Student Co-creation of Digital Learning Resources: An evaluation and reflection of veterinary pharmacy and care home pharmacy interprofessional education packages

Priyanka Chandarana, University of Nottingham, priyanka.chandarana@nottingham.ac.uk
Rebecca Rickaby, University of Nottingham, rebecca.rickaby@nottingham.ac.uk
Kimberley Sonnex, University of Nottingham, kimberley.sonnex@nottingham.ac.uk
Cinzia Allegrucci, University of Nottingham, cinzia.allegrucci@nottingham.ac.uk
Amelia Garcia-Ara, University of Nottingham, amelia.garcia-ara@nottingham.ac.uk

Abstract

Funding secured from the University of Nottingham was used to enable students to work together with academics to develop two interprofessional education (IPE) e-learning resources using Xerte™. One project focussed on veterinary pharmacy and involved six students from both the School of Pharmacy and School of Veterinary Medicine and Science. The other project focussed on the role of the pharmacist in a care home setting; the two pharmacy students involved completed a pilot placement in a care home as a prerequisite. With a focus on digital engagement and co-creation, this project encouraged the development of learning communities and a connected curriculum. Healthcare professionals need to be prepared to integrate into the multidisciplinary team (MDT) and this project aimed to nurture such cooperation.

The perspectives of the student co-creators were explored through a reflective survey, focusing on their experiences of Xerte™, the co-creation process and the skills they developed. In addition, the e-learning resources produced were reviewed by a group of student evaluators focusing on content, relevance to practice, accessibility, learning gained and ease of use. The overall aim was to optimise and enhance any future digital co-creation projects.

The reflection from the student co-creators was generally positive. The students gained an insight into the role of educators, developed interpersonal skills, and gained knowledge related to their profession as well as the wider MDT. Challenges were concentrated around the use of the Xerte™ and logistical issues of group work; specific training and ongoing support from academics was crucial in overcoming this. However, students appreciated the creative freedom and autonomy in deciding the content and activities within the resources. Result from the evaluation showed the resources were easy to navigate, incorporated engaging elements and were relevant. Design, grammatical errors, and accessibility were areas highlighted for improvement.

Overall, these co-creation projects added great value to curriculum development, however, support from academics is key. The produced outcomes also require scrutiny from academics before they can be integrated into the curriculum. The value of co-creation is apparent, but a balance should be sought between giving the students full autonomy and providing structured support.

Introduction

Co-Creation

Students as partners has been defined as active collaboration between academics and students (Mercer-Mapstone *et al.*, 2017). In the scope of this study, the role of students as partners was explored through the co-creation of e-learning resources. Co-creation of teaching material is an approach that encourages student engagement as well as active and deep-learning (Lubicz-Nawrocka, 2018); it is a form of student-academic partnership in teaching and learning. Through this partnership both academic and student have equal voice in curriculum development. Empowering students to contribute to the direction of their teaching improves engagement and ensures teaching strategies are based upon the students' perspective. Therefore, co-creation of learning is perfectly aligned with the development of outcomes in IPE, especially when different professionals and stakeholders are involved in the process (Siekkinen *et al.*, 2021).

A qualitative study conducted in the Scottish higher-education sector, found that co-creation projects fostered an environment of shared responsibility. This is beneficial to both academics and students, resulting in an increase in personal development for both parties as well as creating a sense of satisfaction (Lubicz-Nawrocka, 2018). For co-creation to be effective, there should be two-way respect and mutuality (Cook-Sather, Bovill and Felten, 2014). Challenges around power dynamics and risks related to redefining academic-student roles exist, meaning the use of co-creation is not always widely spread (Bovill *et al.*, 2016). Academics may be fearful of interfering with university structures and processes which have been described as hierarchy focused. Students may also experience concerns around vocalising their opinions to academics, again emphasising the impact of the power dynamic (Lubicz-Nawrocka, 2017). However, through effective utilisation of co-creation in a well-structured and collaborative environment, these hierarchies and barriers can be challenged and equality within the structures promoted (Bron, Bovill and Veugelers, 2022). Furthermore, as per Barnett's conceptualisation of supercomplexity and Baxter Magolda's three-pronged view of self-authorship, involvement in co-creation increases self-authorship, contributing to both personal and professional development (Lubicz-Nawrocka, 2018). Many institutions are now placing a greater emphasis on co-creation within curriculum development. Currently, these institutions are exploring small scale projects focusing on teaching and learning enrichment or extra-curricular projects (Mercer-Mapstone *et al.*, 2017).

Interprofessional Education

Interprofessional education (IPE) has been defined by the World Health Organisation (WHO) as "the interaction that occurs when two or more professions that learn about, from and with each other to enable effective collaboration and improve health outcomes" (World Health Organisation, 2010). The WHO developed a new framework for action on IPE and collaborative practice in 2010, formalising a policy for collaborative practice between health workers from different professional backgrounds to deliver the highest standard of care. This practice aims to develop interprofessional skills and improve health outcomes through interactive effort, teamwork, effective

communication, collective decision making and partnership (World Health Organisation, 2010).

IPE is becoming more important amongst human health science education. This includes medicine, nursing, dentistry, pharmacy, public health, physiotherapy, and social care (Bridges *et al.,* 2011). However, the complexity of public health is becoming increasingly challenging and therefore an effective strategy to design new solutions requires the perspective of cross-disciplinary research and practice. In the 21st century, health has superseded the concept of disease and is now considered as a holistic approach that takes in account human wellbeing and how individuals interact with each other and the environment they live in. To this end, the concept of "One Health" (OH) has been introduced to indicate the "collaborative effort of multiple disciplines working locally, nationally and globally to attain optimal health for people, animals and our environment" (American Veterinary Medical Association, 2008). OH is complemented by One Welfare (OW) and the OW framework which describes the interrelationships between animal welfare, human wellbeing and their physical and social environment and facilitates collaborative work amongst the different stakeholders involved in the three areas (Pinillos *et al.,* 2016; Pinillos, 2019). Indeed, the concepts of OH and OW are currently regarded as a strategy to address traditional and (re)emerging global issues in public health, such as diseases that can be passed from animals to humans (zoonoses), surveillance/prevention and response to infectious and chronic diseases, water and food security, sustainability, climate change and disaster management on animal and human health. Underpinning principles of OH and OW include collaboration with a larger spectrum of professionals, to include veterinarians and other members of the MDT. Therefore, OH and OW initiatives are becoming an integral part of veterinary and pharmacy curriculum development and there is a need for these to be integrated with IPE through active participation from early stages of the learning experience (Estrada *et al.,* 2016).

The General Pharmaceutical Council (GPhC) is the regulatory body for the pharmacy profession. They state that the Master of Pharmacy (MPharm) course taught in the UK must incorporate IPE; there should be a clear strategy that is reflective of current practice and ensure collaboration with other healthcare professionals. This is also reflected through the following learning outcomes: work collaboratively with other healthcare professionals and demonstrate clinical leadership, communicate effectively with other health and social care professionals, manage resources and priorities, making use of the skills and knowledge of other members of the pharmacy team, and demonstrate effective leadership, team working and management skills as part of the multi-disciplinary team. These learning outcomes must be met at the 'does' level, which is the highest level of Millers triangle requiring students to demonstrate skills through active participation (General Pharmaceutical Council, 2019). Similarly, in the context of the veterinary profession, IPE and the One Health concept has been recognised by major professional statutory regulators. The UK Royal College of Veterinary Surgeons (RCVS) recognised a new vision for the veterinary profession in their strategic plan for 2020-2024, where it aimed to "promote, encourage and advance the study and practice of the art and science of veterinary surgery and medicine, in the interests of the health and welfare of animals and in the wider public interest". Additionally, the RCVS recommends to "increase collaboration between veterinary and human health professionals and environmental organisations, in line with the One Health concept" (The Royal College of Veterinary Surgeons, 2020).

Pharmacists play a vital role in the management of medicines in care homes (Royal Pharmaceutical Society, 2016). Many care home residents will be on a number of medications; often residents are not correctly taking or being given their medication, impacting medication optimisation. Issues may be related to administration or medicine management. Pharmacists can bridge the gap between prescribers and the carers that administer medications and interact with residents. Meanwhile, veterinary pharmacy represents one of the major areas of collaboration within the One Heath initiative, due to the role of veterinarians and pharmacists in tackling antimicrobial resistance and the spread of zoonotic disease (Lueddeke *et al.*, 2017; Stafford, 2020).

Digital Learning Resources

Digital learning resources have numerous advantages and potential to positively impact student learning and experience. However, considerations should include the structure, content, engagement opportunities and format (Brown and Voltz, 2005; Armstrong, 2010). The learning technologies used within the resource should facilitate student experience, whilst aligning with the relevant learning outcomes. Therefore, an effective resource would contain a variety of activities and multi-media. Any included activities should be relevant, and it is vital that learning technologies are not used without justification (Lightle, 2011).

Engaging learning resources should be intrinsically motivating and encourage higher-order thinking skills (Hmelo and Ferrari, 1997). This could be through activities requiring collaboration between students, as well as opportunities for individual investigation (Lightle, 2011). Therefore, opportunities must be provided for students to: practice and demonstrate their learning; collaborate with peers; and self-reflect (Boud and Prosser, 2002). These principles should also be applied to digital learning resources (Beetham and Sharpe, 2020). The aim of a digital learning resource should not be solely for knowledge transfer. There should also be tasks requiring application of factual knowledge. This results in deep learning if tasks are adequately challenging, facilitating active participation (Boud and Prosser, 2002; Echavarria, 2010). Short videos and embedded links can also be used for any knowledge-based content. This facilitates and eases student understanding due to the structured and bitesize format (Liyanage *et al.*, 2009). Digital learning resources permit student autonomy, where they learn at their own pace. However, using such resources, mechanisms to access support must be provided and accessibility must be considered (The Quality Assurance Agency for Higher Education, 2020). Such resources can work well when carefully and appropriately planned alongside in-person teaching, creating an augmented experience (The Quality Assurance Agency for Higher Education, 2020).

Xerte™ is a programme in which e-learning packages that include multi-media can be made and can facilitate digital teaching and learning activities (The Quality Assurance Agency for Higher Education, 2020). This is consistent with the 7C'S Framework where learning tasks, resources and support are interlinked (Conole, 2014). A learning experience can be created through a sequence of activities and interactions which promote active participation and deep learning (Biggs, 2014). This minimises students becoming lost in the experience and fosters student involvement throughout. It is crucial that a virtual learning environment allows for personalisation and accessibility.

The Xerte™ platform facilitates this through its integrated accessibility tool. This enables individuals to customise their experience and the user-friendly interface aids navigation.

The students' perspective and the impact on their learning is a key consideration when designing and developing online resources. It is important to ensure students do not feel overwhelmed and are provided with adequate support. This is important as students will have varying experience with using digital learning resources and IT. This is particularly apparent for the MPharm course at the University of Nottingham, which has around 1000 students with varying backgrounds and experiences. Academics can find it challenging to balance providing a range of impactful tasks, meeting all students' needs, whilst trying to keep the content concise and relevant. Here the students' perspective is invaluable, and their contribution has the potential to positively impact curriculum development (Jensen and Krogh, 2017).

Aims and Objectives

Both the care home and veterinary pharmacy projects were opportunities for co-creation. The perspectives of the student co-creators were explored, focusing on their experiences. In addition, the e-learning resources produced were evaluated from a student perspective. Both the reflection and evaluation results aimed to identify areas of good practice as well as highlight areas of improvement. The overall aim was to optimise and enhance any future digital co-creation projects. The following objectives were developed to address this aim:

1. To evaluate the two e-learning packages in terms of content, relevance to practice, accessibility, learning gained and ease of use.
2. To explore the student co-creators' perspectives on the co-creation process.

Method

Student Recruitment

Veterinary Pharmacy Project

The role to develop a veterinary pharmacy e-learning resource was advertised to students via email and required the completion of a short online application form (MS Forms) detailing why they felt they were suitable for the position. For the School of Pharmacy, the opportunity was open to year 3 and year 4 Master of Pharmacy students, as this is when they first start to cover veterinary law/regulations in the curriculum. For the School of Veterinary Medicine and Science, the opportunity was open to year 3, year 4 and year 5 veterinary students. Applications were shortlisted by the academic team and three undergraduate students from each school were offered the role and paid for their time, based on the allocated funding.

Care Home Pharmacy Project

A new care home placement was developed by the School of Pharmacy in 2022 and piloted with 35 Master of Pharmacy student volunteers in their second year of study. The role to develop a care home e-learning resource was advertised to students via

email and required the completion of a short online application form (MS Forms) detailing why they felt they were suitable for the position. From the shortlisted applications, two students were recruited and offered the role and paid for their time based on the allocated funding.

Student Evaluation

The role to evaluate both e-learning packages was advertised to School of Pharmacy students via email and required the completion of a short online application form (MS Forms) detailing why they felt they were suitable for the position. Applications were shortlisted by the academic team and 8 undergraduate students from each school were offered the role and paid for their time, based on the funding allocated. The students involved in creating the e-learning resources were invited by email to share their reflections on the project.

Veterinary Pharmacy Project

Project details
Students from School of Pharmacy and School of Veterinary Medicine and Science were tasked to work together to develop an inter-professional learning (IPL) e-learning resource using the online platform Xerte™. The project required students from both schools to collaborate to build a resource that would aid student learning across both programmes.

Guidance and Training
Notes and facilitator materials that were used for previous in-person Vet IPE workshops (2019-2020 academic year and prior) were utilised as the foundations of this learning resource. Training consisted of initial meetings with the academic team and students to identify beneficial content to be included in the package. Students were given scope to direct the project in a direction they chose, whilst ensuring key areas essential for both vet/pharmacy curricula were incorporated. The academic team provided an introductory training session on how to use the Xerte™ platform, to familiarise students with the platform and show them how to create content. Whilst students were given a high degree of autonomy and freedom to add their own ideas to this project, they were instructed that key elements within the e-learning resource could include:

- A range of media, images and videos created by the student team
- Recordings of student dialogue and discussions related to the supply of veterinary medicine and the role of multidisciplinary teams in veterinary pharmacy
- Short recordings from invited speakers or academics from both Schools
- Resources to cover the similarities, differences and overlaps between the professions/laws/guidelines
- Active learning activities for students to test or apply newly learned skills, using some of the embedded interactive tools within Xerte™

Care Home Pharmacy Project

Project Details
Following a pharmacy pilot placement at a care home, two students from the pilot were recruited to work with academics to co-create an e-learning resource using the online platform Xerte™. This resource would form the pre-work for this placement to make sure students were prepared to complete the required activities at the placement, ensuring learning and development through the placement is optimised.

Guidance and Training
The project was initiated through meetings with the lead academic. During these meetings, discussions including feedback on the placement, training and audit task were facilitated. A meeting with the care home pharmacist was also arranged, this provided the students with the opportunity to ask any questions regarding the care home pharmacist role, other members of the multi-disciplinary care home team, and day to day tasks within the care home. The academic team explained what an e-learning resource would usually look like, presenting them with some examples. Discussions around the required content within the e-learning resource was addressed, focussing on the outcome that it would be used as pre-work for the new placement. Students were empowered to recommend the content they felt would be most appropriate and fill any knowledge gaps they had experienced during the pilot placement. Students were also provided with training from the School of Pharmacy E-learning manager on using the Xerte™ programme.

Student evaluation of e-learning packages
A survey was created using Microsoft Forms to capture data from the students evaluating the e-learning recourses. The survey incorporated Likert scale and free text questions to collect both quantitative and qualitative data. The Likert scale questions enabled the collection of focussed, quantifiable data that could be easily compared across both packages in a manner that was straightforward and easy to complete (Brace, 2018). Evaluation of the resources focussed on accessibility, structure, relevance, and content. Students were given URL links to each resource, which were estimated to take students 2-2.5 hours each to complete. After completing each package, they were asked to complete the evaluation questionnaire. Students were paid to spend 3 hours on each package, which included working through the package and completing the relevant evaluation.

Student reflection on the co-creation projects
A survey was created using Microsoft Forms to capture data from the students reflecting on the co-creation projects. Surveys incorporated open-ended free text questions to collect qualitative data. The questions were designed to facilitate reflection and explore the co-creators' individual thoughts and experiences. This valuable detailed data along with the quantitative evaluation data would provide rich data to draw conclusions from (Brace, 2018). Students were asked about their experiences of the process, collaboration between students, challenges faced, and skills developed.

Data Analysis
Content analysis was used to investigate the qualitative data collected from the open-ended free text box questions from both evaluation and reflection questionnaires. This

systematic approach is often used with written or verbal data and enables inferences to be made from the data collected, through the identification of common categories or concepts (Cole, 1988; Elo and Kyngäs, 2008). Quantitative data was collected from nine 5-point Likert statements in the evaluation survey. Students rated their agreement with each of the statements from 1 (strongly disagree) to 5 (strongly agree); the mean and standard deviation for each statement, and the total for each e-learning package was calculated.

In this research a conceptual analysis was undertaken; the existence of a concept in the words, word sense and/or sentences, was coded for. For the student evaluations this was done via a flexible approach, allowing for introduction and analysis of new themes due to the open nature of the survey questions asked (Hsieh and Shannon, 2005). For the student reflections, pre-defined categories (as per the set questions in the survey) were used. No software was used; analysis was done by hand due to the low number of responses; this allowed for typographical issues and misspellings to be accounted for. For academic rigorousness, the coding was cross-referenced and validated by two members of the research team ensuring reliability of the findings (Elo *et al.,* 2014).

Ethical Approval

An ethics application was submitted to the University of Nottingham School of Pharmacy Research Ethics Committee. The committee identified this work as minimal risk and deemed ethical approval was not needed, as the project was an evaluation of a teaching activity.

Funding

Veterinary Pharmacy Project
Funding secured from the University of Nottingham Education and Student Experience (ESE) Grant Scheme was used to fund undergraduate students from the School of Pharmacy to create the e-learning resource. The School of Pharmacy funded the student evaluation part of the project. The School of Veterinary Medicine and Science provided the funding for their students to create e-learning resources. No veterinary students were employed to evaluate the project at this stage.

Care Home Pharmacy Project
Funding was secured by The School of Pharmacy from Health Education England to pilot pharmacy placements following the GPhC reform of the initial education and training standards. Experiential learning is a significant part of the MPharm, and the placement strategy is being redesigned in line with the new learning outcomes. As the role of the pharmacists is advancing into various settings including care homes, we wanted to ensure a placement at a care home where students are able to make a contribution is included within the MPharm. Following a pilot of the care home placement, some funding was used for this co-creation project. Through this the students created an e-learning resource forming the placement pre-work for when this placement is rolled out to the year 2 cohort. Learning and training that prepares students for placement is a key part of the placement strategy, as through this approach students can gain the most when out on placement as well as give back to the placement providers and patients.

Results

Five pharmacy students evaluated the learning packages; each student evaluated both the veterinary pharmacy and care home pharmacy package. Four students involved in the initial creation of the learning packages reflected on their experiences. Of these, two were pharmacy students involved in the care home pharmacy project, meanwhile one pharmacy student and one veterinary student were involved in the veterinary pharmacy project.

Student evaluation of the e-learning packages

Survey analysis

Strength of agreement with the statements on the evaluation of the learning package using a 5-point Likert scale (1=strongly disagree, 5=strongly agree) are shown in Table 1. The care home pharmacy package scored highly overall; 4.39 (SD 0.49). Particular strengths of the package were: ease of use, well-structured and relevant to the students' profession. However, interactivity of this package was rated as moderate.

The veterinary pharmacy package scored moderately well; 3.78 (SD 0.67). Areas of strength for this package were relevance of the material used and relevance to the students' profession; however, areas of weakness were the appearance, structure and accessibility.

Table 1. Student evaluation of the e-learning packages

Statements	Mean (S.D.) Both projects (n=10)	Veterinary (n=5)	Care home (n=5)
The package is easy to use	4.5 (0.92)	4.0 (1.10)	5.0 (0.00)
The appearance of the e-learning package is appropriate	3.8 (0.87)	3.4 (1.02)	4.3 (0.43)
The literature and reference material are relevant.	4.5 (0.50)	4.4 (0.49)	4.5 (0.50)
The e-learning package is well structured	4.2 (0.98)	3.8 (1.17)	4.8 (0.43)
Completing the e-learning package in 2 hours is appropriate	3.7 (1.27)	2.8 (1.17)	4.5 (0.50)
The package is interactive and so allows opportunity to participate	3.5 (0.92)	4.0 (0.63)	3.3 (0.83)
The content within the package is relevant to my profession	4.7 (0.46)	4.6 (0.49)	4.8 (0.43)
The accessibility of the e-learning package is appropriate	3.4 (1.36)	2.6 (1.36)	4.0 (0.71)
The e-learning package is appropriate for use in undergraduate teaching	4.5 (0.50)	4.4 (0.49)	4.5 (0.50)
Mean	*4.1 (0.47)*	*3.78 (0.67)*	*4.39 (0.49)*

Data represents mean 5-point Likert scale responses (1=strongly disagree, 5=strongly agree).

Content analysis of evaluative feedback on the e-learning packages

Three key themes of content in the student feedback on the e-learning packages were identified along with eight corresponding sub-themes. These are displayed in Table 2. Following this, an overview of student responses related to each content theme are presented. Abbreviations: SP = student pharmacist.

Table 2. Content analysis themes identified from the student evaluation of e-learning packages.

Content theme	Sub-themes
Look, feel and accessibility	Ease of use Areas for improvement
Methods of engaging the learner	Interactivity Time to complete the packages Areas for improvement
Relevance of content to pharmacy students	Relevance to pharmacy degree Relevance to working as a pharmacist Areas for improvement

Look, feel and accessibility:

Students identified the ability to navigate the care home pharmacy package as a positive feature; this is something unachievable with conventional lecture slides where you cannot easily migrate to specific sections. The most frequently identified criticism of the e-learning packages was related to their look and feel. There were many comments around the lack of consistency in the formatting, small font size, spelling and grammatical errors and some suggestion that these contributed to poor accessibility. This was most commonly stated in reference to the veterinary package:

> *"The information presented in slides…is excessively wordy, which may cause students to lose interest quickly"* Veterinary package, SP2]
>
> *"I would suggest increasing the font size, especially for student using a laptop or even with external monitor."* [Veterinary package, SP3]
>
> *"Inappropriate use of punctuation… lack of full stops… the font size of the boxes for the quizzes could be bigger to improve accessibility."* [Care home package, SP5]
>
> *"I think it would be more useful to link these websites within the actual package so people can easily access them as I don't think many students will copy and search up the links to access the website"* [Veterinary package, SP9]
>
> *"I noticed several instances of incorrect spelling"* [Care home package, SP1]
>
> *"There were a few spelling and grammatical errors throughout the Xerte package. The texts that overlaid pictures were difficult to read."* [Veterinary package, SP7]

Overall, it was felt that the care home pharmacy package was concise and easy to read:

> *"I appreciate the fact that this learning package is not overly wordy or tedious"* [Care home package, SP1]

> *"Font size and images are suitable and easy to read"* [Care home package, SP4]

> *"The interactive tabs/images were good tools to help navigate the Xerte package. It also helped the pages look more organised"* [Care home package, SP8]

Methods of engaging the learner:

The students who evaluated the learning packages most commonly commented on their positive engagement with the material; particularly highlighting the different styles of interactive elements that had been included across both packages, including videos, quizzes and methods to encourage critical thinking:

> *"It is helpful that in the clinical audit section, the interactive Q&A activity is introduced prior to learning about the clinical audit cycle. This approach encourages critical thinking before acquiring knowledge, instead of merely presenting information in a passive manner. It is an effective way of presenting the learning material."* [Care home package, SP1]

> *"The range of different types of quizzes were useful to learn from and there was the right amount in the package."* [Veterinary package, SP9]

> *"I found the video on communicating with people with different conditions really useful as it gave many helpful tips on what to do and what not to do."* [Care home package, SP8]

> *"I particularly liked how Molly's consultation is structured. This approach prompts students to think critically and reflect on the answers rather than simply receiving them passively."* [Veterinary package, SP2]

> *"It also features well-designed images, making it visually interesting to learn from."* [Care home package, SP1]

In addition to specific areas of high engagement, the students also found the overall packages to be interesting and able to be completed within the designated time:

> *"I believe that a 2-hour time frame is sufficient to cover all of it."* [Veterinary, SP2]

> "*The content was relevant and insightful- covered a large breadth of topics without dragging….. The interactive activities were interesting and engaging"* [Veterinary package, SP7]

"Overall, it was a well-structured, organised, and succinct learning package to introduce care homes to students" [Care home package, SP8]

"The learning package is both well-organised and informative, with a concise format that can be easily completed within two hours" [Care home package, SP1]

However, there were a few areas highlighted where interactivity and engagement could be improved. For example, the use of quizzes in the care home package and videos or diagrams in the veterinary pharmacy package:

"Personally, I think is better to put in more quiz[zes] to achieve active recall" [Care home package, SP4]

"The earlier sections lacked interactive activities which would have been helpful for students." [Care home package, SP8]

"I think there could be more quizzes added to test knowledge" [Care home package, SP10]

"Perhaps adding a few more videos to enhance learning" [Veterinary package, SP6]

"I think on some of the slides of zoonotic diseases, diagrams of the transmission may be more easy to understand rather than text." [Veterinary package, SP9]

Relevance of content to pharmacy students:

The students recognised that much of the material contained in both e-learning packages was relevant to their learning needs on the MPharm course. The role of the pharmacist within the MDT and links between the different health care areas were also recognised, demonstrating learning related to IPE.

"The content of the e-learning package was all relevant and useful" [Veterinary, SP9]

"The summarising what the pharmacist's role is in care homes was useful as it linked the information back to the degree. The video on communication was extremely useful …and it was explained in a way which was easy to understand." [Care home package, SP10]

"The visual comparison between vet prescription requirements and human prescription requirements was great to summarise the differences and similarities between the two types of prescriptions" [Veterinary package, SP7]

"The stepwise approach to prescribing the antibiotics and counselling the owner on was also useful. The highlighting the specific areas of the prescription and explaining what needs to be included and the legal aspects was very useful." [Veterinary package, SP9]

Additionally, there were positive comments about the wider applicability of the learning to their future careers:

> *"From my perspective, the material is highly relevant and valuable to our profession as community pharmacists."* [Veterinary, SP2]

> *"As a student who has done a care home placement, I find this package useful in terms of getting to know about how a care home runs and conducting an audit."* [Care home package, SP5]

There were some specific areas of improvement suggested in both e-learning packages, to further support topics of learning that the students considered relevant:

> *"I believe it would be more relevant if we focused on topics such as communication tips, the significance of effective communication between healthcare providers and patients, or within the multidisciplinary team."* [Care home package, SP1]

> *"The information provided about the different types of care for individuals struggling with independent living is somewhat brief. To enhance student engagement and comprehension, it would be beneficial to include more detailed explanations for each type of care."* [Care home package, SP1]

> *"I think it would be more useful if this package could cover more on the role of pharmacists in zoonotic disease, such as how to recognize zoonotic infections and how to manage them."* [Veterinary package, SP6]

> *"I think it would be beneficial if there was slightly more depth in explaining the zoonotic diseases as I felt that they was too brief to be used as a standalone learning package."* [Veterinary package, SP7]

Student co-creators' reflections

The student co-creators were asked to reflect on their experiences of co-creation. This was through a survey; the reflective questions were organised under the content themes of digital learning, co-creation, benefits and challenges, and skills and knowledge. Table 3 displays the sub-themes identified from their responses, grouped with the relevant content theme. An overview of student responses related to each content theme are presented below. Abbreviations: PC = pharmacy co-creator; VC = veterinary co-creator.

Table 3. Content analysis themes identified from student co-creators' reflections.

Content theme	Sub-themes
Digital learning	Ease of use of digital technologies
	Rapid learning of digital platform
	Challenges with using digital platforms
Co-creation	Insight into the production of learning materials

	Freedom to be creative and autonomy
	Collaboration with academics
Benefits and challenges	Challenges of working with others
	Student benefits
Skills and knowledge	Improved professional knowledge
	Teamwork
	Other skills
	Application of prior skills

Digital learning

Although the use of the Xerte™ digital learning technology was new to the students undertaking the project, most comments made on digital learning centred around its ease of use, or rapid learning of the technology.

Ease of use of digital technologies:

Despite a lack of familiarity with Xerte™, two students found the technology easy to use.

> *"No additional skills were required to learn and understand how to use Xerte making it efficient to use and produce a learning package for students."* [PC1]

> *"Xerte is a very useful resource, and appreciate that a lot more now I have made one myself and understand how accessible it is for educators to use"* [PC2]

Rapid learning of digital platform:

Although two students found the technology used challenging at first, they both commented that it did not take long for them to become competent with it.

> *"With time, patience and help of a colleague, I created the content laid out as I deemed best for the user, and by the end I was adjusting small details like timing of text boxes appearing, which reflects a huge increase in my ability in a relatively short period of time."* [VC1]

> *"However, after just spending a little time using the platform I became competent using the software."* [PC3]

Challenges with using digital platforms:

Two students did find the learning technology difficult to use at first, but with help or additional training they were able to proceed with the project.

> *"The process of understanding how to combine my ideas for content within Xerte was initially quite overwhelming, in particular, struggling to visualise the outcome of how it would be formatted, and whether this aligned with my vision."* [VC1]

"The main challenge was getting used to the Xerte platform as it was confusing to use at first and there was quite a lot of training to do before using the platform" [PC3]

Co-creation

Overall, the students reflected positively on their experience as co-creators. In particular they cited different aspects of the project such as gaining an insight into producing learning materials, increased creativity and autonomy, and an appreciation of the collaboration and support received from the academic staff.

Insight into the production of learning materials:

Through participating in these projects, the students were able to gain an insight into the role of educators.

"It allowed me to appreciate the other side of education - creating teaching rather than being taught. This skill is one I will definitely take forward into my career, especially if I consider becoming a teacher-practitioner." [PC2]

"Gave some insight to the ideas academics have to consider when designing work packages for education, such as teaching methodologies, intended learning outcomes and clear design and usability of learning tools." [PC1]

Freedom to be creative and autonomy:

Students appreciated the autonomy and freedom to be creative with both the content and design of the packages; this made the process more enjoyable.

"Me and the team of students were given a lot of freedom when creating the Xerte package, we were given some topics to be covered but were not bound by them." [PC1]

"I also felt like I had a lot of autonomy over what I included and how I included it, which allowed me to enjoy and explore more." [PC2]

"It was very clear that it was up to us what we created" [PC3]

Collaboration with academics:

Students found working with the academics valuable, they particularly appreciated the support the academics provided through the process.

"It was a good and unique experience to collaborate with academics in this way, and I very much enjoyed being involved with the teaching aspects of the course" [PC1]

"The support from the staff was exceptional, answering any questions I had and going above and beyond to contact lecturers to contribute to my content." [VC1]

Benefits and challenges

Challenges of working with others:

In addition to the challenges in learning how to use the digital technology for the projects (described in the digital learning section previously), the main challenge describe by the student co-creators was around working as part of a team and managing their own project.

> *"I created a WhatsApp group to allow all of the students to discuss ideas and divide up tasks, whilst this worked well initially after a period of time responses were slower and there was less engagement."* [VC1]

> *"The main challenged faced was mainly orientated around time management and working as a team to find time to complete the learning package"* [PC1]

> *"We had a few issues with work being deleted, when the edited version of the file was still open by one person and the other person went in and made edits also. This was frustrating for the peers involved"* [PC2]

> *"There was a distinct variation between students' input and perhaps could have been a better connection between the sections."* [VC1]

Student benefits:

When asked specifically about the benefits of the project, each student stated a different benefit to them focusing on creation, project management and IPE.

> *"I will go forward from this being able to confidently create clear and useful learning resources for colleagues, patients and the public"* [PC2]

> *"It gave me the opportunity to get a greater understanding of project management with other colleagues with varying skillsets"* [PC1]

> *"I hope other students will find the resource useful and open their eyes, like it did for me, to the contrasts and similarities between the professions* [pharmacy and veterinary medicine]*, and how collaboration is critical to moving medicine forwards"* [VC1]

> *"Enhanced knowledge on care homes."* [PC3]

Skills and knowledge:

As expected, the students gained knowledge in their subject area by undertaking the projects. Additionally, skills gained in working and communicating with others were commonly included in their reflections, amongst other specific skills to each individual student.

Improved professional knowledge:

There was an increase in the students' knowledge related to the topic area and an appreciation of IPE. This added to the students' individual professional knowledge, contributing to their course and future career.

> *"It was also very good for my learning, recently on an exam covert administration came up and I got full marks on that question as I knew it very well as it was a topic on the Xerte package that I created."* [PC3]

> *"The main skills I acquired from the project was competency with Xerte. I have since used this as a tool for coaching students from 1st and 2nd year during my course"* [PC1]

> *"From an academic perspective, I have learnt to appreciate how human pharmacy is different and how this impacts on being a vet"* [VC1]

Teamwork:

Students paid particular attention to the development in skills related to teamwork including communication.

> *"I learnt to be understanding of how others' chose to work and to embrace their ideas, and to be creative about how to incorporate them."* [VC1]

> *"It gave me the opportunity to get a greater understanding of project management with other colleagues with varying skillsets"* [PC1]

> *"I have gathered various skills and greater confidence when it comes to developing learning resources, communicating with peer academics and peers"* [PC2]

Other skills:

Students also developed skills which were not directly related to the topic area or to the project task set.

> *"I now understand how to split a complex subject up into clear, simple information within single slides."* [PC2]

> *"Developing my leadership ability was a surprising outcome"* [VC1]

Application of prior skills:

In addition to learning new skills, it was clear from the student reflections that they felt they had bought prior skills to the projects.

> *"I used skills and experience from other projects and placements as well as employment where I had worked in teams together which involved project management"* [PC1]

"I had a good background of working with different media, audio etc (hobbies), and also had experience in training my peers within my part time profession as a firefighter. This role also gives me good knowledge of interacting with professionals, IT platforms/troubleshooting" [PC2]

"At university, I'm a member of the student academic skills team which has given me an invaluable insight into the processes of creating learning resources for students" [VC3]

Discussion

The evaluation of the two e-learning packages created by student co-creators showed that the strengths of the resources included the easy navigation, engaging elements and relevant content. Areas for development focussed on the overall design, correction of grammatical errors, and the accessibility of the package. The student co-creators were asked to reflect under four key areas: use of digital technologies, students as co-creators, benefits and challenges of the project and skills and knowledge gained. Reflective data collected from the student co-creators of the veterinary pharmacy and care home pharmacy projects indicated that students developed interpersonal skills, gained an insight into the role of educators and gained knowledge related to their profession. They also enjoyed the autonomy and freedom to be creative. For some, learning to use Xerte™ was challenging, and logistical issues of group work posed some problems. Specific training and ongoing support from academic staff was vital in supporting the students.

Student evaluation of the e-learning packages

From the Likert-scale survey questions, there was high agreement that the care home pharmacy package was easy to use, well-structured and relevant to the students' profession as pharmacists. The free-text feedback also supported this. However, both the Likert-scale responses and free-text feedback indicated that the main area of weakness was in its lack of interactivity to support student engagement and learning. Conversely, the veterinary pharmacy package scored particularly well in the Likert-scale questions and free-text feedback for interactivity and relevance, but was criticised for lack of ease of use, accessibility and appearance. As previously discussed, these aspects are all required to facilitate and enable deep learning (Brown and Voltz, 2005; Armstrong, 2010). Both packages contribute to IPE and reflect the principles of One Health. The packages contain holistic content that demonstrates how different health care professionals can work together and collaborate within the MDT to provide optimum patient and animal care. Students highlighted understanding around the developing role of pharmacists in care homes, as well as an appreciation of differences and similarities between human and veterinary prescriptions. This is beneficial to the students' future careers, with IPE becoming more significant than ever with the emerging roles of pharmacists. Within all healthcare roles, collaboration between different healthcare professionals is crucial (American Veterinary Medical Association, 2008; World Health Organisation, 2010; Pinillos *et al.*, 2016; Pinillos, 2019).

Findings from this research highlight that the strengths of student co-creation are in the relevance of the material produced and the engagement of the learner. However, there are limitations in terms of the accessibility and ease of use of the packages made. The current packages would need modification and improvement from academics to ensure they are both fully accessible, interactive, and engaging. This would then ensure the content is in line with the Quality Assurance Agency for Higher Education guidelines on digital learning (The Quality Assurance Agency for Higher Education, 2020). The use of Xerte™ enabled easier navigation of the learning content; this was identified by the student evaluators as a positive aspect of the care home pharmacy package. The use of a digital platform for these packages enabled the content to be easily navigated. Although students will have previously used learning materials that are accessible, they may not have been sufficiently experienced in this stage of their careers to fully understand how to make learning material easy to use and to ensure accuracy. A future consideration would be to ensure an academic staff member oversees the quality of the final learning materials produced.

Many of the comments on the poor look and feel of the e-learning resources related to the veterinary pharmacy package rather than the care home pharmacy package. It is important to consider the differences in the way these two projects were conducted. The care home pharmacy package development was solely from two pharmacy students, whereas the veterinary pharmacy package involved six students from two schools. It is possible that the wider remit and larger team meant students did not work together as well to produce a cohesive package. The students working on the care home pharmacy package had been on placement to a care home and received training from a care home pharmacist prior to producing the package together. As such it was a more well-defined project than the veterinary pharmacy project where the students were given a broad task of producing an e-learning package on topics they felt were important. However, the veterinary pharmacy package was well liked in terms of its engagement and interactivity so the freedom the students had may have manifested in a more innovative end-product. This indicates a balance must be found between giving student co-creators an adequate level of autonomy alongside an appropriate level of structured support and training. Though the evaluators appreciated this learning being presented in a digital platform, it is important to consider that student learning preferences vary considerably (Nikolopoulou, 2022). This project reported data from a small group of student evaluators; it is likely that student opinions may differ based on previous experiences, background and demographics (Nikolopoulou, 2022).

Student co-creators' reflections

Use of digital learning technologies

The use of the digital learning platform Xerte™ received mixed comments. Although some students found it easy to use, two students said it was a challenge, but both later reflected that in a short time and with the support and training provided they became competent in its use. This suggests that one of the barriers of digital co-creation is the training or experience needed to use new learning technologies. In short time-pressured projects, this is likely to be a more apparent challenge. Furthermore, the student co-creators were specifically informed of the nature of the project before applying, so naturally students with more interest in the use of digital technologies may

have applied. If this type of project were conducted more widely with students, it is likely that more would struggle to use the required technology or need substantial additional support or training at the beginning.

Students as co-creators

One common theme identified was the autonomy and flexibility the students felt during the projects; they were able to develop resources with creative freedom. Through self-governing autonomy and representing the student body, students develop their intellectual reasoning, communication skills and intrapersonal abilities. It also prepares them for real-life complexities through adaptation and problem solving (Bron, Bovill and Veugelers, 2022). The positive feedback on interactivity given by the student evaluators on the veterinary pharmacy package indicates that this freedom and autonomy may have positively impacted the creation process. Allowing students creative freedom in future co-creation projects should be championed.

Benefits and challenges

One of the main challenges identified by the student co-creators was the logistics of working with other students. There was some reflection that this resulted in a less-cohesive e-learning package, which was also identified by the student evaluators. However, when asked about skills gained, several students commented that working with others and embracing their different skills and ideas were areas they developed. Indeed, co-creation can enthuse shared responsibility, trust and respect by learning from each other within a collaborative learning setting (Lubicz-Nawrocka, 2018, 2022). Students reflected that they learnt about how pharmacy sits within the integrated healthcare system, indicating that through these co-creation projects they developed knowledge related to IPE. A recent study by Siekkinen *et al.* (2021) highlighted the importance of knowledge sharing, flexible interactions and innovation when healthcare professionals worked together to enhance interprofessional practice.

Skills and knowledge

Students gained a range of skills and knowledge through partaking in these projects. In particular, veterinary students also developed an understanding of the pharmacist's role in veterinary medicine. Although also acknowledged as a logistical challenge in this project, the students recognised that they gained skills through working with others. These skills included managing a project and leadership. This project allowed students time and space to work with peers, including those of another discipline; this further prepares students for their future careers as part of the MDT. A 2019 systematic review on OH implementation highlighted education as a key challenge when implementing OH initiatives. The lack of interdisciplinarity and transdisciplinary structure in academia has been shown to impact collaborative approaches (Ribeiro, van de Burgwal and Regeer, 2019); this highlights the importance of such co-creation activities.

Strengths and limitations

Strengths

The care home pharmacy and veterinary pharmacy projects drew upon the knowledge and skills of staff and students from multiple disciplines. The next steps of this research

will include using the evaluation data to make amendments and improvements to the two e-learning packages. These will then be integrated into the MPharm curriculum.

The benefits bought to the students who partook in the co-creation projects was significant. They gained valuable experiences whilst utilising and developing key skills further. The academics involved gained an insight into the students' perspectives of what works well in co-creation. These learnings can be shared with fellow academics and applied to future co-creation projects.

Limitations

Both projects were small-scale projects, owing to the limited funding available. This student sample is not a true representation of the diverse community of students and scaling up would be needed. The MPharm course consists of a large number of students, from over 26 countries, all with different experiences and needs. Furthermore, the student co-creators were in year 3 or 4 of their studies; both the student experience and perspective may differ for students in the earlier stage of their studies. The conclusions drawn from the student co-creators' reflections may not be generalisable, as only four of the eight student co-creators provided a reflection. The evaluation also only involved 5 pharmacy students, and again this does not represent the diverse student community. No veterinary students evaluated the veterinary pharmacy package, so this research has only assessed the relevance to the pharmacy curriculum. Furthermore, manual analysis was used which risks introducing some biases and subjectivity in the interpretation of responses.

Another limitation of this research is that both projects employed students to undertake this work outside of their studies and therefore could have attracted students who are more motivated, interested in educational careers or more fluent in digital technologies. The evaluation also solely included the student perspective. Whilst it can be argued that students are best placed to comment on accessibility, ease of use and learnings gained, they may not be able to contribute to all elements of the evaluation, including accuracy and importance of content for their future career.

Further research

In addition to collecting data from a wider group of student evaluators, further research should explore the perspectives of academics and practitioners; their evaluation of the packages would be beneficial to improve the content. It has been highlighted that co-creation is a partnership activity where both parties have equal voice. Indeed, the differing experiences and expertise contributed by co-creators results in contribution of elements and considerations often missed when working individually (Cook-Sather, Bovill and Felten, 2014).

Neither the students or academics involved in these projects were practicing pharmacists. Gaining the perspective of practitioners would provide reliable and accurate data on the relevance of the content and if context to real-life practice is truly represented. The academic reflection on the co-creation experience is also important. Through understanding challenges faced by academics, strategies can be created to reduce these. This may result in academics being more open to partaking in future co-creation projects.

Conclusion

This research aimed to identify areas of best practice and challenges faced within digital co-creation, in order to optimise and enhance future projects. The first objective of this research was to evaluate two e-learning packages created by students. The content within the packages was evaluated as relevant and contributed to student learning, indicating that the students' perspectives added great value to curriculum development. Furthermore, the nature of the cross-discipline topics covered in both packages contributed to IPE, emphasised the importance of the MDT and highlighted the principles of One Health. Therefore, in health care disciplines, there is value added through collaboration between students of different disciplines in co-creation projects.

The challenges faced were in the use of the specific digital learning platform Xerte™. Furthermore, the e-learning resources produced by students may need another layer of scrutiny in terms of their ease of use, accessibility, and accuracy before being widely used in undergraduate teaching. Clearly students play a vital role in co-creation but input and support from academics is key. The second objective of this research was to explore the reflections from the student co-creators. The benefits to students who partook in co-creation were multi-factorial. Students gained learning relevant to their course or future career, skills related to working with others and leadership attributes. Students bring their own interests and skills to the co-creation process which is advantageous to create dynamic and interactive final products. From these findings, it is apparent that effective co-creation requires sufficient digital training, ongoing support from academics and an appreciation of the logistical challenges of group work.

Acknowledgements

The School of Pharmacy placement team and placements manager, Julia Thompson, supported student recruitment. Rachel Kenward contributed to the development of the care home pharmacy project. This project would not have been possible without the hard-work, commitment and contributions from the student co-creators and evaluators.

References

American Veterinary Medical Association (2008) *One Health: A New Professional Imperative*.

Armstrong, P. (2010) *Bloom's Taxonomy*, *Vanderbilt University Center for Teaching*. Available at: https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/ (Accessed: 23 June 2023).

Beetham, H. and Sharpe, R. (2020) *Rethinking Pedagogy for a Digital Age: Principles and Practices of Design*. Third Ed. New York: Routledge.

Biggs, J. (2014) *Constructive alignment in university teaching*, *HERDSA Review of Higher Education*.

Boud, D. and Prosser, M. (2002) 'Appraising New Technologies for Learning: A Frarnewoek for Development', *Education Media International*, 39, pp. 237–245. Available at: https://doi.org/10.1080/09523980210166026.

Bovill, C. *et al.* (2016) 'Addressing potential challenges in co-creating learning and teaching: overcoming resistance, navigating institutional norms and ensuring inclusivity in student–staff partnerships', *Higher Education*, 71, pp. 195–208. Available at: https://doi.org/10.1007/s10734-015-9896-4.

Brace, I. (2018) *Questionnaire Design: How to plan, structure and write survey material for effective market research*. Fourth Ed. London: Kogan Page Limited.

Bridges, D.R. *et al.* (2011) 'Interprofessional collaboration: three best practice models of interprofessional education', *Medical Education Online*, 16. Available at: https://doi.org/10.3402/meo.v16i0.6035.

Bron, J., Bovill, C. and Veugelers, W. (2022) 'Students experiencing and developing democratic citizenship through curriculum negotiation: the relevance of Garth Boomer's approach', *Curriculum Perspectives*, 42(1), pp. 39–49. Available at: https://doi.org/10.1007/s41297-021-00155-3.

Brown, A.R. and Voltz, B.D. (2005) 'Elements of Effective e-Learning Design.', *The International Review of Research in Open and Distributed Learning*, 6(1). Available at: https://doi.org/10.19173/irrodl.v6i1.217.

Cole, F.L. (1988) 'Content Analysis: Process and Application', *Clinical Nurse Specialist*, 2(1), pp. 53–57.

Conole, G. (2014) 'The 7Cs of Learning Design - a new approach to rethinking design practice', *Proceedings of the 9th International Conference on Networked Learning*, pp. 502–509.

Cook-Sather, A., Bovill, Catherine. and Felten, Peter. (2014) *Engaging Students as Partners in Learning and Teaching: A Guide for Faculty*. Jossey-Bass.

Echavarria, M.V. (2010) 'Problem-Based Learning Application in Engineering', *Revista EIA*, 14, pp. 85–95.

Elo, S. *et al.* (2014) 'Qualitative Content Analysis: A Focus on Trustworthiness', *SAGE Open*, pp. 1–10. Available at: https://doi.org/10.1177/2158244014522633.

Elo, S. and Kyngäs, H. (2008) 'The qualitative content analysis process', *Journal of Advanced Nursing*, 62(1), pp. 107–115. Available at: https://doi.org/10.1111/j.1365-2648.2007.04569.x.

Estrada, A.H. *et al.* (2016) 'Incorporating Inter-Professional Education into a Veterinary Medical Curriculum.', *Journal of veterinary medical education*, 43(3), pp. 275–81. Available at: https://doi.org/10.3138/jvme.0715-121R.

General Pharmaceutical Council (2019) *Consultation on initial education and training standards for pharmacists*. London.

Hmelo, C.E. and Ferrari, M. (1997) 'The Problem-Based Learning Tutorial: Cultivating Higher Order Thinking Skills', *Journal for the Education of the Gifted*, 20(4), pp. 401–422. Available at: https://doi.org/10.1177/016235329702000405.

Hsieh, H.-F. and Shannon, S.E. (2005) 'Three approaches to qualitative content analysis.', *Qualitative Health Research*, 15(9), pp. 1277–88. Available at: https://doi.org/10.1177/1049732305276687.

Jensen, A.A. and Krogh, L. (2017) 'Re-Thinking Curriculum for 21st-Century Learners: Examining the Advantages and Disadvantages of Adding Co-Creative Aspects to Problem-Based Learning', in T. Chemi and L. Krogh (eds) *Co-Creation in Higher Education: Students and Educators Preparing Creatively and Collaboratively to the Challenge of the Future*. Volume 6. Sense Publishers, pp. 1–14.

Lightle, K. (2011) 'More than just the technology', *Science Scope* [Preprint].

Liyanage, C. *et al.* (2009) 'Knowledge communication and translation - a knowledge transfer model', *Journal of Knowledge Management*, 13(3), pp. 118–131. Available at: https://doi.org/10.1108/13673270910962914.

Lubicz-Nawrocka, T. (2017) 'Co-creation of the curriculum: challenging the status quo to embed partnership', *The Journal of Educational Innovation, Partnership and Change*, 3(2).

Lubicz-Nawrocka, T. (2022) 'Conceptualisations of curriculum co-creation: "it's not them and us, it's just us"', *Curriculum Perspectives*, pp. 1–13. Available at: https://doi.org/10.1007/s41297-022-00180-w.

Lubicz-Nawrocka, T.M. (2018) 'Students as partners in learning and teaching: The benefits of co-creation of the curriculum', *International Journal for Students as Partners*, 2(1), pp. 47–63. Available at: https://doi.org/10.15173/ijsap.v2i1.3207.

Lueddeke, G.R. *et al.* (2017) 'Preparing society to create the world we need through "One Health" education', *South Eastern European Journal of Public Health*, 13. Available at: https://doi.org/10.56801/seejph.vi.111.

Mercer-Mapstone, L. *et al.* (2017) 'A Systematic Literature Review of Students as Partners in Higher Education', *International Journal for Students as Partners*, 1(1). Available at: https://doi.org/10.15173/ijsap.v1i1.3119.

Nikolopoulou, K. (2022) 'Face-To-Face, Online and Hybrid Education: University Students' Opinions and Preferences', *Journal of Digital Educational Technology*, 2(2). Available at: https://doi.org/10.30935/jdet/12384.

Pinillos, R.G. *et al.* (2016) 'One Welfare - a platform for improving human and animal welfare', *Veterinary record*, 179(16), pp. 412–413. Available at: https://doi.org/10.1136/vr.i5470.

Pinillos, R.G. (2019) 'One Welfare: A Framework to Improve Animal Welfare and Human Well-Being', *Animal Welfare*, 28(1), pp. 122–123. Available at: https://doi.org/10.7120/S0962728600010812.

Ribeiro, C. dos S., van de Burgwal, L.H.M. and Regeer, B.J. (2019) 'Overcoming challenges for designing and implementing the One Health approach: A systematic review of the literature', *One Health*, 7. Available at: https://doi.org/10.1016/j.onehlt.2019.100085.

Royal Pharmaceutical Society (2016) *Working in care homes - a guide*. Available at: https://www.rpharms.com/resources/pharmacy-guides/working-in-care-homes-a-guide (Accessed: 24 June 2023).

Siekkinen, M. *et al.* (2021) 'Work empowerment among cancer care professionals: a cross-sectional study', *BMC Health Services Research*, 21, p. 502. Available at: https://doi.org/10.1186/s12913-021-06528-8.

Stafford, E.G. (2020) 'Highlighting the role of veterinary pharmacists in zoonotic diseases including COVID-19.', *Journal of the American Pharmacists Association: JAPhA*, 60(6). Available at: https://doi.org/10.1016/j.japh.2020.06.021.

The Quality Assurance Agency for Higher Education (2020) *Guidance: Building a Taxonomy for Digital Learning*.

The Royal College of Veterinary Surgeons (2020) *Strategic Plan 2020-2024. Clarity, compassion, courage, confidence: the future of the Royal College of Veterinary Surgeons*. London.

World Health Organisation (2010) *Framework for Action on Interprofessional Education & Collaborative Practice*.