Pilots Completion Report

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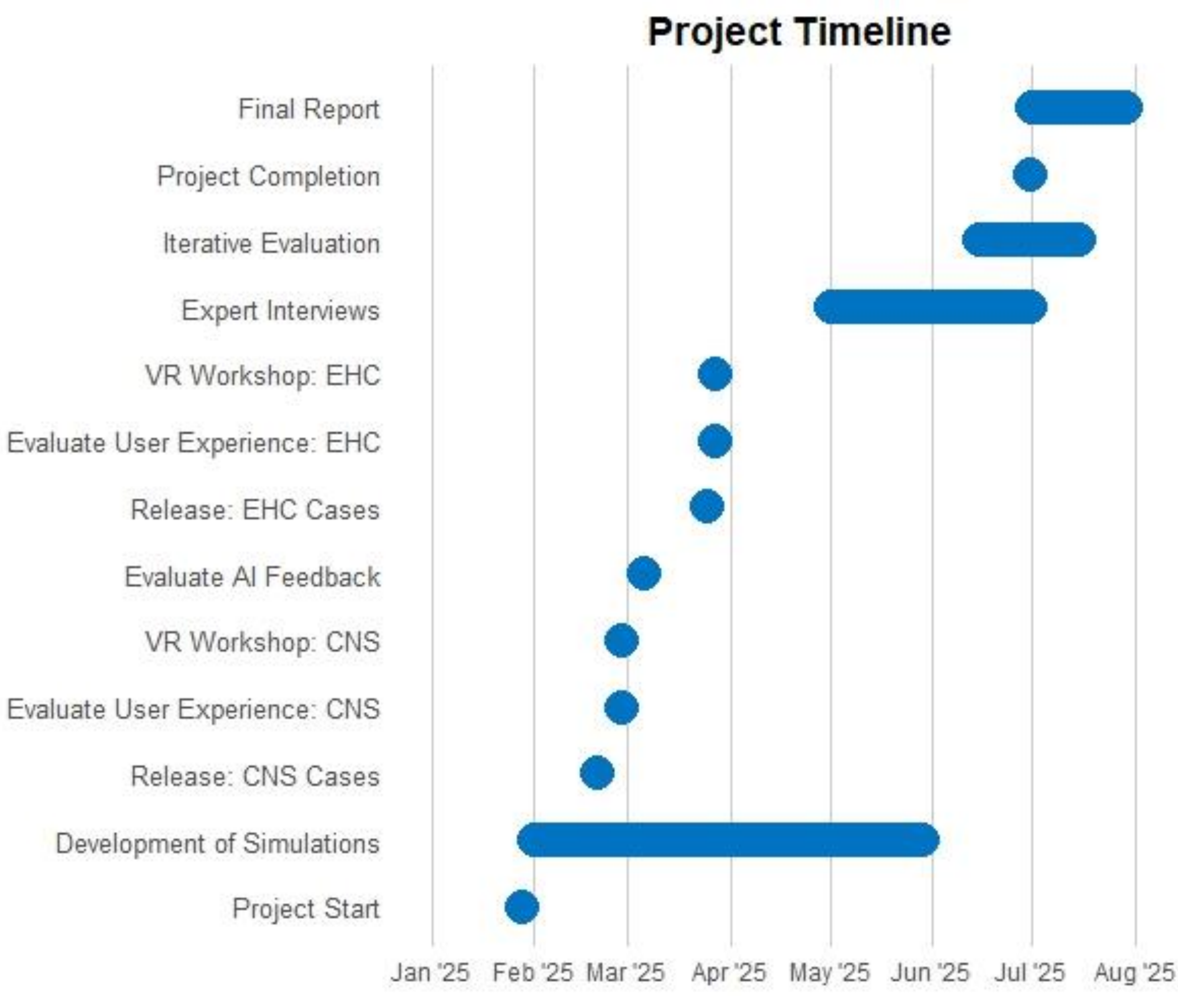


Summary

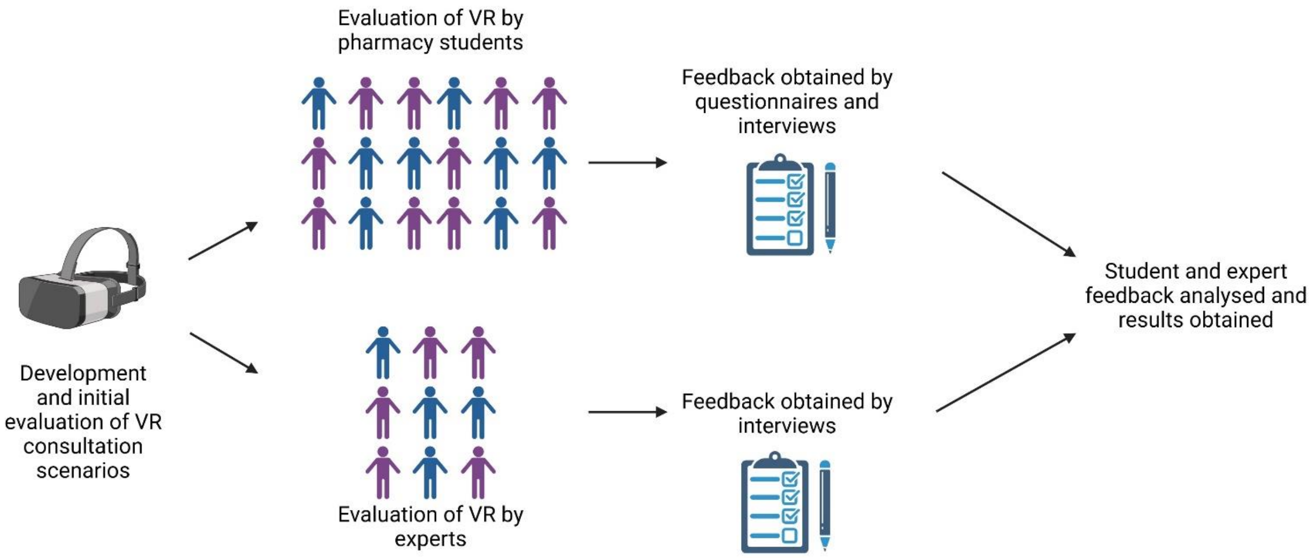
This Flexible Learning Pilot (FLP -ID90) has been successful in developing simulations to support consultation skills for BSc clinical pharmacy students in the Division of Pharmacy and Optometry at the University of Manchester.

Overall Pilot Rating:
Fully Delivered

A full-scale solution would include 60 fully working VR simulations to enhance undergraduate pharmacy consultation training by integrating scalable virtual reality (VR) and generative AI (GenAI) simulations into undergraduate pharmacy education covering wide range of minor ailments presented in community pharmacy. The aim of the solution would be to support students in achieving consultation competence at the 'shows how' level of Bloom's taxonomy, aligning with the General Pharmaceutical Council's competency requirements assessed during Structured Learning Events (SLEs).

The *PharmVR* pilot aimed on replacing a portion of formative traditional SLEs with AI-supported VR simulations in the Year 4 of BSc clinical pharmacy curriculum. Over a five-month period, we successfully developed and piloted 19 immersive VR simulations. These simulations allowed students to engage with realistic, AI-driven patient avatars across a range of minor ailments, to improve their confidence and competence in clinical communication and consultation.

Figure 1. Experimental design



Nineteen VR simulations were developed by *SentiraXR* using Unity for the HTC Vive Focus 3 headset. A ChatGPT-based system provided real-time, mark scheme-driven feedback. Avatars were created using Character Creator 4 and iClone 8, with voice cloning via ElevenLabs and dialogue powered by Inworld AI. Undergraduate pharmacy students participated in pilot sessions, having prior experience with traditional SLEs. They were informed of clinical topics but not avatar characteristics.

A mixed-methods approach was used. The **qualitative data** was obtained via semi-structured interviews which were audio-recorded, transcribed verbatim, and analysed thematically using Braun and Clarke's approach. The **quantitative data** was obtained via questionnaires completed before and after students attended the pilot VR session which consisted of a series of Likert-scale questions. The responses were dichotomised for analysis.

Experimental Results

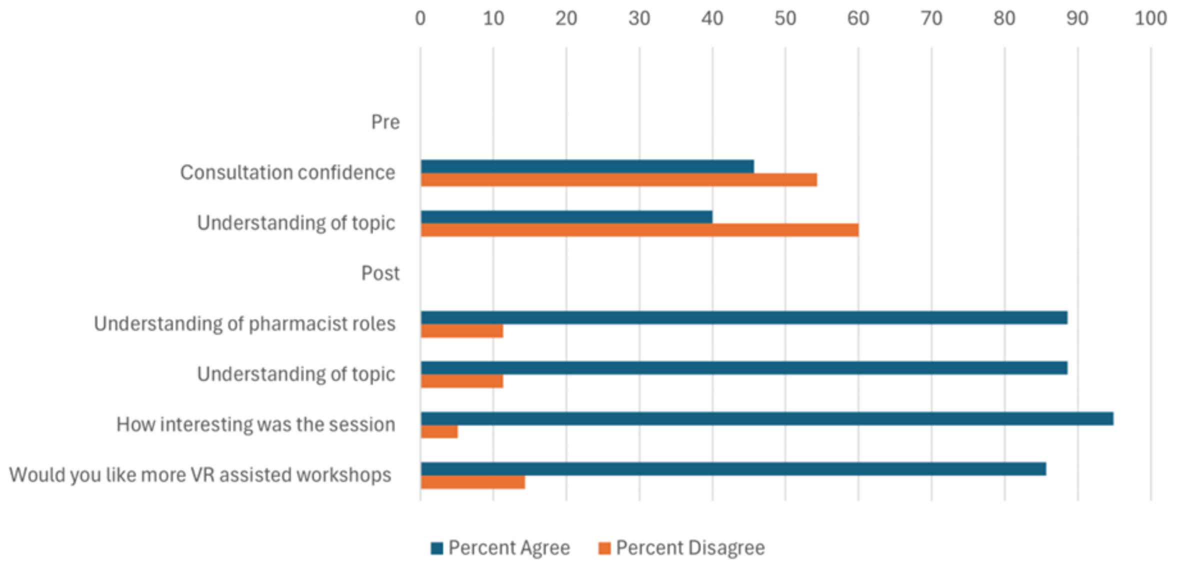
Student Perspective

A total of 44 pharmacy students were recruited. Each participant experienced at least one of three scenarios. Students were generally very positive towards the use of VR simulations. A majority of students thought the GenAI was beneficial to their learning (see table 1). Furthermore, the majority of students (95%) found the VR assisted workshop interesting, with 100% responding that they would recommend VR to other students.

Table 1: Overall experience of the simulation(s):

Area	**Positive (%)**	**Negative (%)**	**No response**
Comfort	85.7	14.3	
AI Responsiveness	64.3	14.3	
Beneficial to studies	85.7	14.3	
Improved performance	85.7	14.3	
Improve Confidence	92.9	7.1	
Would recommend VR	100.0	0	
Overall Experience	89.3	10.7	

Figure 2. Summary of Pre- and Post-questionnaire responses



According to the questionnaires, prior to undertaking the consultation, 54% of students said they were not confident in their consultation skills. Importantly, following the VR workshops, significantly more students agreed that their confidence to consult a patient and their understanding of pharmacist roles had improved compared to pre-workshop responses (χ^2 = 15.01, $P < 0.0001$ and χ^2 = 18.74, $P < 0.001$, respectively). The majority of students (95%) found the VR assisted workshop interesting, with 86% responding that they would like to have more VR based SLEs.

Interviews revealed that students generally found the VR/GenAI workshops accessible, flexible, and useful for building consultation confidence in a low-pressure environment. Four key themes emerged: **authenticity, usability, feedback,** and **learning support**.

Authenticity

Students found the VR simulations highly realistic and aligned with real pharmacy settings. The format mirrored traditional SLEs, offering a safe space to simulate real consultation pressure. Some even found VR more engaging than standard teaching methods.

"Structured very similarly to the SLEs… over the past three years." (Student 1)

"I feel interesting and exciting using it." (Student 8)

Usability

Some students experienced communication issues, particularly with speech recognition and the inability to use gestures. Accents and fast speech occasionally reduced system accuracy. A few felt VR wasn't essential and suggested compatibility with non-VR devices to improve access. Wearing glasses also impaired visual clarity in VR.

"Computer can be fine… not everyone has VR devices." (Student 8)

"My glasses… can block the VR." (Student 10)

Feedback

Concerns were raised about the accuracy and fairness of AI-generated feedback. Some students felt their responses weren't fully acknowledged, leading to trust issues in using it for formal assessment. However, many saw value for formative learning, though not for summative evaluations.

"Even though it did say it… the whole section was not met." (Student 5)

Learning Support

Students appreciated the ability to practise repeatedly without waiting for staff and described VR as a less stressful, non-judgmental space. They believed it boosted confidence and encouraged self-directed rehearsal. However, many still preferred in-person learning for emotional connection and richer feedback.

"It helps me to boost my confidence…"(Student 8)

"...more relaxed to do that... I know I will not do harm to the AI (Student 9)"

"I would prefer non-AI." (Student 2)

Expert perspective

All expert interviews have not been analysed. However, analysis of a few expert interviews identified three key themes: **communicative clarity**, **pedagogical utility**, and **feedback reliability**.

Communication

Experts found the avatar's speech recognition generally accurate, handling accents and informal speech well. Prompts supported dialogue flow, though some noted issues with fast speech, multi-part questions, and lack of emotional tone.

Expert 1 "I speak with a heavy accent, and I speak quite a lot of slang… I thought it really understood everything''

Expert 2 "Hard to put emotion into the avatar's voice… lacked tone."

Educational Value

Simulations were seen as useful for practising core consultation steps and building confidence, especially for students with developing communication skills. Experts emphasised that VR/GenAI should **supplement** in-person training, not replace it, due to its limitations in emotional interaction and non-verbal cues.

Expert 2 "There's always a blend that's needed."

Feedback

AI feedback was mostly reliable, but occasional mismatches between spoken input and recorded feedback were noted. Experts supported its use for learning, but advised caution for high-stakes assessments.

Expert 2 "Very accurate… but there were issues to iron out."

There were few advantages of VR based workshop that experts expressed:

Expert 5 ''It felt real like, I was working in a pharmacy''

Expert 6 ''If doing it through computer they will discuss with each other, help each other ……doing it through VR there is no distraction …it is independent work''

Expert 7 ''You can't cheat …….. you can't look anywhere for information''

Conclusion

In conclusion, these findings highlight the promise of VR and GenAI tools to advance consultation skills education in pharmacy training. Although these technologies should not be seen as substitutes for conventional approaches, they can meaningfully contribute to a hybrid model that leverages AI's scalability and objectivity, preserving the vital interpersonal guidance delivered through human facilitation. Continued refinement of AI feedback systems and thoughtful integration into teaching will be crucial to ensure graduates develop both technical competence and the human-centred skills essential for safe, effective practice.

Objectives

Below we discuss how this project has met its objectives.

Objective 1: Design 19 VR-based consultation scenarios tailored to the pharmacy curricula.

Status: **Fully achieved**

In collaboration with SentiraXR, a total of 19 interactive VR consultation scenarios were developed to simulate a wide range of pharmacy-based interactions. Scenario content and assessment was informed by input from pharmacy educators. The scenarios included varied case types covering wide range of minor ailments presented in community pharmacy including central nervous system, emergency hormonal contraception. They were designed to reflect realistic challenges students are likely to encounter in practice.

To ensure pedagogical validity and relevance, expert consultations were conducted during the design phase, guiding the structure, tone, and clinical complexity of the scenarios.

Objective 2: Integrate GenAI into the VR experience to simulate patient interactions and generate feedback on user performance.

Status: **Achieved, with further developments being implemented.**

GenAI models were embedded into the VR scenarios to serve two main purposes:

1. Real-time conversational capability with virtual patients.
2. Automated feedback generation post-consultation.

GenAI assessment was evaluated and compared to human assessment. The AI was able to detect the key criteria required for assessment, such as if the user asked the avatar if they take other medications or have any allergies. Furthermore, we found that the outcome of AI assessment was generally consistent with human assessment. However, more continuous evaluation and improvement is needed via iterative student/expert feedback and simulation refinement.

One minor technical limitation noted during pilot testing was that the AI assessment process occasionally slowed avatar responses, affecting the smoothness of user interactions. However, this issue is being actively addressed with new technology ready for implementation in the coming months, which is expected to significantly improve response times and overall system fluidity. This enhancement will further improve user experience and engagement during VR consultations.

Objective 3: Evaluate and develop scenarios with internal stakeholders on the project

Status: **Partially achieved,** with ongoing evaluation.

The first five scenarios were piloted and evaluated over several workshops by at least three experts involved in the VR project. Initial pilot testing gathered usability feedback, allowing for adjustments in interaction flow, avatar realism, and GenAI assessment. Ongoing evaluation of all 19 scenarios will continue over the coming months. The use of new platform is expected to overall simulation. However, generally many of the improvements applied to the first three scenarios can be applied to all consultations, meaning evaluation of the later scenarios will be quicker.

Objective 4: Evaluate the educational value and usability of the VR platform through student surveys and interviews.

Status: **Achieved.**

The quantitative and qualitative data gathered for the evaluation of the pilot has been discussed in the summary section of the report. Concerns were raised about over-reliance on VR and the risk of losing human interaction and opinion, particularly in feedback and emotional interactions.

Objective 5: Conduct expert evaluation of the VR scenarios and GenAI feedback mechanisms to assess their educational validity and clinical accuracy.

Status: **Achieved.**

In addition to student feedback, structured VR experience with expert educators were conducted. Experts reviewed selected scenarios and tested the GenAI-driven feedback tools. The qualitative data gathered for the evaluation of the pilot has been discussed in the summary section of the report including the advantages of delivering via VR.

They commended the system's potential for scalable training and noted the immersive quality of the VR environment. However, they shared concerns similar to students regarding the accuracy, specificity, and pedagogical reliability of GenAI-generated feedback. Experts particularly noted missed cues around empathy, shared decision-making, and patient-centred language. Many experts agreed, however, that GenAI is a very useful tool for developing consultation skill for students. This feedback has been invaluable in refining system parameters and will inform future iterations of AI training models.

DELIVERABLES

The following section details the range of outputs delivered as part of the project's successful completion.

D1

A library of 19 interactive VR consultation scenarios

A complete suite of 19 pharmacy-specific VR consultation scenarios was developed. These scenarios reflect core therapeutic areas and common consultation themes aligned with MPharm and clinical BSc Pharmacy curricula.

D2

Integrated GenAI-driven virtual patient consultation system

A functioning GenAI component was developed and embedded into the VR system. This enables real-time avatar interaction and automated consultation feedback. The GenAI system accurately recognised key consultation components and was benchmarked against expert human assessment.

D3

Expert-informed design and iterative refinement process

Multiple structured workshops were conducted with pharmacy educators and clinical experts to guide and refine the scenarios and AI assessment parameters. These sessions contributed to improvements in clinical detail, avatar behaviour, user interface design, and feedback tone.

D4

Student pilot workshops and evaluation dataset

A total of 44 students completed VR consultations and provided quantitative and qualitative feedback through pre- and post-session questionnaires and interviews. This evaluation produced clear evidence of the platform's educational value and acceptability.

D5

Expert feedback on GenAI assessment validity and platform usability

Expert assessors tested the GenAI feedback mechanism within selected scenarios. Their feedback, including both praise and constructive critique, has informed refinements in the GenAI's interpretive logic and communication style.

Materials and publications

1. Final report

2. Abstract accepted for an oral presentation at the 7th International Workshop on Artificial Intelligence and Education (WAIE 2025).

3. A manuscript detailing the development of the VR scenarios, as well as the outcomes from the student pilot study, is currently undergoing internal review by co-authors. This will be submitted to be published in the proceedings of 7th International Workshop on Artificial Intelligence and Education (WAIE 2025) in the coming months.

Key Delivery Criteria Linked with the Flexible Learning Strategy

Relevance

Supporting the Vision of a Flexible, Digital, and Inclusive Education

The Flexible Learning Strategy emphasises the need for an education system that prepares students for a flexible, digital, interconnected world. This project directly embraces this by integrating VR and GenAI into the development of consultation skills.

- VR provides an immersive, digital-first learning environment, aligning with the strategy's "Flexible First" pillar.
- It embraces new modes of delivery, meeting student expectations for technologically enhanced, modern education.
- The project supports inclusivity by offering a safe space for students to practice without fear of failure, critical for anxious learners.
- The simulations allow flexibility that students can practice consultation skills in their own time, negating the need for the preparatory workshops. Also, it offers a self-directed learning environment where students can repeat scenarios as needed, fostering competency at their own pace.

Efficiency

Streamlining Resource-Intensive Training

Traditional Structured Learning Events (SLEs) require actors, assessors, and significant scheduling efforts, making them resource-heavy and logistically complex.

- VR consultations remove the need for live actors and in-person assessors, significantly reducing staffing burdens.
- Sessions are self-directed, can be run anytime, anywhere, and reused across cohorts.
- AI-driven feedback enables immediate post-session reflection, reducing turnaround time for formative assessment.

Effectiveness

Enhancing Learning Outcomes and Student Experience

Compared to traditional SLEs, VR consultations offer several educational advantages:

- **Increased understanding**: Students reported that the VR setting increased their understanding of the topic and their role as a pharmacist. This is supported by instances in the literature where use of VR has been shown to enhance learning.
- **Confidence building**: The low-pressure, repeatable format helped students build confidence without performance anxiety.
- **Personalisation**: Students can move at their own pace, addressing the "pace, place, and pathway" dimensions of flexible learning.
- **Feedback quality**: GenAI feedback compared well to human assessment and was accurate in identifying core consultation skills, promoting self-awareness and improvement.

Outcome

Evidence of Positive Impact on Confidence and Learning

This pilot demonstrated clear benefits for students:

- 82% of students agreed the VR sessions helped them achieve their learning objectives.
- 93% reported increased confidence in patient communication.
- Interview themes included the flexibility, accessibility, and real-world applicability of the training.
- Expert evaluators confirmed the credibility of AI feedback, reinforcing its use in formative assessment.

Sustainability

Scalable, Reusable, and Cost-Effective

VR-supported learning addresses multiple sustainability concerns in education:

- Scenarios are **digitally reusable**, requiring only one-time development and minimal upkeep.
- VR technology can be scaled to accommodate hundreds of students per session while requiring only one or two staff members, significantly reducing the current need for five staff and four actors to manage just 50 students.
- Sessions can be updated or added, without rebuilding from scratch.
- Future implementation across additional programmes supports the strategy's emphasis on lifelong learning and transnational education.

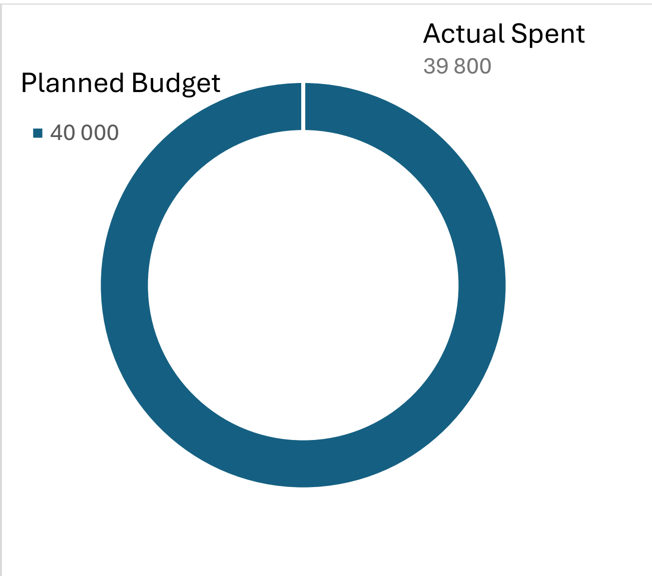
Financial

The total spend was managed efficiently across development, evaluation, and dissemination activities. The budget allocation aligns with the project's goals to deliver scalable, high-quality immersive learning tools while gathering robust feedback from stakeholders. The project was delivered on time in budget with £200 under spend.

The majority of the project budget was allocated to **simulation development** (£33,820), reflecting the technical complexity and scale of creating 19 interactive VR/GenAI consultation scenarios. This investment covered software development, avatar animation and AI integration.

The budget spent for administrative support enabled effective coordination, scheduling, and documentation throughout the project. To acknowledge participants who significantly contributed for the evaluation of the projects, both e-vouchers and physical vouchers were distributed. Other expenses were scenario development which ensured the development of clinically relevant scenarios aligned with pharmacy curriculum standards. Additional expenses supported academic dissemination and the acquisition of equipment for recording interviews, which enhanced the quality of qualitative data collection.

Figure 3. Budget spent



Lessons Learned

Allow time for student and staff recruitment

This project primarily depended on feedback from members of the BSc Pharmacy course, as recruiting MPharm students proved more difficult than anticipated, which impacted both the sample size and participant diversity. Future projects should begin recruitment earlier, use a broader range of communication channels, and consider offering incentives or integrating the activity into coursework to increase engagement. In addition, reaching out to MPharm lecturers to secure their support in promoting VR workshops could improve uptake. A clearer articulation of the value of participation, such as how it supports learning outcomes or professional development, may also help motivate students. Introducing student ambassadors from within the MPharm course to become more familiar with the project could have led to stronger engagement from the wider course. These ambassadors could have acted as peer advocates, helping to raise awareness, answer questions, and generate interest among their cohort. Taking this into consideration the project has now been offered to MPharm final year student as their dissertation topic.

Recruiting staff on a casual basis within a short timeframe proved to be a significant challenge. The university's regulation limiting casual contracts to a maximum of 13 weeks per individual further complicated the process. Additionally, one of the recruited staff members had to withdraw from the project after only a few weeks, adding to the administrative burden and disrupting continuity. For future projects, it will be important to plan recruitment well in advance and explore a wider variety of advertising platforms to attract suitable candidates and ensure a smoother, more timely hiring process.

Flexibility in engaging experts

While our original plan was to conduct focus groups with academic and clinical experts to gather feedback on the VR tool, scheduling difficulties and time constraints meant we had to pivot to individual interviews. This shift provided valuable, in-depth, and tailored feedback that may not have surfaced in a group setting. However, it also highlighted some trade-offs: one-to-one sessions were significantly more time- and labour-intensive, and the lack of group interaction limited opportunities for experts to build on each other's ideas or challenge assumptions collaboratively.

From this, we learned the importance of designing flexible engagement approaches that account for the busy schedules of academic and clinical stakeholders. In future iterations, offering a hybrid model with both group and individual options may help balance efficiency, depth of insight, and collaborative discussion. Furthermore, planning for expert workshops would have to begin in the very early stages of the project to accommodate busy schedules.

Technology takes time to develop

The integration of AI-driven assessment within the VR environment introduced a range of technical and design challenges. Most notably, there were occasional delays in avatar responses, which disrupted the natural rhythm of user interaction and impacted immersion.

These lags were often tied to the processing demands of real-time AI interpretation and feedback generation. Another significant challenge was calibrating the avatar's behaviour ensuring it withheld key information until prompted by the user, while still appearing responsive and natural. Striking the right balance between informative and reactive, without making the avatar feel overly passive or unhelpfully vague, required careful fine-tuning.

Addressing these issues involved multiple iterative testing and development cycles. In several instances, updates made to correct specific avatar behaviours inadvertently introduced problems elsewhere in the system, such as misaligned scoring, reduced realism, or inconsistencies in feedback delivery. This interdependence of system components underscored the complexity of integrating GenAI into immersive educational tools.

New scenarios were developed specifically for the project to ensure greater autonomy and flexibility. While the original plan was to use existing MPharm cases, this approach became complicated due to their use in summative assessments, which limited its use. Creating entirely new scenarios within a tight timeframe was demanding and complex. However, despite these challenges, the team successfully produced bespoke cases that aligned with the project's needs and pharmacy curriculum allowing creativity and instructional control.

The experience highlighted the importance of building in ample time for refinement, not only for rigorous technical testing but also for real-world usability trials. Early engagement with developers, continuous feedback loops, and flexible timelines are essential for achieving a stable and effective learning tool.

Mixed models is the best approach for feedback

While the questionnaires provided valuable quantitative insights into changes in student confidence and perceived learning outcomes, some inconsistencies in responses were observed. These variabilities may have stemmed from differing interpretations of the Likert scales used, as well as language-related nuances, given that many participants did not speak English as their first language. Such factors can subtly affect how questions are understood and how responses are selected, especially when dealing with abstract concepts like confidence or perceived preparedness.

Despite these limitations, the questionnaire data still offered a strong baseline for assessing the educational impact of the VR platform, particularly when combined with insights from qualitative interviews. This mixed model approach led to a richer understanding of user experience. The interviews not only contextualised some of the trends seen in the survey data but also revealed specific areas for improvement that might not have been captured in fixed-response formats.

This experience highlights the importance of mixed-methods evaluation when assessing novel educational technologies. Future evaluations should continue to pair questionnaires with interviews and consider refining survey tools to be more accessible. Increasing the diversity of participants and piloting questions for clarity can further enhance the reliability of findings and ensure that feedback reflects the true user experience across varied student backgrounds.

Increase project visibility

We learned that increasing the visibility of the project within the course and wider school community could have significantly enhanced engagement from both students and subject-matter experts. While initial outreach efforts were focused, they were not fully integrated into existing academic channels, which may have limited some student and staff engagement.

A more proactive and integrated communication strategy, such as incorporating project information into course specific pages (such as on Canvas or Blackboard), delivering short pitched at relevant lectures, and engaging academic leads and personal tutors early on, might have increased engagement with VR project in the wider team.

This could have helped increase our sample sizes in both student and expert evaluations, as well as help frame the project as a valuable part of the learning experience. For future initiatives, early and sustained communication touchpoints across academic and student networks should be considered essential to maximise engagement and ensure the feedback collected is as representative and insightful as possible.

Consider technical infrastructure

Poor Wi-Fi signals during sessions led to at least one expert having a suboptimal experience, as delayed AI responses disrupted the flow of interaction and caused frustration. Also, one of the student evaluation sessions was cancelled and rescheduled. This highlighted the importance of carefully considering the technical infrastructure when planning and delivering projects that rely on real-time AI and VR technologies. Ensuring reliable, high-speed internet access and choosing suitable locations are critical to maintaining smooth interactions and positive user experiences. Projects aiming to implement these technologies should consider the infrastructure, particularly if planning on upscaling so numerus devices are running simultaneously.

Ethical and administrative considerations

Programme Awareness and administration

The short timeframe of the project meant everything had to be organised quickly and efficiently. Since I had no prior experience with managing a grant, this made things more challenging. I also found that many people across the university weren't familiar with the FLP programme: what it's for, how it's funded, or what kinds of projects it supports. It took time to figure out how to set up the right grant code and how payments would be processed. Creating a contract with the simulation company, especially around GDPR and intellectual property rights, was also complicated and time-consuming. Although the FLP scheme has now ended, it would be helpful in the future if the programme offered more presentations for academic and administrative staff and created a website with information about current projects and key contacts to improve awareness and understanding.

Ethics and Research Governance

Navigating ethical approval proved time-consuming and labour intensive, requiring an exceptional level of detail. However, proportionate UREC approval was gained for the evaluation of the project and data collection. Ethical approval is valid for future research until 2030. One key challenge is the limited flexibility in promoting voluntary student participation. The ethics process mandates that students view the full consent form and GDPR statement before registering. However, this approach is incompatible with how students typically engage quickly and on-the-go via QR codes or links. This highlights the need for careful planning and communication strategies in similar future initiatives.

Financial considerations

One of the most significant financial considerations for a scheme like this is allocating funding for the researcher's time. In this project, there was no budget provision for researcher time, which meant the work had to be carried out outside of regular duties, on top of existing academic, teaching, and administrative responsibilities. This placed a considerable burden on the researcher and had the potential to affect both the quality and timely delivery of the project. Despite these challenges, the project was completed to a high standard and on schedule, with hard work and dedication, effective teamwork, and a substantial amount of personal time committed beyond contracted hours. Moving forward, it would be extremely valuable for the programme to set clear guidance on workload management or offer designated time allowances for researchers involved in such initiatives to ensure sustainability and protect project quality. '**Overall, FLP scheme represents a novel approach to fostering innovation that might otherwise have remained undiscovered and undeveloped'**.

Next Steps

1

Continue scenario evaluation and improvement

Ongoing testing and feedback collection on the remaining VR scenarios will help identify usability issues and learning gaps. This process ensures the platform will meet student needs.

2

Roll out to new student cohorts

Introducing the platform to new students in the upcoming academic year will expand the feedback dataset and provide insights across a broader, more diverse user base. This increased participation will strengthen the evidence for the platform's educational impact.

3

Present at conference and submit publication

Delivering a talk at the 7th International Workshop on Artificial Intelligence and Education (WAIE) will increase knowledge sharing and invite expert critique. Preparing a manuscript will document project findings and contribute to the literature on VR and AI in education.

4

Integrate VR platform into course curricula

We aim to embed the VR technology into the BSc pharmacy criteria. In the next year, this will generally by for practice and summative purposes. However, in the following academic year this could be used as a 50% replacement for consultation skills structured learning events on the BSc course. In the mid-to-longer term future, integration into the MPharm course could also be possible.

5

Work towards achieving a full-scale solution

We aim to actively seek further funding opportunities and establish new collaborations to support the development of a comprehensive suite of simulation scenarios. Our long-term vision is to expand beyond the initial focus on consultation skills, broadening the scope of the project to support learning in a wider range of clinical environments, including general practice and hospital settings. By doing so, we hope to enhance the versatility

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Appendix 1

Expenditure Summary

Category	Amount (£)
Software development, avatar animation and AI integration	33,820
Scenario Development	1,800
E-vouchers	120
Physical vouchers	200
Admin support	1,912
Dissemination of work in conference	1,177
iPad for interview recording	771.60
Total Expenditure	39,800.60