not the scope of this particular study. Some students had experience – to a greater or lesser extent – of housing inspections, but others did not (some were international students).

Before formal surveying of the participants, each cohort was asked to watch a demonstration of the 360 photospheres detailed in figures 1-3 during a lecture session and shown a Meta Quest 2 virtual reality (VR) headset with which 360 photospheres and videos can be viewed and interacted with. For each cohort, the demonstration was delivered at a stage in their course learning programme when they would be thinking about inspection and investigation techniques in housing, health and safety and they would have a range of experiences of a 'real-world' housing survey, which would be distinguishable from the survey responses.

Following the demonstration, the research participants were asked a range of open-ended questions about their attitudes towards using 360 technology for recording and documenting housing inspections in relation to other options available, including traditional film and 2D photography to help support practice-based work and the development of skills and competencies for inspection and investigation in housing work; they were asked to comment

on areas requiring improvement and other user expectations. The Momentive survey also included participant information on the study and a consent statement outlining the voluntary nature of the survey and the option to withdraw by a given date. The data were analysed and themes arising identified.

Results

In total, 36 participants took part in this study, which included undergraduate (8), apprentice (9) and postgraduate (19) students. No particular patterns emerged as to comments made by each group or based on stated practice experience, so participants are listed as 1-36 below. Participants 1-17 are undergraduate students, including apprentice students and 18-36 are postgraduate students. A range of level of detail was provided and some yielded much richer data than others. The results were sorted into themes, which are highlighted in the sub-sections below.

Theme 1: Self-reported experience of housing regulation and enforcement practice and training

Practice-based training that students had received varied enormously and there was a sense that, overall, there was no plan and little direction to meet any set of requirements, with huge variation demonstrated amongst our small group. It should also be remembered that these students' perceptions as captured here are already in the main supported by their employer, so are not representative of what one might expect to find in practice overall.

Not all the respondents reported having experience of housing survey/inspections in practice. This was reported irregularly across the three groups of respondents, with some students at both undergraduate and postgraduate level reporting experience. Not all apprentice students reported experience, although it is likely that these will gain it as they progress through their study. It is not therefore helpful to comment on these aspects here.

Students were asked about what practice-based training they had received in housing inspections. The most common response to the type of practice training received was 'shadowing' experienced officers. There was little additional information about what this entailed in this particular study or about what students learnt from it or how their skills and competencies developed; indeed, this was not probed here. Some shadowing was reported, but it appeared to lack a comprehensive training structure (Participants 2,4,6).

There was, overall, a sense that this was all rather *ad hoc*, with nothing formal really planned about inspection techniques. This was also the case amongst some of the apprentice students, though this may be because of where they were in their training, having more on housing due in the future. According to the feedback given, there was no consistency about training; comments ranged from "*A few lectures around Housing and Health*" (Participant 35) to "*No formal training given*" (Participant 1). Comments also suggested that there was little structure or strategy in the practice training for housing inspection and that trainees learnt from more experienced officers. The following two comments are representative of what we were being told:

"I haven't been involved in enough visits, recently enough, to know. I have more housing visits planned for the near future in which I hope to pick up techniques" (Participant 6)

"Joining officers on visits, receive no training, just getting shown stuff"
(Participant 11).

In some cases, there seemed to be more of a training plan, though no way to record or capture it (something not clear from the responses). For example: "*I shadowed, took notes and followed inspection worksheet, trial inspections*" (Participant 7). The issue of 'shadowing' was raised elsewhere, but it was not possible to say what this meant; nor was it possible to ascertain the skills, competencies and training potential of the officer being shadowed, or whena student or practitioner was deemed skilled and competent enough to carry out an inspection alone. Training therefore felt very *ad hoc* and erratic, as illustrated by the following comments:

"Shadowing other officers and observing their inspections techniques until competent to conduct my own." (Participant 15)

and

"Training was through on the job experience shadowing Inspections and a 3 day classroom training course." (Participant 26).

One Masters student (Participant 18) reported on practice in a range of dwelling types (including HMOs) supported by the short training courses. Short courses were described as being three days maximum and therefore limited in terms of what it would be feasible to cover and assess in this time. It should also be mentioned that these short courses are delivered by a range of providers, do not necessarily have an inspection requirement and are not accredited. Some have been online only (perhaps on account of COVID), with no assessment built in. COVID also affected the ability of many students to access any practice experience. However, it also accelerated thinking about how else this might be done. Participant 15 reported: "*Asked some landlords to conduct an inspection of their property via live video call*"; it is known anecdotally that this happened elsewhere. Overall, there was little commentary about continuing learning from inspections or reference to evidence and research about housing deficiencies or links to health and safety or how this experiential learning was captured.

To be of real value, experiential learning through curriculum initiatives needs to capture some threshold concepts; for example, that lived work-related experiences are embodied, experiential/participative, co-constructed, emergent and situated (Boud, 2012). Students may need to engage more in curriculum activities that are authentic and understood as practical, knowable and valuable (Coldham and Armsby, 2016). This could mean more engagement with how the academic curriculum, pedagogy and assessments can be related to industry standards.

Theme 2: Self-reported experiences of 360 technology in housing inspection practice and enforcement

Regarding individual experience of having used 360 photospheres in environmental health, findings demonstrated that most respondents in this study had never before come across the use of 360 technology for the purpose of housing inspection practice and training. One respondent's LA used drones and Pix4d to complete mapping as well as for investigative processes and two other respondents had used this in previous jobs, but not in environmental health or housing roles. In this study, there were only two exceptions to this: one reported experience of 360 filming as part of the Police Force (Participant 27) and another as having previously worked as an estate agent (Participant 35). In this latter instance, 360 filming was deemed to be "*very useful, engaging and gave people a great look at the property.*"

Students were asked how they felt 360 filming might help them if they already had practice experience of housing inspections. A range of responses included "*Useful tool for practice inspections*" (Participant 3) and learning further, following a 'real' inspection. It was not just on follow-up: one participant reported a personal 'triage' type of approach to prioritising cases – indeed an important issue facing a current and very busy workforce: "*Currently I have to do 'pre-inspection visits' for damp and mould, to send pictures to senior officers. This set up would be incredible for showing the whole dwelling*" (Participant 16). The responses were revealing, with some, like Participant 1, clearly seeing this as a back-up in case they had missed things on their initial inspection.

Some felt that it would be useful to add to their experience in being able to learn about lots of property types and practice inspection techniques, before having to factor in such additional complexities as dealing with landlords and tenants (Participant 18) or adding to their learning post inspection (Participant 1). Since inspection could prove complex, with multiple factors to record, it was reported that 360 filming could allow an additional look, after the primary inspection, and "*help to see all the examples of cat 1 hazards as you don't always see these in reality*" (Participant 2). Some felt it would expand their learning and, in one case, "*it can help me revisit to see if I missed any hazards*" (Participant 7).

Students were also asked about whether and how their learning could be more practice-based to create a better environment for more experiential learning. Suggestions included: practical mock inspections and real-life scenarios (Participant 7, 18, 19, 30); in-person visits (Participant 1, 7); scenario-based training (Participant 3); case studies (Participant 4); "*role play/acting out an inspection/visit e.g. difficult complainants/business owner*" (Participant 6). There were also suggestions about using local housing stock for inspections; this unfortunately has proved unworkable to date, owing to insufficient availability of empty premises in the timescale required for the number of students studying as well as to COVID restrictions earlier (Participants 21 and 28). However, "*it should be a mixture of both - 360 filming can accompany and add more examples along with in-person inspections*" (Participant 22).

Theme 3: Self-reported attitudes towards using 360 technology versus traditional photograph and filming methods for experiential learning, training and practice purposes

When respondents were asked if they thought that traditional photographs and filming rather than 360 would help in a similar way, there was a very mixed response, but the prevalent opinion was that it was better, for learning and assessment, to adopt 360 technology (filming and photospheres) than to choose other more traditional types of 'capture' photography or filming. The following comments are representative of the range of reasons given:

"Both ways are good ways to learn" (Participant 5) though "I think still images and filming would help me in a similar way, but I do think the 360 camera is better" (Participant 6)

"Beneficial at taking a holistic approach, looking at lots of deficiencies in one go, and being more engaging than still images" (Participant 6)

"It puts you in the moment and shows when you can't respond with a numbered photo, how you would describe a scene" (Participant 27).

Some respondents pointed out the primary need for actual, experiential inspection opportunities based upon real case studies and scenarios (Participants 11, 15 and 16) and mentioned, in particular, this medium's capacity for engagement and interaction in offering a more holistic sense of the whole property with an ability to zoom in and "*pinpoint*" problems in a professional way (for example, Participants 1,3,4,9,10).

The main point to be drawn from this is 'interactivity' in learning, which is essentially what 360 filming is trying to replicate from practice; 360 was seen as a better experience than that offered by still photographs or films, although these were also held to be of value to learning. Participants 15, 26 and 35 were fairly typical in regarding 360 filming as the much more realistic method and Participant 14, particularly, represented much of what we were being told: "*Photos and filming can still show what is going on in an inspection, however, unlike the 3D* [360] *it's not as interactive. 3D brings a whole new depth to the learning experience.*" In this sense, 360 filming could be good, both for those with practice experience and for those with only classroom experience: "*I think, this a great way to show up things we would not see or understand by just sitting in a classroom*" (Participant 13).

Students really valued becoming an active part of their learning through 360 filming: "*The more immersive the experience and more realistic the better*" (Participant 21) and "*I think an immersive experience would have more learning impact*" (Participant 23). Some comments were insightful and reflected the natural curiosity of the student: "*I think pictures and videos are limited in scope as you are restricted to looking at what the photographer viewed as important*" (Participant 18). The immersive nature of 360 filming found favour in responses to several of the questions posed in this study, with abundant evidence of a belief that this would have far greater applicability beyond housing: to wider environmental and public health. Many participants appeared strongly to value its potential as an engaging training tool to "*put you 'in the action'*" (Participant 27); Participant 2 saw it as "*more interactive than a photo it is and it's easier to visualise the layout of the house*". Participants 5 and 29 typify those respondents most impressed by its "*immersive*" capability and its potential "*flexibility to manoeuvre*", while Participant 25 said it was "*far more useful as a training tool*".

Some, like Participant 32, were excited about the learning opportunity 360 filming could provide and recognised our unique approach in trialling this: "*It's new to me. So, I'm quite impressed*" (Participant 17); Participant 19 suggested that we should be using such "[a]*dvanced technology*". By contrast, very few negative comments were captured in this study, though "*Not the technology I'd want to use*" (Participant 11) may serve to show that there were critical judgements in the mix.

360 recording was also seen to offer diversity in learning, with more accessibility – as Participant 29 said – in learning style and also physical access to learning. Participant 7 was equally positive ("*3D* [360] *feels more practical and I'm a visual learner*"), but there was also recognition that, ideally, training should be in the real world, or that this should be replicated as closely as possible. Students made some valid suggestions for improving the 360 learning experience to make it feel less sterile and more real: Participants 13 and 17 respectively offered "*people taking in the background etc.*" and "*I think bad situations should be included*"; Participant 22 wanted more types of housing to be filmed and Participant 25 had the idea of finding ways to introduce additional real-life elements, such as "*providing smell and scent during the VR element*". To add to the learning experience, students suggested "*Tests about things to find, and linked regulations to contraventions maybe*" (Participant 35).

Students were very positive – even expressing excitement (Participant 3) – when asked for any final comments they wished to make about 360 filming. Again, the immersive potential was highly valued (Participant 6) and the method was particularly seen to benefit those who did not have any opportunity for real world housing inspections, but also to fill gaps in learning for those who did (Participant 2). Some reported liking the concept, but recognised it was still in its infancy (Participant 35). Others even offered support in developing this as a teaching and learning tool and wanted to develop its potential for the benefit of other students in the future: "*I think this is a great idea and should be explored. I'd be happy to help too if student help is needed*" (Participant 16); "*I think this is such a good idea especially for some of us who have just experienced it and impressed by how it could be should more be done to it*" (Participant 29).

> *It should be added here that some participants said that the technology made them feel unwell: "As with technology things can always go wrong. People also may struggle with a VR headset - sickness or claustrophobic" (Participant 28); "I get motion sickness wearing a VR headset" (Participant 2).*

Theme 4: Self-reported attitudes towards the application and use of 360 technology for experiential learning and training purposes in housing inspection enforcement and regulation

Students were probed for their thoughts and concerns about reliance on 360 technology as just a learning tool for those not able to access practice-based training. Many believed that practical experience in tandem was essential: "*Should be used as part of the overall training not used solely*" (Participant 3); "*I still believe that inspection of a real property will provide the best learning experience*" (Participant 15); "*It's important to gain practical experience too. Nothing beats that*" (Participant 20). However, with the current crisis in the workforce, students reported that "*It can only help*" (Participant 21) and "*it might not be the only way to learn about housing issues but it sure would go a long way*" (Participant 36).

Students were also asked how they would find it most helpful to access this 360-based training (yet to be developed) for the first time or as a refresher. There was some consensus that for the first time it was used, it should be in a supported learning environment such as a lecture or delivered in an office environment (for example, Participants 1,4,5 and 21) and as a refresher via a module page or laptop/mobile app to make it accessible (for example, Participant 28). Participant 14 suggested: "*maybe have days where you can invite people in*

to try out the new tech, especially as VR headsets are very expensive." Students saw this as necessary for both those new to it and those with more experience: "*it will help to have practice opportunities for first timers and additional opportunities for those who have had prior experience*" Participant 36.

Students tended to think that this kind of experience should be in well-designed learning scenarios: "It will allow a VFR experience which will allow you to see in an almost 'real' environment what the living and housing situation is like at the premises and allow you to make a more informed decision based upon what you can see. All practitioners would benefit from this" (Participant 25); "It would help us to understand scenarios that we will encounter in real life" (Participant 17); "A visual run through of worked examples. Potentially using it as hazard awareness, potentially using it with multiple options for users to choose along their journey" (Participant 16); "I think it would be most beneficial if you could be wearing the headset at the time" (Participant 18).

A few students wondered, considering the required use of all senses throughout inspection, whether there was a possibility for this to be replicated: "*I think it is a great alternative but seeing it in person gives a real sense of issues that may not be picked up through the camera, for example, odours, smaller problems*" (Participant 6); "*360 is a useful tool, but should not replace wholly a in person, real inspection. As there are other sensory perceptions that can be used in a real inspection, that cannot be replicated in 360. However, it is a very good learning tool to use for practice*" (Participant 25). Students largely favoured the 360 approach, but wanted to know how employers viewed, valued and recognised its potential for learning. There were suggestions for visiting mock properties (Participant 23) and empty homes – but some universities, owing to availability and timing of courses and assessments, have found this impossible. As for 360 filming, suggestions included: "*Push its acceptance in terms of requirement, qualification is nothing without the experience to implement the powers*" (Participant 21); "*Provide certificates for this once someone has done some training using the headset so they can show this to employers*" (Participant 1).

> *One student in fact suggested linking this to an assessment to help demonstrate its worth in practice and to add credibility: "A certificate would be a way to get it recognised by different LAs and offices" (Participant 28).*

Discussion

Four key themes emerged from the data analysis in this research, in relation to rethinking housing inspection and regulation using 360 technology as a new approach in environmental health practice training.

Most students who had received some form of practice-based training in housing inspection gave the impression that there was no plan and little direction to meet any set of specific requirements with regard to its conduct, with some simply 'shadowing' more senior officers and others having more rigid form of training. Some students, however, had no experience of conducting housing inspections in practice. This would suggest that, despite the clear remit of environmental health practitioners to enforce and regulate housing via inspection, there is no universal approach to on-the-job training.

In this study, there were limitations to the student experience of using 360 technology for housing inspection regulation and enforcement, but most students recognised its potential for enhancing experiential learning overall beyond the areas of housing and health, particularly when contrasted with the more traditional methods of learning, training and practice with standard film or still photographs. They certainly saw 360 as specifically useful for environmental housing inspection enforcement and regulation training and practice; the minor reservations voiced do little to detract from the overwhelmingly positive nature of their responses to it. The findings therefore reveal that they perceive this novel technology to be better for experiential learning, practice and training than traditional methods when it comes to the development of appropriate skills in this field.

In terms of research limitations, though there was evident variation amongst our small group in the responses given, it should also be remembered that these students' perceptions as captured here are already in the main supported by their employer, so are not wholly representative of what one might expect to find overall in practice.

Conclusion

This study explored attitudes towards using 360 technology as an alternative approach to learning housing inspection as part of environmental health regulation and enforcement practice and training.

The key findings of this research highlighted that there was a variation in the practice-based training that students had received previously, with the majority having experienced no formal training on the housing inspection process but had learnt instead through 'shadowing' other senior officers. Using novel 360 technology could help in the creation of more formalised training in this context, as illustrated by the responses relating to the potential benefits of this method for teaching, assessment and training, even though most respondents had never come across 360 technology before the demonstration. The participants specifically acknowledged the superiority of its interactivity – something lacking in traditional photo and video resources used for training – in improving the learning experience. They did have some reservations about its capacity for replacing real-world inspections, being currently unable to replicate some sensory aspects or to test communication skills. These were not, however, part of the goal of using such technology, which should be to supplement and enhance current learning and assessment methods in this particular field of housing inspection regulation and enforcement practice and training.

Beyond the findings of this research, 360 technology for learning, assessment and training purposes could in theory be extended to other areas of environmental health (*e.g.*, in virtual health and safety or food hygiene inspections, continuing monitoring and compliance for auditing purposes, CPD requirements etc.) as has been demonstrated in other disciplines.

With the decline of practice-based experience, workforce trainers have tried to find alternatives to offer other experiences in learning. The COVID-19 pandemic provided a new urgency and rapid developments in 360 technology could help to drive new ways of learning, but there is still a long way to go. Our work to date has demonstrated an appetite amongst students for the deployment of 360 as a learning tool, even though some do have reservations about its

limitations. In the absence of available alternatives in the context of housing inspections, many saw the potential of 360 and acknowledged its place in CPD in this discipline. In summary, its current strengths lie in its capabilities: user immersion, focus on specifics, meaningful replication of the house inspection process; its current weaknesses include: lack of some sensory aspects and inability to develop communication skills, both of which are present in a real-world inspection. What is clear from our study is that to embed this technology in relevant modules and to shape training to exploit its obvious potential will go a long way towards addressing the challenges in preparing well-trained inspectors for the rented housing sector.

We focused here on a niche area, but it is clear that many other professions are also struggling with deficiencies in practice-based experiences and opportunities. 360 technology is readily transferable as a means of enhancing synchronous and asynchronous learning in a range of disciplines. With development – for example in the application of case study scenarios that closely replicate practice and are assessed, possibly as coursework and/or as part of any emerging skills and knowledge within competency frameworks – it may well prove indispensable as preparation for the workplace.

Future planned research will involve further testing and evaluation of 360 technology as an alternative learning and practice training approach to environmental health enforcement and as part of a needs-assessment. It will include the planning and recording with this technology of practice-based scenarios so that users in other environmental health contexts may benefit from interacting with it. The researchers also want to test and evaluate the potential for integrating virtual reality with 360 technology in relation to both this particular discipline and to wider pedagogic practice.

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