Interactive fiction and learning from failure in distance learning postgraduate clinical pharmacy education

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Abstract

Formal postgraduate clinical pharmacy education is relatively common but underexplored in the literature, particularly in clinical decision-making and learning from errors – a source of anxiety and stress for pharmacists. Research shows interactive fiction (IF) has been beneficial to help undergraduate pharmacy students learn from their errors and gain confidence in their decision-making whilst developing their clinical knowledge. Its use at the postgraduate level however remains unexplored.

This study explores how postgraduate distance-learning (DL) pharmacy students engage with IF as a pedagogical tool to learn from failure within their academic studies, as well as on the impact on their usual professional practice. Using Green and Jenkins' (2014) conceptual model of interactivity effects in interactive fiction, this research investigates how students' dual identities as learners and professionals shape their interactions with IF for their own academic and professional development.

Anonymous online questionnaires and semi-structured interviews were used to gather quantitative and qualitative data in this mixed methods study. Participants were required to play through an IF story simulating a clinical scenario, making both sound and unsound choices in multiple playthroughs to explore the impact of error and failure. Findings suggest IF may be an enjoyable way to enhance clinical decision-making, knowledge retention, learning engagement, and confidence. Unlike undergraduate studies on IF, participants were able to draw on real world experiences and connections to practice which appears to have increased learning impact.

Participants found the IF valuable overall, and noted that it encouraged reflection and changes in processes for some participants. Emotional responses to poor decisions did not reduce engagement but appeared to facilitate deeper reflection. This may have implications for long-term knowledge

retention and enhanced decision-making. Whilst some found the IF time-consuming, all participants stated they would welcome more IF within their course, particularly in complex case discussions, ethical decision-making, and for experiencing other clinical specialties and pharmacy sectors.

This research highlights IF's potential use as an educational tool for PG pharmacists, particularly in learning from failure, the development of clinical decision-making skills and simply as a tool to foster engagement. It also contributes to the literature on interactive fiction, postgraduate pharmacy education and on the use of Green and Jenkins' conceptual framework within formal educational contexts. Limitations include a low response rate and a resultant small participant pool, all from one academic institution. Areas for future research include further applications in other healthcare professions, inter- and multi-disciplinary use, in longitudinal knowledge retention, and the use of IF in other subjects within the same context. Furthermore, comparisons of UG and PG engagement may reveal further insights into pharmacy education at both levels.

Table of Contents

Abstract i

List of Figures and Tables vi

Glossary and List of abbreviations vii

Acknowledgements ix

Chapter 1: Introduction and Background 11

1.1 Personal Context 11
1.2 The Decision to Investigate IF as a Learning Tool 12
1.3 Pharmacists as Risk Averse Professionals 14
1.4 Learning from Failure 15
1.5 Decision-Making 17
1.6 Reflection 17
1.7 PG Pharmacy Education 18
1.8 Undergraduate Vs Postgraduate Research 19
1.9 Navigating Professional and Academic Identities 21
1.10 Research Aims and Questions 21
1.11 Research Design 22
1.12 Results and Contribution to Knowledge 23
1.13 Thesis Overview 23

Chapter 2: Literature Review 25

2.1 Literature Search Strategies 26
2.2 Simulation in Healthcare Education 27
2.3 Interactive Fiction (IF) 28
2.3.1 IF Within Non-Healthcare Education 28
2.3.2 IF Within Non-Pharmacy Healthcare Education 31
2.3.3 IF Within Pharmacy Education 32
2.4 Reflection 35
2.4.1 Reflection Within Pharmacy Practice 35
2.4.2 Reflection and Learning from Failure or Errors in Professional Practice 36
2.5 Learning from Failure in PG Education 37
2.6 Pharmacist Clinical Decision-Making 39
2.7 Pharmacy Distance Learning/Postgraduate Pharmacy Education 42
2.8 Professional and Student Identities 43
2.9 Gaps in the Literature and Contribution to Knowledge 46

Chapter 3: Conceptual Framework 48

3.1 Model Overview 48
3.2 Applications in this Study 50
3.3 Previous Applications 51
3.4 Interactivity 54
3.5 Descriptions of the Framework Headings and Subheadings 55
3.6 The Framework as Applied to "Lady And Gent" 58
3.7 Twine 59
3.8 Summary 60

Chapter 4: Research Design 62

4.1 Research Philosophy 62
4.1.1 Pragmatism 63
4.2 The Rationale for Mixed Methods 64

4.2.1 Establishing the Trustworthiness of Qualitative Data 65
4.3 Positionality and Insider Research 68
4.4 Research Context, Site, and Participants 70
4.4.1 UK Higher Education (HE) Structure 70
4.4.2 QUB and the School Of Pharmacy PG DL Provision 70
4.4.3 Timing of the Research 71
4.4.4 The Pharmacy Distance Learning (DL) Hub 71
4.4.5 Creating and Distributing the IF 72
4.5 Data Collection Tools 74
4.5.1 Questionnaires 74
4.5.2 Semi-Structured Interviews 75
4.6 Data Analysis 78
4.6.1 Quantitative Analysis 78
4.6.2 Qualitative Analysis 81
4.7 Ethical Considerations 83
4.8 Summary 84

Chapter 5: Interactive Fiction and Academic Learning: Findings and Discussion 86
5.1 Participants 87
5.2 Overview of the Quantitative Data 88
5.2.1 Learning from Failure 91
5.3 How Pharmacy PG DL Students Engaged with IF as a Pedagogical Tool 91
5.3.1 User Control 93
5.3.2 Narrative Structure 94
5.3.3 Moderator: Individual Differences 97
5.3.4 Role of the Self 101
5.3.5 Outcomes 104
5.4 Non-Framework Elements 106
5.4.1 Providing Structure for Self-Evaluation of Learning 107
5.4.2 As Formal Assessment 107
5.4.3 Group Work and Development of Community 108
5.5 Summary 110

Chapter 6: Interactive Fiction and Professional Practice: Findings and Discussion 112
6.1 Quantitative Responses to the Questionnaire 112
6.1.1 Reflection and How It Can Affect Clinical Practice 114
6.1.2 Decision-Making Abilities 114
6.2 IF as a Learning Tool for Professional Practice 116
6.2.1 Moderator: Individual Differences 116
6.2.2 Engagement Variables 120
6.2.3 Role of the Self 121
6.2.4 Outcomes 124
6.3 Summary 137

Chapter 7: The Reciprocal Influence of Professional Practice and Academic Study: Findings and Discussion 139
7.1 The Influence of Practice on Academic Learning 139
7.1.1 User Control 140
7.1.2 Narrative Structure 142
7.1.3 Moderator: Individual Differences 145
7.1.4 Engagement Variables 150
7.1.5 Role of the Self 153
7.1.6 Outcomes 159

7.2 Summary **164**

Chapter 8: Conclusions, limitations and recommendations for further research **166**

8.1 Research Summary **166**

8.2 Answering the Research Questions **167**

8.2.1 RQ1. How Do PG Pharmacy DL Students Engage with IF As a Pedagogical Tool? 167

8.2.2 RQ2. In What Ways Do PG Pharmacy DL Students Feel Their Experiences Through IF Could Be Useful for Their Clinical Practice? 171

8.3 Perspectives on the Use Of Green and Jenkins' (2014) Model of Interactivity Effects in This Study **174**

8.4 Limitations **177**

8.5 Contributions to Knowledge and Further Work **179**

8.6 Final Points **180**

References **183**

Bibliography **216**

Appendix One – Demographic Data **217**

Appendix Two – Questionnaire and Interview questions **225**

Appendix Three – Interactive Fiction Design and Story **229**

Appendix Four –Participant information sheets and informed consent forms **262**

Appendix Five - Ethics Approval **273**

Appendix Six – Statistical Analysis **282**

Appendix Seven –Results Summary Tables **288**

List of Figures and Tables

Figures

Figure 2.1 Example pathway through an IF. From “Using Interactive Fiction to Teach Clinical Decision-Making in a PharmD Curriculum” by Morningstar-Kywi, N. & Kim, R.E. (2021). Medical Science Educator. 31, p.690.

Figure 3.1 Green and Jenkins Model of Interactivity Effects in Interactive Fiction. From “Interactive Narratives: Processes and Outcomes in User-Directed Stories”, by M.C. Green, M. Jenkins, 2014, Journal of Communication, 64(2014), p.480. doi:10.1111/jcom.12093.

Figure 4.1 Screen shot of the invitation to participate from Canvas

Figure 4.2 The final panel of "Lady and Gent" that directs students back to the questionnaire, or to the start of the story if they need or want to complete it again

Figure 4.3 SPSS variable view screenshot displaying numerical values assigned to Likert- scale responses.

Figure 4.4 SPSS Data View screenshot demonstrating the organisation of individual participants' data.

Figure 4.5 Example of the data coding as shown in NVIVO 14

Figure 0-1: My first post on the Lancaster University Moodle forum at the start of my PhD.

Tables:

Table 3.1 Summary of framework applications in the literature

Table 5.1 Descriptions of interview participants

Table 5.2 Overall, how valuable do you think learning through IF could be for your postgraduate pharmacy distance learning experience?

Table 5.3 Responses to Questions Relating to Participants as Learners

Table 6.1 Responses to the Questions Relating to Participants as Professionals

Table 8.1 A representation of how the findings address the research questions, organised by framework headings

Glossary and List of abbreviations

Abbreviation	Expanded term
A&E	Accident and Emergency Department
ACPP	Advanced Clinical Pharmacy Practice
AKI	Acute Kidney Injury
APP	Advanced Pharmacy Practice
CPD	Continuing Professional Development
CQC	China Queen's Campus
Creatinine (Cr)	A waste product filtered by the kidneys for excretion. Used to monitor how well a patient's kidneys are functioning
CYOA	Choose-Your-Own-Adventure
DHSS	Department of Health and Social Services
DL	Distance Learning
DOH	Department of Health
DPharm	Doctor of Pharmacy degree
ED	Emergency Department
FTY	Foundation training year
FY1/F1	Foundation Year 1 Doctor
Gent	Gentamicin
GPhC	General Pharmaceutical Council
IF	Interactive Fiction
IP	Independent Prescribing
IV	Intravenous
labs	Clinical laboratory results. Used for monitoring patient's medical condition and drug levels where required and ofer referred to as 'bloods'.
MedRec	Medicines Reconciliation
MPharm	Master of Pharmacy degree
MSc	Master of Science
NACS	N-acetylcysteine infusion [used for paracetamol overdose in an acute hospital setting]
NHS	National Health Service
NI	Northern Ireland
NICPLD	Northern Ireland Centre for Pharmacy Learning and Development
OSCE	Objective Structured Clinical Examination
PG	Postgraduate
PGR	Postgraduate Research
PGT	Postgraduate Taught
PIP	Pharmacist Independent Prescribing
PSNI	Pharmaceutical Society of Northern Ireland
QUB	Queen's University, Belfast
RPS	Royal Pharmaceutical Society
UG	Undergraduate

Vanc	Vancomycin
VLE	Virtual Learning Environment

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Author's declaration: I declare that this thesis is my own original work and has not been submitted for the award of a higher degree at this institution or elsewhere.

I confirm that the wordcount of this thesis is 48,590 and conforms to the permitted maximum of 50,000 words.

Chapter 1: Introduction and Background

In this research I explore the use of interactive fiction (IF) as a pedagogical tool for learning from failure, and to improve clinical decision-making skills through reflective practice in postgraduate (PG) pharmacists studying on distance learning (DL) courses at Queen's University, Belfast (QUB). This research was born from the desire to add interactivity and interest to a clinical pharmacy DL programme that also allowed students to explore their errors in a safe and enjoyable way.

In this introductory chapter I first explain why I chose this topic, describing my own background and experiences as both a pharmacist, a PG educator and a PG DL student, both past and present (1.1). I then describe how this led to the consideration of IF as a tool for learning through failure (1.2) and a brief discussion of risk aversion in pharmacy practice (1.3). This leads into mechanisms of learning from failure (1.4), decision-making (1.5) and reflection within pharmacy practice (1.6). The place of PG pharmacy education (1.7) and the educational research conducted at PG and undergraduate (UG) levels (1.8) as well as the difficulties in navigating and balancing studies as both pharmacists and students follow (1.9). Finally, I state the research questions (RQs) that drive this study (1.10), as well as a brief overview of the study design (1.11) and contributions this research makes to existing knowledge (1.12) before providing an overview of the thesis (1.13).

1.1 Personal Context

Although I am now a programme lead for pharmacy DL courses at QUB and bear the title of lecturer, I still see myself as a pharmacist, having practised in that capacity for longer than I have been working in higher education (HE). I understand what it is like to make a mistake in a patient's care, an error in judgement, or to fall foul of a busy day. I also understand the difficulties of balancing sound clinical decision-making with the fear of error. Like my own students, I also completed my PG Diploma in Clinical Pharmacy in 2009 and a PG certificate in independent prescribing (IP) in 2012 via DL. Learning materials and assignments were exchanged by post however, rather than through a Virtual Learning Environment (VLE). My interactions were

primarily confined to those with colleagues in my workplace who were also enrolled, rarely interacting with other students.

As QUB's courses went online, student demand for interactive and engaging course content rose. However tutors, who are often employed as ad-hoc clinical specialists rather than trained educators, still often rely on more traditional, didactic methods due to time and resource constraints. Student questions and comments also overwhelmingly focus on achieving the highest possible assignment mark rather than real-world knowledge application. Even within their studies pharmacists appear to be risk averse, suggesting a high fear of failure (Wright et al., 2019). It was necessary then to incorporate effective ways of applying their learning and making mistakes to a patient case in a safe environment. This could eliminate the fear of judgement from peers, and avoid focusing on minor grading discrepancies, such as haggling over a few marks for not mentioning a drug dose in an assignment. I hoped that by incorporating a mechanism that reflected their offline work environment the course would be an enhancement to their professional lives, allowing them to focus on becoming confident clinicians, rather than perfect students.

Much like the enrolled students who balance the dual roles of student and pharmacist, I approach this research wearing two hats: one as an academic and the other as a registered pharmacist.

1.2 The Decision to Investigate IF as a Learning Tool

IF may also be referred to as choose-your-own-adventure (CYOA), branched narratives, and hypertext fiction: a style of gamebook wherein the reader takes on the role of the protagonist, making choices and dealing with the consequences as they progress to either a happy ending, dire consequences, and everything in between, depending on the steps taken (Pope, 2010). Although IF started as a text-based game in the 1970s (Morningstar-Kywi & Kim, 2021) it has expanded into other media including videogames (e.g. "*The Oregon Trail*" (Rawitsch, et al., 1971)) and television (e.g. "*Black Mirror: Bandersnatch*" (McClean, 2018)). Green and Jenkins (2014) more specifically define IF as "a story in which the reader has opportunities to decide the direction of the narrative, often at a key plot point" (p.481).

The idea for using IF as a learning tool was formed over various stages of reflection rather than a "lightbulb" moment. Initial ideas were seeded by a discussion about "*The Oregon Trail*" (Rawitsch et al., 1971) where I recalled my frequent (intentional) failure to safely deliver my charges to Oregon, instead making memorably poor decisions resulting in death by dysentery, drowning or snakebite. A subsequent simulation-design workshop reminded me of the impact of learning from critical incidents as I described a real-life instance where a clinician dismissed my recommendations. Had I not confronted my discomfort and escalated the situation this would have resulted in the patient's death.

Reflecting on my PG DL courses and how I could replicate this impact safely and ethically I surmised that IF could offer a solution. By providing immersive and impactful scenarios, PG pharmacy students could safely, affordably, and accessibly explore complex grey areas and refine their clinical decision-making skills whilst making as many errors as they liked, free from observation or judgement. Acting on my hunch, searches revealed that other researchers had used IF educationally in a number of areas (see Chapter 2), though sparsely in healthcare education (especially pharmacy), and not at all at PG level (Wettergreen et al., 2024).

Although primarily conducted with UG students, these studies demonstrate that IF enhanced learning engagement and improved student learning outcomes (Morningstar-Kywi & Kim, 2021). Gamification boosts learner engagement in medical and pharmacy education (Bartel, 2014; Hope et al., 2021) and beyond (in student career planning (Frank et al., 2021, for example), while simulation is a well-established teaching method in healthcare disciplines. However, simulation creation can be costly in time, money, and data requirements, and simulations often need technical maintenance and software updates (Benedict & Schonder, 2011). Additionally, for my own international DL students, internet access has occasionally been limited due to poor infrastructure or conflict (the military coup in Sudan and the outbreak of war in Palestine in 2023, as two examples) which could render these kinds of resources unusable for some, reducing equity in learning.

IF however, can be created and distributed through free resources that require minimal user-instruction (e.g., Twine, detailed in Chapter 4) to create what are essentially websites that do not require additional software (Benedict & Schonder, 2011). IF provides academic and real-world, data-friendly learning (e.g. “Lady and Gent” is only 552 kilobytes and can be made downloadable for offline use) that has shown potential in allowing UGs to explore decision-making safely, where the impact of their actions is free from the risk of patient harm.

The reality for healthcare professionals (HCPs) is that mistakes happen and those involved suffer the “worry, guilt, anxiety, self-doubt, blame, and depression following serious errors, both for themselves (for disciplinary actions) and for the patient who has been harmed” (Rogers et al., 2017. p.308-9). As decisions parallel those which the players make in real life, IF functions as a form of simulation, providing a practice environment that includes authentic interactions. This “may impart a sense of responsibility to a patient’s care and stimulate interest or enthusiasm for the subject matter” (Benedict & Schonder, 2011, p.1). Additionally, “the relation between participants’ CYOA decisions and real-world behavior has been consistently demonstrated. The diversity of topics in which CYOA has been successfully applied, and its utility in shaping real-world decisions, offers evidence to its apparent cross-disciplinary utility as a research tool” (Frazier & Gonzales, 2021, p.4).

Crucially, IF may also provide some of the interactivity that my own students desire as this is at the heart of the experience. As the player actively shapes the narrative’s progression and outcomes by making decisions and experiencing the consequences they move from being a passive reader to an active participant (Miller, 2014). The non-linear structure enhances immersion, agency, and emotional connection with characters, magnifying the significance of player choices to provide greater impact. Unlike traditional narratives (including clinical case studies), players can replay the IF to uncover new clues, explore alternative pathways, and engage with ideas they may not have previously considered. This dynamic encourages reflection and deepens the interactive experience (Green & Jenkins, 2014).

1.3 Pharmacists as Risk Averse Professionals

The literature notes what pharmacists themselves will usually admit: we are generally risk averse HCPs who struggle with ambiguity in clinical practice (Cox, 2020; Mantzourani et al., 2022). Indeed, “pharmacists view themselves as more risk averse…than their medical colleagues” (Kallis & Allinson, 2023, p.1176) and “the thought of making an error is a major stress for pharmacists and trainees” (Ferguson, 2015, p.4).

There are many possible reasons why pharmacists avoid risk. We usually mark the endpoint of a consultation, for example, dispensing medication prescribed by medics who often consider us their failsafe, though we have no such backup (Ferguson, 2015). Our medicines expertise makes us particularly aware of the risks of even small dosage errors, never mind dispensing the wrong medication (PJ, 2018). Until 2018, criminal prosecution was a potential outcome for dispensing errors (Lewis, 2017; PJ, 2018). Even clinical decision-making processes are relatively new to pharmacists, as usually we provide the advice that is acted on rather than autonomously deciding ourselves (Wright et al., 2019).

This perhaps speaks to why pharmacy education is detail orientated, critical, and highly adherent to guidance, reinforcing this cautious culture (Nohria & McBane, 2022). Practice-oriented teaching is usually delivered by registered pharmacists (academic and clinical) who understand these risks, but who have also been shown to have an internalised fear of failure even within education (Nohria & McBane, 2022). Reflective processes (see 1.6) also encourage pharmacists to consider all aspects of their practice, perhaps prompting them to be overly cautious.

All this could point to some of the reasons why failure as a learning mechanism hasn’t been explored to date, but also emphasises exactly why it *should* be, and how we can facilitate this within higher education courses.

1.4 Learning from Failure

Whilst there are many different types of error and failure, within the context of this study the literature suggests three main methods: deliberate (Wong & Lim, 2022), unintentional (e.g. choosing the wrong answer in the belief that it is correct) (Fazio & Marsh, 2009), or semi-intentional error (e.g. guesswork) (Potts et al., 2014).

IF can account for each of these, as players choose an answer that they think (or know) is right and see the consequences. Alternatively, they may intentionally choose the incorrect to uncover insights, test limits, or explore innovative approaches. In education, deliberate failure by design is particularly valuable as it encourages learners to confront personal or professional challenges and to learn from their mistakes without the high-stakes consequences associated with real-world failure (Benedict et al., 2014). Additionally, players can learn to navigate the ambiguity in complex and unpredictable situations: an area where pharmacists have been shown to be unconfident and manage poorly in clinical practice (Mantzourani et al., 2022). Deliberately erring may also lead to increased knowledge retention and better recall than providing the correct answers (Wong & Lim, 2022).

For PG pharmacists, academic failure can cause significant anxiety as errors in assessments may be considered reflective of real-life patient care risks and be heavily penalised (O'Byrne et al., 2023). IP courses, for example, are required by the regulatory bodies (the General Pharmaceutical Council (GPhC) and the Pharmaceutical Society of Northern Ireland (PSNI)) to include what are colloquially known as "red flag" fails: any action performed by the student that would be likely to cause serious patient harm if carried out in practice. These fails may result in students being withdrawn from the course entirely, regardless of their academic performance (GPhC, 2019).

Research into the lessons that can be learned from failures is extensive and not limited to healthcare, as discussed further in Chapter 2. Many sectors where failures can have catastrophic consequences invest heavily in root cause analyses and developing mechanisms to prevent future occurrences (Kapur et al., 2015; Kim & Lee, 2020; Powell-Dunford et al., 2017). Despite extensive evidence that individuals – not just students – learn effectively from both their own and others' failures (Bledlow et al., 2017; Eskreis-Winkler & Fishbach, 2019; Wong & Lim, 2022), there is limited empirical research on academic learning from failure at the PG level within healthcare. In pharmacy, it appears to be notably absent (as detailed in Chapter 2.5). A recent commentary by Smith et al. (2024) also recognises that research in this

area is lacking, and that pharmacists must learn to become comfortable with mistake and error as an “unavoidable part of patient care” (p.420).

This research therefore aims to work towards finding a practical solution to a consistent issue that has proven difficult to resolve, in addition to creating competent clinical pharmacists.

1.5 Decision-Making

In practice, pharmacists “must perform sound clinical reasoning and solve therapeutic problems in high stakes environments” (Morningstar-Kywi & Kim, 2021, p.687). These decisions involve a complicated array of processes involving formally acquired knowledge and skills alongside professional and personal experiences (including error) and pattern recognition (Charrois & Sewell, 2023; Croft et al., 2017; Wright et al., 2019).

Pharmacists also report a disconnect between what they learn as UGs and the realities of professional life, and consider decision-making skills to be poorly taught at the UG level (Nusair et al., 2018). Though pharmacist clinical decision-making has seen increasing interest, it has been investigated primarily at the post-registration level and remains underexplored (Chapter 2.6). Indeed, existing research “does not assess the impact of educational techniques on knowledge and confidence with clinical decision making” (Kiles, et al., 2021, p.2). There seems to be an expectation and assumption that these skills are learned from more experienced colleagues through real-life practice. However, for pharmacists working alone in a community pharmacy for example, there may actually be no one there to learn from, causing stress and anxiety (Harrison et al., 2018).

1.6 Reflection

Pharmacists are encouraged to critically reflect on their own knowledge, skills and experiences to identify areas where they can develop to improve patient care and outcomes (Black & Plowright, 2007; Mantzourani et al., 2022). Reflection as a learning tool is now well integrated into UG teaching and remains a key component

of pharmacy practice, sometimes required for annual re-registration processes (Black & Plowright, 2007).

Whilst in practice, much of this reflection is conducted as part of the job: when investigating new drugs, new indications for existing drugs or updated guidelines as only three such examples. Reflection may also occur with errors or near-misses, including those of others or those in which they have identified. Notably, pharmacists who engaged in meaningful reflection showed improved critical thinking and decision-making skills (Mantzourani et al., 2019).

1.7 PG Pharmacy Education

Typically, pharmacy education does not stop at the point of professional registration[1], and pharmacists increasingly require academic PG qualifications for career progression and to take on emerging and advanced roles (FIP, 2015; Koudmani et al., 2024; Pharmacist Support, n.d.).

Within the UK, a rapidly evolving landscape has driven demand for PG courses – both university- and practice-based – as those currently practicing seek to upskill in response to extensive changes to UG courses. For example, from 2026, foundation training year (FTY) trainees will qualify as prescribers at the point of registration, increasing demand for these courses from those already qualified. Practice-based portfolios for advanced practitioner (AP) credentialing require self-directed learning to complete and submit for assessment (RPS, 2024). Pharmacists must also demonstrate they have maintained competency through reflective practice and revalidation to maintain their registration.

And that is only within the UK. Pharmacists in New Zealand, Australia, the United States and Canada have prescribing rights, for example, but most European countries do not (Kempen et al., 2024). A comment from a student highlights the differences:

[1] Pharmacists typically complete a primary pharmacy degree followed by 12 months of foundation training and a final registration exam before they can join the professional register and practice autonomously

> *"I live and work in Cambodia, where Clinical Pharmacy does not exist, it is not always possible to apply what I am learning, I do not have any senior pharmacist with some expertise in clinical pharmacy to learn from and to share thoughts on what I am learning…being alone in a country where there is no one else practising clinical pharmacy to interact with, makes my learning process more difficult and slow".*

Meeting the needs of all students can therefore be challenging. The development of essential skills such as medicines optimisation and clinical decision-making (for example) must therefore nestle beside advancement in clinical knowledge to meet the diverse needs of students and healthcare systems (Smith et al., 2024).

Existing literature often stresses that "curricula need to develop student pharmacists who are able to apply clinical knowledge, thereby making effective decisions about patient care during pharmacy practice experiences and after graduation" (Osae et al., 2022, p. 790). The emphasis on "after graduation" suggests that this teaching is considered a UG experience. However, for many of QUB's pharmacy DL students the opportunity to learn, practice and hone their skills is a PG university-bound experience.

1.8 Undergraduate Vs Postgraduate Research

As noted by Angell et al. (2008): "whilst undergraduates have received substantial academic exposure, postgraduate-based research has been scant" (p.236). This contrast in quantity and variety also extends to pharmacy educational research, where UG again dominates (see Chapter 2: Literature review).

The disparity may stem from the large number of UG students worldwide, especially in comparison to PG taught or research courses (House of Commons Library, 2024). making them a readily available resource for educational research. This includes pharmacy master's projects[2] which are usually aligned with staff interests and

[2] UG students in the UK study for the MPharm (Master of Pharmacy) rather than a bachelors degree and must produce a piece of masters level research.

publishable outcomes. Additionally, pharmacy faculties are driven to conduct research to demonstrate they meet accreditation standards, which provide a framework for demonstrating competencies (House of Commons Library, 2024; Micallef & Kayyali, 2020).

At the PG level however, the focus shifts to more practice-based learning (e.g. residency programmes in the US and Australia, or the UK Foundation Programme) that align more with work-based competency assessments (AACP, 2024). Other research into wellbeing (O'Byrne et al., 2023) and student support (Hallett, 2010) offer valuable insights into student experiences but do not address the effectiveness of the learning itself.

Research volume and pedagogical diversity also appears to decline significantly from UG to PG level, where students are presumed competent after their primary degree (Coneyworth et al., 2019). UG research takes pains to point out "the importance of graduating pharmacy students with competence in providing independent, patient-centered, evidence-based pharmaceutical care… by promoting active-learning strategies to develop critical-thinking and problem-solving skills" (Benedict, 2010, p.1). Yet literature often fails to address that at UG level this learning can feel unreal or abstract (Mertens et al., 2024) especially as UGs may be new to experiential learning[3] and unfamiliar with the complexities of real patient care. This often leads to uncertainty and stress when they finally register and are practicing autonomously (Allinson et al, 2022).

At the core of all of this on the PG DL courses are the pharmacists themselves, who must navigate the rapidly changing landscape of pharmacy practice and, with the COVID-19 pandemic, exceptionally challenging clinical environments. They are required to not only maintain their level of professional practice but to add studying on top, renegotiating their time, knowledge, personal, and working relationships to encompass their new role as a student.

[3] Experiential learning typically involves multi-week placements in hospital, community, or primary care settings, under the direct supervision of one or more experienced pharmacists who assess students as they perform tasks expected of registered professionals. At QUB these were widely adopted in the 2024/25 academic year.

1.9 Navigating Professional and Academic Identities

Pharmacy PG DL students at QUB must be registered pharmacists who are working in practice to enrol and study on the course, and the need to balance professional and academic work with personal lives has been shown to take its toll on pharmacists' wellbeing (O'Byrne et al., 2023). Research also shows that autonomous HCPs frequently struggle with being labelled as 'students' once again, and grapple with this change in perception from others when they return to full-time study (Hughes-Morris & Roberts, 2017). How part-time learners wrestle both identities has been researched very little, and seemingly not within the healthcare professions.

Whilst similar professional courses may provide students with protected study time, students on the pharmacy PG DL QUB courses have reported that they are not afforded this luxury. The expectation is that they will complete their courses outside of working hours in their personal time. As shown in the demographics for my own courses (Appendix One), students are from a variety of sectors, backgrounds and geographical areas with differing educational and work experiences, and personal lives, all of which impact on their study habits and abilities (Harrison et al., 2018). Regardless of previous experience or knowledge, all pharmacy DL students must complete the same assessments, and students move from being experts who provide guidance and potentially life-saving advice to being given feedback in an area in which they may already have expertise.

1.10 Research Aims and Questions

The aim of this study is to investigate the use of IF within a PG pharmacy DL course at QUB, how it can be used to learn from failure pedagogically, and to prompt reflection to develop pharmacists' decision-making skills in practice. This serves as a pragmatic attempt to both help pharmacists become more comfortable with failure and to promote deeper learning through self-reflection to improve patient care in practice.

To achieve this aim, I address two research questions that acknowledge the situation of pharmacists as both PG learners and as clinical practitioners.

RQ1. How do PG pharmacy DL students engage with IF as a pedagogical tool?

a) What do they consider to be the benefits or advantages in its use?
b) What do they consider to be the drawbacks or disadvantages in its use?
c) What changes would students recommend to increase its value to their studies?

RQ2. In what ways do PG pharmacy DL students feel their experiences through IF could be useful for their clinical practice?

a) In what ways do they feel their decision-making abilities are affected?
b) In what ways do students reflect on their usual practice whilst using the IF?
c) How do they feel this reflection can affect their clinical practice?

1.11 Research Design

This mixed methods study has been carried out through the lens of Green and Jenkins 2014 Conceptual Model of Interactivity Effects. Designed specifically for IF-based entertainment education research, this model has seen limited prior use but provides the framework for this study from conception to completion, as discussed in Chapter 3.

Within pharmacy research quantitative data - such as improved exam scores (Lichvar et al., 2016) - is often used to demonstrate *if* students are learning. However, in this research I aim to also discover *how* these students learn. Taking a pragmatic stance, I employed a complementary mixed-methods study design to not only answer the RQs but to identify future areas of research. Anonymous questionnaires primarily comprising of Likert scales and open-response questions were initially distributed in conjunction with the IF. This data was briefly analysed before participant interviews took place to identify any gaps that could be addressed, ensuring the RQs were adequately answered.

Data from both the questionnaires and semi-structured interviews were analysed using the framework headings and considers the participants as students (Chapter

5), professionals (Chapter 6), and in their dual roles (Chapter 7). As non-framework related elements (e.g. timed decision-making) also emerged from the analysis these have also been addressed in Chapter 5.

1.12 Results and Contribution to Knowledge

This research contributes to the existing knowledge and literature in four main areas: PG pharmacy education, the use of IF as an educational tool, learning from failure in healthcare education, and on the impact of professional experience on academic learning and decision-making with PG pharmacists.

Recommendations from this research include improving and implementing IF in online DL PG pharmacy courses, with potential applications for other healthcare professionals to support learning from failure. Emphasising the dual identities of students and professionals could enhance the learning experience. Further research could explore the impact of IF on longitudinal knowledge retention, decision-making, its effectiveness as an assessment tool, and the differences between UG and PG learning. Additionally, IF presents opportunities for multidisciplinary and interdisciplinary research.

1.13 Thesis Overview

Chapter 1: Introduction and Background. This current chapter described the background and context for this study, my motivations to investigate this topic and the questions driving this research.

Chapter 2: Literature review. The literature review attempts to place this research within the wider context of PG pharmacy education and practice, learning from failure, gamification in healthcare education, and identifies where this research contributes to knowledge.

Chapter 3: Conceptual Framework. In this chapter I describe and discuss the conceptual framework that informs this research, previous applications, and how it shapes this study.

Chapter 4: Research design. This chapter describes my philosophical position as a researcher, the study population, the mixed-methods design, data analysis methods, and ethical considerations for this study.

Chapter 5: Interactive Fiction and Academic Learning: Findings and discussion. In this chapter the findings from both the questionnaire and the interviews are presented and discussed using the conceptual framework and in context of the existing literature in relation to academic learning.

Chapter 6: Interactive Fiction and Professional Practice: Findings and discussion. Similarly to Chapter 5, this chapter presents and discusses the findings from questionnaires and interviews in context of the existing literature in relation to pharmacy professional practice.

Chapter 7: The Reciprocal Influence of Professional Practice and Academic Study: Findings and discussion. This final findings chapter presents and discusses how participants' identities as both student and professionals affected their experiences with IF.

Chapter 8: Conclusions, Limitations, and Recommendations for Further Research. The final chapter brings the thesis together to provide a summary, acknowledging any further research areas, gaps in this research, and limitations.

Chapter 2: Literature Review

This study seeks to answer two main research questions:

- How do PG pharmacy DL students engage with IF when used as a pedagogical tool?
- In what ways do PG pharmacy DL students feel their experiences through IF could be useful for their clinical practice, including clinical decision-making?

In this chapter, I review the existing literature that informs this research and highlight the gaps I aim to address. Specifically, I focus on gaps related to PG pharmacy education, the use of IF as a learning tool, learning from errors, and clinical decision-making. Moreover, whilst there is significant research on reflective practice in pharmacy, I identified relatively little on pharmacists' reflection on their own errors. The challenges PG pharmacists encounter in balancing part-time study with working in practice, as well as managing the tension between being both learners and experienced practitioners, are not also well researched or understood. However, these factors seem to influence the impact of learning at the PG level.

Given the breadth of topics and extensive literature that contribute to this study, this review, though comprehensive, is not exhaustive: nor could it be (Bergdahl, 2022; Greetham, 2020). Instead, I concentrate on the most relevant discussions and contributions to this thesis, highlighting key themes and conversations related to the research (Bergdahl, 2022; Greetham, 2020).

This chapter begins with a description of my approach to literature searches (2.1). I explore the literature on simulation (2.2): a widely used pedagogical tool in healthcare education that closely aligns with IF (2.3). I then move to review the literature relating to professional practice beginning with reflection (2.4), learning from error (2.5), and clinical decision-making (2.6). I then address PG pharmacy education (2.7) and consider how impactful learning is affected by both 'student' and 'pharmacist' identities in this group (2.8). I conclude by outlining the contribution this thesis makes to existing knowledge (2.9).

2.1 Literature Search Strategies

Initial searches were carried out using Scopus and PubMed to identify relevant literature on the use of IF within pharmacy education. These were complemented by the use of both QUB and Lancaster University's library search engines (OneSearch), bypassing some accessibility issues resulting from differing institutional subscriptions. This strategy also identified valuable grey literature (conference proceedings and theses, such as Faidi's 2021 research on PG part-time study, for example) in areas where I could find little published literature (Irvine, 2022). Initial search terms focused on "interactive fiction", "pharmacist postgraduate", "learning from failure" and a number of combinations and variations (e.g "pharmacist learning from error") to maximise results.

Using two large databases for initial searches conferred benefits as well as drawbacks. Firstly, specialised databases may give results focusing on specific disciplines. They require different search strategies that may give differing results even within the same database (Irvine, 2022) and, in the case of PubMed, provide additional content (e.g. articles published online ahead of print) (UCL, 2024). The combination of Scopus (which focuses more on social sciences) and PubMed (which additionally focuses on healthcare) provides access to a large number of up-to-date resources from various publishers and can be filtered by keyword or provide abstracts (Ferderikson & Phelps, 2017; Irvine, 2022).

I also employed citation chaining from existing papers to identify further literature and key search terms (Irvine, 2022). This proved useful in, for example, identifying further literature on pharmacist self-reflection on error that was lost amid studies on how pharmacists reduce error. However, as even the choice of keywords can vary between authors and disciplines even multiple databases may not capture all relevant information (Frederikson & Phelps, 2017; Irvine, 2022).

Whilst mostly beneficial, this approach also had some drawbacks. Using both institutions resulted in an overwhelming volume of overlapping results, requiring substantial filtering and the use of a 'berry picking' strategy (Irvine, 2022). Databases also have a tendency towards English language publications, and some publications

remained inaccessible, even with interlibrary requests (Frederikson & Phelps, 2017, Irvine, 2022).

2.2 Simulation in Healthcare Education

Simulation is the most utilised serious game[4] in clinical education (McKenna, 2021a). Given the overlap between IF and simulation it would be remiss to ignore the research on simulations in this thesis.

Simulation itself is not new in healthcare education and has been frequently and effectively used to reproduce patient scenarios in safe environments. Simulations are used for teaching and assessment across related disciplines (particularly in nursing and medicine) at both UG and PG level (e.g. Anderson et al., 2021; Frederick & Reed, 2021; Koivisto et al., 2017). Simulations particularly "promote clinical reasoning and decision-making skills and apply theoretical knowledge in a safe environment" (Bernaitis et al., 2018, p.731). Within pharmacy the applications of simulation are broad and include dispensing (Ambroziak et al., 2018), interprofessional training (Cropp et al., 2018; Kayyali et al., 2019), pharmaceutical technology use (Garnier et al., 2021), change management (Guérin et al., 2015) and medication-specific simulations such as anticoagulant dose adjustment (Al-Sallami & Loke, 2018).

Clinical simulations are usually delivered in-person, alongside other students, and in a classroom even when the "patient" is virtual (Beshir et al., 2022; Guérin et al., 2015; Korayem et al., 2018). Outcomes focus on student experience, module marks or test scores and rarely explore the effects on the student at a more human level (Beshir et al., 2018; Garnier et al., 2023; Gharib et al., 2023).

Many simulations also require the use of specific equipment (e.g. mannequins (Korayem et al., 2022)) or software (e.g. DecisionSim™ (Mohammad et al., 2018)) often inaccessible to students outside designated teaching areas. For DL students

[4] Serious games are games designed for a primary purpose other than simply entertainment and are often used in education and training.

studying entirely online, this usually renders them completely unavailable. As a result, students have no further opportunities to revise or reflect on their decisions and explore alternative paths and processes (Bokken et al., 2009). On occasions where students were given ongoing access prior to exams the uptake was also lower than expected (Bernaitis et al., 2018).

Whilst some IF authors were able to build feedback into each scenario (see 2.6) it seems that many simulations (or serious games) fail to take full advantage of the potential to automate feedback into the game itself, rather providing additional content requiring an element of psychological removal from the game. Gharib Bindoff et al.(2023) note that even within computer-based simulations tutors often have to review students' performances before providing individual feedback. Students, however, "appreciated the immediate guidance and feedback provided… with the ability to undertake more activities and view results almost immediately" (p.8).

Beyond that, in a PG, online and self-directed environment – or in independent learning – research on simulation use is limited despite evidence showing "simulations that foster clinical decision-making skills for healthcare education, have been shown to promote self-directed learning, thereby encouraging life-long learning, a desirable quality in a health professional" (Bernaitis et al., 2018, p.731).

2.3 Interactive Fiction (IF)

There is a wealth of literature on IF in varying disciplines. Additionally, research has been conducted in a variety of age groups (Flynn & Hardman, 2019; Holm, 2020), in non-educational contexts (Pope, 2010) and using a variety of research methods (Jones, 2022; Kowald & Burns, 2019).

2.3.1 IF Within Non-Healthcare Education

Educationally, IF has been utilised relatively extensively in non-healthcare subjects including English literature (Batchelor et al., 2021; Kozdras et al., 2006), philology (Diesz Sanmartin, et al., 2020), religious studies (Brooke Lester, 2018), resource management (Kowald & Burns, 2019), research training (Melcer et al*.,* 2020), high-school science (Flynn & Hardman, 2019) and engineering ethics (Burkey et al.,

2022). As students are free to choose different actions in multiple playthroughs, IF can display the consequences should these same decisions be enacted in real life. It can also allow students to explores ideas that they not have been open to (or considered trying) before. Indeed, “the relation between participants’ CYOA decisions and real-world behavior has been consistently demonstrated. The diversity of topics in which CYOA has been successfully applied, and its utility in shaping real-world decisions, offers evidence to its apparent cross-disciplinary utility as a research tool” (Frazier & Gonzales, 2021, p.4).

Holm (2020) employed a digital IF (based on Jonathan Swift’s poem “The Lady’s Dressing Room”) to inform “careful, detail-oriented reading practices in undergraduate readers” (p.1) and foster open discussion on feminist theory in a classroom setting. Brooke-Lester (2018) however, had UG students themselves produce an IF game based on passages with the Hebrew Bible/Old Testament religious studies. In both cases the authors have used existing texts in attempts to expand their students’ views. However, there is a potential disconnect from contemporary life in both scenarios (especially in using an ancient text) that could make it difficult for students to fully experience the consequences of decisions.

As students play any IF they must step into the protagonists’ shoes, making decisions as someone else. This can afford some psychological distance, separating them from the consequences of their decisions (Antonsen, 2021). Thus, students may feel more free to explore how badly they can perform (purposefully or by chance) which may be as powerful a learning experience as restricting them to only doing their best (Eskreis-Winkler & Fishbach, 2019). Similarly, this experience can be used to invoke sympathy and empathy. Pérez Miles and Jenkins’ (2017) educate-the-educators IF was created to help teachers explore gender identity and demonstrate ways to support transgender students in the classroom. By adopting the role of a student transitioning from male to female, the IF forces the teachers to challenge their own knowledge and assumptions, break down boundaries and open conversations. This IF has shown real-world results and consequences to in-game actions by helping teachers empathise with students, making a difference to their experiences.

Whilst these examples are useful for seeing the critical skills development of participants few papers discussed the provision of direct feedback to the participants during play. Flynn and Hardman (2019) however, in their research with paper based IF in secondary level science education, note that incorporating explanatory (not corrective) feedback was difficult, especially whilst maintaining student immersion within the IF.

Each of the above involved in-person, in-classroom delivery, allowing students freedom to discuss or amend their answers as influenced by their peers. However, none of the papers discussed this or appear to have considered it a downside. In my view, delivering the IF in this way could influence autonomous decision-making, partly in fear or anxiety of judgement from peers or tutors who may select a different response. Alternatively, students may make better decisions through discussion, though it might diminish students' sense of personal agency in their actions.

One variation of IF explored by Kowald and Burns (2019) is the use of chatbots, some acting as tutors to deliver resource management training, guiding students to resources in their *"Pit in the Warehouse"* game. Chatbots, however, may be considered more like roleplay due to their direct one-on-one interaction and may lack immersion. Students may also not be able to view the consequences of other actions or even see the various potential pathways open for exploration. Engaging with a single responsive entity may also have a different psychological effect compared to interacting with multiple characters. However, chatbots could be useful for answering common course questions or replicating some of these interactions that are missing where tutors are not present (Hobert, 2023; Martins et al., 2024).

Outside purely educational contexts, Pope (2010) discusses the disadvantages of IF – particularly the design interface – by exploring how much enjoyment a group of readers found in a digital IF. Participants gave mixed responses: some saying the "unfamiliarity of the reading medium, together with non-standard interactivity behaviours, caused distraction and disruption in the reading process" (p.81). This was not an issue for others, however. Results indicated that the novel experience of using IF was more exciting than the material itself, which could have implications for introducing new and interesting ways of learning in other courses. However, it seems

to me that it is worth acknowledging that even if engagement is higher simply because of the format, then it is still higher engagement: something which can be difficult to achieve in an educational context, and worth bearing in mind when analysing data.

2.3.2 IF Within Non-Pharmacy Healthcare Education

One relatively well established IF in healthcare education is "*The Brewsters*", which tackles professional, clinical and research ethics in interprofessional healthcare education (Rozmus et al., 2015; Spike et al., 2012). "*The Brewsters*" allows readers to adopt different characters within three generations of one family, experiencing realistic consequences of their decisions whilst engaging with ethical dilemmas. Topics include the potential risks of social media use, harassment, and conflicts of interest. Crucially, the story also includes realistic outcomes demonstrating that good choices do not always lead to predictable or good results, similarly to clinical practice where the unpredictable influence of nature can also affect patients' outcomes. Similarly, Ritchie et al. (2024) also demonstrated the unpredictability of nature by incorporating random occurrences of T-cell differentiation – despite player choices ─ throughout their CYOA.[5]

Redinger et al. (2022) also tackle ethical dilemmas with UG medical students in critical care teaching through a CYOA as they "are particularly attractive areas to explore given the inherent greyness of decision-making" (p.558). They note that IF has benefits to self-directed learning beyond the classroom as "time is often the most in-demand resource in the clinical setting." (p.558). To maximise impact, their CYOA remained available to students throughout the academic year, allowing them to return and explore the case more completely. Indeed, students who accessed the material more often performed better in their assessments and demonstrated more advanced clinical decision-making skills. Donovan et al. (2021) also used the critical care setting to deliver a short CYOA that incorporated escape room elements (such

[5] Briefly, T-cell differentiation is the process by which precursor T-cells mature and specialise into distinct subtypes according to requirement. Each subtype has specific functions in immunity, enabling effective recognition and defence against pathogens.

as puzzle solving) to learn to manage a patient's care, interpret results and develop their decision-making skills.

Beyond the exploration of ethical dilemmas, non-pharmacy healthcare IF applications are varied. They include practicing motivational interviewing techniques (Cragun et al., 2023), critical appraisal in evidence based medicine (Blevins et al., 2017) and X-ray interpretation (Wilson-Stewart, 2017). Wilson and Walker (2017) also combined a CYOA with a theatrical play in a large-lecture setting to explore patient experiences. Students dictated the play's direction by using 'clickers' (electronic voting pads) to "engage with the complex emotional, interpersonal and psychological dynamics that arise in making decisions in practice" (p.110). In this application, students "collectively reach decisions in a classroom environment where freedom to speak their minds on intellectual, ethical, moral and legal issues is encouraged" (p.110).

Again, each IF discussed in this section was delivered to UG students. There is also a mix of those that are designed to be used in a group (Rozmus et al., 2015; Wilson & Walker, 2017) or played alone or with others (Donovan, et al., 2021), or alone and outside of the classroom (Ritchie et al., 2024). Indeed, Ritchie et al. (2024) noted that making their IF a non-classroom activity was a "potential way to both capitalize on learning benefits and remove student resistance barriers such as social anxiety" (p.2). In all cases where the IF itself was assessed as a learning tool, students reported that it was an enjoyable and effective addition to their learning.

2.3.3 IF Within Pharmacy Education

Initial searches revealed only Morningstar-Kywi and Kim's (2021) paper on the use of IF on clinical decision-making within UG pharmacy education. A 2024 meta-narrative review of the published literature (Wettergreen et al.) corroborated my conclusions that there was "limited examination of CYOA-style patient case activities…and no review within pharmacy education" (p.485). However, whilst some of the papers identified by Wettergreen et al. present students with various choices at different points, they are more like simulations than CYOA/IF, and many of the authors to refer them as such (as discussed in 2.2). While Smith et al. (2014), Benedict et al. (2013), Benedict and Schonder (2011) and Benedict (2010) present

their studies as "branched narratives," the papers are not detailed enough to determine the actual level of student choice. Descriptions from Vadiei and Lee (2022) and Mohammad et al. (2018) indicate the narrative is not truly led by players as students either make one choice (Vadiei & Lee, 2022) or their decisions ultimately lead to a uniform outcome (Mohammad et al., 2018). What is clear from all studies however, is that students are required to make a least one narrative choice during the activity. The common threads running through these papers are that all participants were, once more, UG students, all were classroom-based (albeit some were virtual), and all were facilitated or led by an instructor.

Whilst most cases involved group-work, Bernaitis et al. (2018) noted that the “feedback from the students suggested the DecisionSim™ activity was not as useful as a workshop activity, however the technology was well suited to individual study done in students’ own time” (p.733). This confers potential benefits in the PG DL context as not only is in-person, classroom-based use not applicable to an entirely asynchronous DL course but practicing alone confers some psychological safety to practicing pharmacists. Other students cannot see their mistakes, for example, and they can learn from their errors without the potential judgement of colleagues or peers.

In all studies students were directly given immediate feedback on their wrong answers through either facilitator feedback (for example, Osae et al., 2022; Smith & Waite, 2017) or via digital, in-game mechanisms (Bernaitis et al., 2018). Bernaitis et al (2018) also specifically note that their “Decision Sim™ activity allowed students to experience clinical decision-making, while allowing them to make mistakes without the risk of causing harm to real patients” and that the “provision of a safe learning space is invaluable for teaching clinical skills” (p.733). However, “where incorrect or dangerous decisions were made or actions taken that would cause harm to a real patient, [they] provided immediate feedback to the student.” (p.733). This also appears to apply in the other studies discussed. As these students were UGs their reflective practice would be unlikely to be as developed as those of practicing pharmacists. In this context it is therefore more ethical to provide immediate feedback. However, in general, students were prevented from fully experiencing and learning from the consequences of their "bad" decisions.

Using Twine (described in detail in Chapter 3.7), Morningstar-Kywi and Kim (2021) developed 14 clinical IF cases for UG pharmacy students to develop their clinical decision-making skills. In contrast to previous papers students were able to play through the narrative whilst making mistakes without interruptive feedback. Personalised feedback was provided on completion before students were able to freely play through the scenarios (see Figure 2.1). Similarly to the previous papers students reported that the IF was easy to use and allowed them to learn from their mistakes, and faculty reported that IF provided students with experience of real-world knowledge applications. Educational effectiveness was measured through improvement in assessment score. UGs lack real-world experience however, making it hard to predict how their learning translates to practice, post-registration. As PGs have prior experience, they may engage with the IF differently.

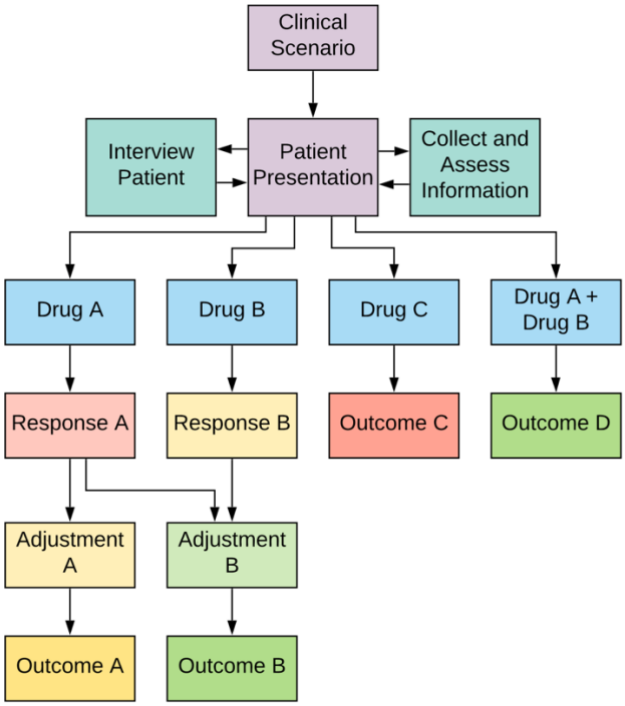


Figure 2.1: example pathway through an IF. From *"Using Interactive Fiction to Teach Clinical Decision-Making in a PharmD Curriculum"* by Morningstar-Kywi, N. & Kim, R.E. (2021). Medical Science Educator. 31, p.690.

In 2023, Litten and Stewart published further work using classroom-based CYOA to explore insulin management with UG students who completed the cases alone or in pairs. Successful management, however, was the only potential outcome. Class assessment was through the submission of a reflective piece though these were not

analysed as part of the research. Instead, the study reports students' confidence in their knowledge of medicines management, self-reported through a survey. Like Morningstar-Kywi and Kim (2021) quantitative, survey data was primarily used and students rated the experience of learning through CYOA highly. Qualitative analysis of the reflections, however, could have enhanced the study indicating both what, and how, students learned through their experiences. Students may have demonstrated a profound shift in their thinking or nuanced learning, for example, which quantitative data overlooks, removing the person from the process.

To summarise, studies using IF used almost exclusively quantitative data – through, for example, improvement on test scores (Lichvar et al., 2016) or questionnaires and test scores (Benedict & Schonder, 2011; Mohammad et al., 2018; Vadiei & Lee, 2022) – and mixed methods (Bernaitis et al., 2018; Osae et al., 2022). Where measured, students reported increased enjoyment, critical-thinking, and decision-making skills (e.g. Benedict & Schonder, 2011; Smith et al., 2014; Vadiei & Lee, 2022).

2.4 Reflection

It would be difficult to discuss pharmacists' PG learning without acknowledging the role reflection plays. As the literature on reflection in pharmacy practice is vast, I offer a review of the broader conversation of the topic within this thesis.

2.4.1 Reflection Within Pharmacy Practice

The sentiment offered by Droege in 2003 - that "through reflection-in-action, practitioners will regain confidence in their expertise, whilst utilizing evidence when appropriate" (p.71) - does not appear to have substantially altered in the intervening period, despite advances in clinical pharmacy practice. In 2006, the Royal Pharmaceutical Society of Great Britain[6] integrated reflective practice and continuous professional development (CPD) into its standards, aiming to improve

[6] The Royal Pharmaceutical Society of Great Britain was once the regulatory body overseeing pharmacy in Great Britain (Northern Ireland retains its own Pharmaceutical Society). In 2010 it subsequently split into the Royal Pharmaceutical Society (which represents the profession) and the General Pharmaceutical Council (which regulates).

pharmacists' and students' problem-solving and decision-making skills (Black & Plowright, 2007; Tsingos et al., 2014b) (see also section 2.6). As reflection is thought to encourage deeper learning it is seen as “one way to bridge the gap between pharmaceutical knowledge and clinical practice” (Tsingos et al., 2015, p.493), thereby optimising patient care. The literature indicates that reflection is essential to the development of pharmacist decision-making skills, discussed further in 2.6 (Charrois & Sewell, 2017; Duffull et al., 2019; Wright et al., 2020).

At its core, reflection requires practitioners to purposefully self-evaluate their skills and knowledge gaps, enabling them to pinpoint areas for improvement. However, whilst reflection is generally expected to be an introspective and lone process for pharmacists, peer discussion and group teaching sessions may help identify these areas more effectively (Black & Plowright, 2007). Mantzourani et al. (2019) have also identified that “a positive correlation was observed between reflective practice and improved critical thinking ability“ (see section 2.6) and that “the practice of reflection with the help of… prompts was a useful tool for practitioners” (p.2-3), not just pharmacists.

2.4.2 Reflection and Learning from Failure or Errors in Professional Practice

Whilst there is an abundance of literature on how pharmacists, for example, prevent (Alzahrani et al., 2021), identify (Rothschild et al., 2010) and manage prescribing, dispensing, and administration errors (Kang et al., 2017; Khalili et al., 2011; Kim et al., 2023) the literature on pharmacists’ reflection on their *own* errors is less plentiful. This may indicate that there is an expectation that pharmacists police the errors rather than perpetrate the acts themselves (Addison & Taylor, 2023).

Considering pharmacists are often tasked with managing errors it is perhaps understandable that they experience a heavy emotional burden when they do occur. As Ferguson (2015) points out “fatal and harmful errors can stay with health professionals for the rest of their lives” (p.5). As recently as 2017 pharmacists were still being criminally prosecuted for making genuine errors in Northern Ireland (Lewis, 2017; PJ, 2018) whilst their nursing and medical colleagues are unlikely to suffer the same fate. Indeed, “the thought of making an error is a major stress for pharmacists

and trainees—one of the worries is the impact of potential errors on their careers" (Ferguson, 2015, p.4). It is understandable, therefore, that pharmacists may be less forthcoming in discussing or demonstrating errors, especially in front of their peers.

The 2015 Pharmaceutical Journal (PJ) article, "How to recover from making a mistake at work", highlights the significant concern surrounding error in practice. As a pharmacist in the article points out:

> *"I once made an error and was trying to sort it out when two of my GP friends arrived as we were supposed to be going out," he says. "Both of them were aghast at my concern until one pointed out that they had a safety net (pharmacy) and we don't." (Ferguson, 2015, p.3)*

However, errors are inevitable where people are involved. Current literature indicates how these errors are identified and investigated in pharmacy (Guchelaar et al., 2005) but less commonly addresses what individual pharmacists learn from them, despite the anonymity provided (e.g. "I learned that it's OK to refuse to fill a prescription when you know that the dose is excessive" …"Since then, I always check hive reactions when dispensing any med in a similar or possible cross-reactive category." (Hamm, 2018, p.18-19)).

2.5 Learning from Failure in PG Education

In addition to learning through accidental error as professionals there are benefits to learning from failure pedagogically. Currently, there is little guidance on the post-registration formal education of pharmacists. Much of the research done on failure and error at this level relates to prescribing (HSIB, 2020; Simegn et al., 2022; Turner et al., 2021) and dispensing errors (Hong et al., 2019; Phipps et al., 2020; Tariq et al., 2022), and not within educational institutions.

Searches revealed very little in the way of learning through failure in PG healthcare, and no results for pharmacy education. In fact, as identified in a similar literature search by Darabi et al. (2018), little empirical research has been conducted in learning from failure as an instructional strategy within any context. During the final stages of this research (June 2024) Smith et al. also published a commentary that calls for "normalizing and exploring mistakes through simulation-based education"

(2024, p.420) within pharmacy practice. In this, they call for the specific use of simulation-based techniques to “reframe error as an unavoidable part of patient care, thus reducing the fear and stigma associated with mistakes… to frame error as an essential part of the learning process, and therefore reflect on their mistakes to improve their consultation skills” (p.420-421).

Many industries use lessons learned from failure and error to review old and develop new processes to stop similar future events. The aerospace industry (Kim & Rhee, 2017; Nemeth et al., 2008; Powell-Dunford, 2017) and the National Health Service (NHS) are both well-known for having such mechanisms in place (Emre Simsekler et al., 2019; NHS, 2018; NHS, 2019; NHS, 2022), as failure in either area can prove catastrophic. The NHS frequently adopts aerospace research into their strategies for managing and negating risk (Kapur et al., 2015; Powell-Dunford et al., 2017). Business and management (Gauthier, 2014; Jamison, 2017; Wang et al., 2021), engineering (Silverstein, 2004) and construction (Vlachakis et al., 2020) have also adopted similar mechanisms. The shared commonality between learning through failure in all these industries, however, is that failure was costly in a very real context. The NHS Never-events list (NHS, 2018) was created precisely because of avoidable fatalities or life-altering events resulting from errors which still occur even with procedures in place (Posnett, 2024).

The focus on failure within pharmacy PG (or, more appropriately, a post-registration level) tends to be on dispensing and clinical failures within practice, as discussed in Section 2.4.2. As noted by Klasen and Lingard (2019), there were “no studies directly exploring the question of clinical supervisors allowing failure as an educational strategy” (p.1263) despite noting that students “perceived their own errors to be highly instructive and that factors such as a sense of responsibility and emotional response influenced the educational impact of these errors” (p.1263). The authors also recommend that “the lack of discussion in the medical education literature regarding allowing failure for learning suggests that we need research into the nature and extent of this supervisory strategy” (p.1263). This demonstrates not only a gap in the literature for this type of learning but also an un-met educational need that could prove highly beneficial.

Failure within academic settings can have various results. “First, it renders the academic journey as somewhat unpleasant–fraught with anxiety, perceptions of low control, and unstable self-esteem…Second, when overstrivers do not succeed, failure is seen as proof of suspected incompetence and this increases the risk of falling into the second and more counterproductive form of failure avoidance: self-protection” (Martin, 2012, p.1277). For pharmacists the potential consequences could also include ineffective clinical decision-making, which could adversely affect patients, careers, reputations, personal well-being, and have financial implications for employers. My own previous research exploring the views of practicing pharmacists who act as external tutors in PG pharmacy courses revealed a divide between academia and practice. The perspective of one tutor was that he preferred the student "be a good pharmacist [and] as a result of that they get their diploma" (McKenna, 2021b). However, he considered the university’s opinion to be: "we’re an academic institution…We don’t care if they are crap pharmacists: can they pass the diploma?" (McKenna, 2021b).

It was unclear from the literature if any HE institutions facilitate learning through failure within their healthcare courses, encouraging students to explore errors or suboptimal care and, importantly, how these can be rectified or minimised to ensure sound patient outcomes. Research also seems focused on HE outcomes without acknowledging the implications that academic failure may have on real-life scenarios. Even within academic pharmacy there is an acknowledgement that there is an “internalized a fear of failure…This mindset…may inhibit improvement in educational theory and design” (Nohria & McBane, 2021. p.124), showing that there is a need to alternative approaches on all levels and for pharmacists to embrace failure.

2.6 Pharmacist Clinical Decision-Making

There is no single definition for clinical decision-making in the literature, though it can be broadly defined as the “series of cognitive processes and skills that allow pharmacists to make patient-centered, therapeutic decisions” (Wright et al., 2019, p.601), incorporating interactions with patients and other professionals.

The literature acknowledges that pharmacist decision-making is neither well researched nor understood (Croft et al., 2017). Whilst efforts have been made to untangle the processes behind pharmacist decision-making—especially in how it differs from those of nurses and medics— “clinical decision-making skills are recognized as a central component of professional competency but are underdeveloped in pharmacy compared to other health professions” (Wright et al., 2019, p.600).

Unlike other areas, research on clinical decision-making is more prevalent at PG/post-registration level than UG (Branan et al., 2023; Charrois & Sewell, 2023; Scutt et al., 2022), particularly with prescribers (e.g Croft et al., 2017; Duffull et al., 2019; McPherson et al., 2020). This perhaps indicates an expectation that these skills are developed through professional experience. However, this expectation appears to be the likely source of the idea that pharmacists “feel inadequately prepared to make important therapy decisions, are generally risk averse, and lack confidence to deal with ambiguous situations” (Wright et al., 2019, p.604). As such, there is a need to “evaluate instructional approaches that are designed to develop effective decision-making skills in different practice settings” (Wright et al., 2019, p.604).

Research on pharmacist clinical decision-making in practice is largely qualitative unlike previously discussed papers. The Think Aloud technique—in which pharmacists verbalise their decision-making process to researchers while dispensing prescriptions – has been used in community pharmacy (Croft et al., 2017; Nusair et al., 2018), and semi-structured interviews in hospital and outpatient settings (Mertens et al., 2024a). Authors noted in all cases that decision-making processes are complex and highly dependent on individual pharmacists’ personal experiences, as “adults come to learning with experiences that affect how they create knowledge” (Charrois & Sewell, 2023, p.782). Additionally, short-term memory plays an important role in managing the information required to make each decision and can result in errors if overloaded, in busy dispensaries for example, or where their processes are frequently interrupted (Scutt et al., 2022; Wright et al., 2020).

The researchers acknowledge that the Think Aloud method may not comprehensively identify every process involved in decision-making as it relies on pharmacists to vocalise every step or thought involved. Indeed, some processes may be subconscious, through autopilot (Mertens et al., 2024a), or pattern recognition “by expert practitioners who “know” appropriate choices but are not necessarily able to elucidate their personal decision processes” (Duffull et al., 2019, p.611). Unlike experienced pharmacists who can recognise patterns learned over years of practice, Mertens et al. (2024b) note that “pharmacy students did not routinely consider multiple reasoned options before committing to a therapeutic recommendation” (p.110). They recommend specific teaching strategies are implemented for both students and pharmacists to develop these decision-making skills. These processes may also speak to how PGs engage with IF as their experiences aid in their choice of action, but also their potential courses of action are driven by their experiences with previously played pathways.

A recurring theme in the literature is the disconnect pharmacists feel between decision-making concepts taught at UG level and how they are applied in real-world practice. Branan et al.’s (2023) flipped-classroom method aimed to teach complex clinical decision-making to UGs, requiring them to explain their reasoning, similarly to the Think Aloud method. By including ill-structured cases alongside the well-structured they were able to reflect clinical realities: ambiguity, imperfection, and complexity. They found that “learning to solve ill-structured problems requires the development of advanced metacognitive skills, … the ability to account for multiple perspectives, and the development of strong argumentation skills for reconciling conflicting interpretations and justifying solutions” (p.3). Students demonstrated better performance in assessment when required to work through these more realistic and cognitively demanding cases, even at UG level.

Ambiguity or uncertainty was also identified as challenging for pharmacists who may be reluctant to make clinical (and ethical) decisions thus impacting patient care (Cooper et al., 2007; Mertens et al., 2023), and who “by nature proceed with greater risk aversity than other colleagues…when making decisions” (Kallis & Allinson, 2023, p.1182). In fact, multiple authors suggest that pharmacy students should be taught to become comfortable with ambiguity to improve decision-making and confidence

(Charrois & Sewell, 2023; Mertens et al., 2024a), as was demonstrated in Branan et al. (2023) as discussed previously. For UGs, it has been suggested that observing tutors or mentors working through clinical decision-making processes would be beneficial. However, this same method would be especially difficult for PG pharmacists who often work or study alone, and who must already make these decisions regularly, or who are, in fact, expected to be the tutors. Whilst ambiguity can, on occasion, be somewhat removed through the use of decision-making tools (Bingham et al., 2020) these are neither universally available nor applicable. Teaching skills and letting students (and pharmacists) practice and become more confident in these decisions is therefore necessary.

2.7 Pharmacy Distance Learning/Postgraduate Pharmacy Education

Literature tackling learning at the PG level is sparse and much of the research within academia concentrates on undergraduates (Casanave, 2002). Finding literature on the academic teaching methods for this PG pharmacists was especially challenging. Research in pharmacy education leans towards accredited programmes (as outlined in Chapter 1.8) such as the MPharm and the IP programme (within the UK), or the DPharm and residency programmes (in the United States).

At PG level much of the learning expected of UK pharmacists is self-directed, as evidenced by the increasing number of practice-based portfolios they are expected to submit for assessment to prove their competency and progress to higher positions (RPS, 2022; RPS & CMHP, 2024; RPS & UKCPA, 2024). These portfolios are assessed by the regulatory bodies themselves, often by other pharmacists who may or may not be academics. However, they receive no academic credit for their completion.

At UG level however, this same group of students were taught and assessed using a range of different techniques and methods. Beyond traditional lectures, students may engage in interprofessional learning (Almoghirarh et al., 2023), debates (Hanna et al., 2014), Objective Structured Clinical Examinations (OSCEs) (Lim et al., 2024), and online prescribing assessments (Hardisty et al., 2018). It may also include the development of visual thinking strategies (Poirier et al., 2020), experiential

placements (Jacob et al., 2022), workshops (Han et al., 2024), practical dispensing (Nazar et al., 2018), laboratory sessions (Lunn et al., 2021), and the simulation methods discussed in sections 2.6 and 2.7.

On-campus, synchronous teaching is standard for pharmacy UGs which aids in facilitating these types of sessions. Even when teaching moved online during the COVID pandemic certain activities (e.g. dispensing classes) remained in-person in accordance with social distancing rules. Significant resources were also invested to enhance UG online learning, as can be seen from the literature that was forthcoming from 2020 onwards, however PG DL has historically received less attention. Literature searches did not reveal any equivalent research for PG pharmacists studying academically, revealing a disparity in teaching approaches between UG and PG levels. This divide exists despite PG students' recent exposure to similar UG teaching methods, highlighting a potential disconnect in educational strategies as students progress.

2.8 Professional and Student Identities

Throughout this review, I have highlighted the wealth of UG literature while considering how PG students, with their practical experience, may engage differently with the same scenarios. As Rozmus et al. (2015) emphasise, “the difference between knowing the answers to questions on a test and assimilating the meaning of those answers into one’s professional and personal identity is crucial” (p.816). Indeed, PG studies tend to focus on pharmacists in practice rather than in consideration of them as learners, which risks overlooking the complexities and value of balancing both roles and how this overlap can drive them to engage with their learning.

Whilst still being relatively under-investigated literature searches show an increase in research relating to identity development for students—particularly at transitional educational stages (such as moving from secondary school to university) (Cassidy & Trew, 2004)—and for professionals from university to the workplace (Noble et al., 2014) or from the workplace back to full time study (Thirtle, 2021). The development of professional identity with UGs has also been more investigated, and there is an overall lack of research with healthcare professionals—though more prevalent in

nursing and medicine—as also acknowledged by Cornett et al. in their 2022 scoping review.

Additionally, there is little regarding part-time students in general (Faidi, 2021), and no studies I could locate specifically discussing the multifaceted identities for PG DL pharmacy students. In general, these students continue their usual practice and wrestle with sticking the student label on top. Indeed, Mawson and Abbot (2017) (in their study on PG students returning to doctoral studies) note that “part-time study enables students to maintain their professional identity… However, when students become part of a new educational environment they feel the loss of the well constructed professional identity they have relied upon, in some cases for many years,” (p.189).

This shift in identity is something that students are often unprepared for and is noted by multiple authors. Hughes-Morris and Roberts (2017) also discuss this issue with experienced, autonomously practicing nurses returning to full time PG study. Participants reported feeling like they were starting from scratch and “had not appreciated the impact this would have” (p.237): their change in status making them feel “uncomfortable… vulnerable… inadequate… out of control” (p.237) harbouring resentment towards the student label. However, this study only involves participants who have discarded their professional identity, albeit temporarily, and there is no discussion of having to maintain or juggle both identities simultaneously.

Brunton and Buckley (2020) explore the changes in identity that take place in adult learners transitioning to university for the first time, conducting 34 semi structed interviews at the beginning of the academic year and once more at the end. Like the majority of other studies, participants were UG, full time students. Interestingly, and pertinent to the PG DL students, they note that “some adult learners may seek… to treat university as if it were a work context” (p.2698). Conversely, the participants in Thirtle’s 2021 study (experienced nurses returning to full-time professional study) are unable to treat their study like work as—having experienced autonomous professional practice—it differs so much from what they are used to, and they found the return to studentship to be quite traumatic. Participants reported that the confidence formed through years of professional experience was suddenly

challenged by “being labelled as a student” (Thirtle, 2021, p.381), making them question their abilities, causing self-doubt and anxiety.

O’Byrne et al. (2023) discuss the effect of studying on PG DL pharmacists’ mental health. They report that “the ability to have a clear boundary between their paid work and their study was…reported by several participants to be difficult to manage” (p.864) and that they struggled to merge their studying and professional lives with other outside commitments, negatively affecting all identities. In fact, Faidi (2021), in her thesis on part-time students who returned to study across various academic disciplines, notes that one identity may dominate the other making it difficult to achieve a balance, as similarly discussed by O’Byrne et al. (2023) and Thirtle (2021). It may also be, as Tobbell and O’Donnell (2013) postulate, that “assumptions are made that there is nothing new in postgraduate transition because it follows on, in the same type of institution, from undergraduate study” (p.124).

Whilst many studies explore professional identity in UG pharmacy courses, Kellar and Austin (2022) question why schools limit students to developing a “pharmacist” identity. They promote the development of diverse identities, but admit educators may lack adequate training to cope “a winding road that requires faculty to give students the freedom to choose their own adventure” (p.239). Given that pharmacists are generally risk-averse (Chapter 1.4) this could prove difficult. This focus on the pharmacist professional identity within academia may also be related to the “evidence that students’ sense of identity is positively related to learning outcomes and…motivation” (Jensen & Jetten, 2016, p.1027). As admission to pharmacy UG courses is generally very competitive, the predominance of this identity cold be seen as a bonus, as pharmacists’ “academic identity, and their sense of belonging to the environment are significantly related to their academic achievement” (p.1027).

Generally, the literature agrees that—at PG level in particular—identity becomes more complex. Professional and student roles intertwine in addition to the familial, societal, and beyond. This complexity shapes both the transition to study and experiences as students. Returning to some of these identities especially after a prolonged period of absence may be challenging, and “a consideration of

postgraduate students' wider life experiences are a legitimate focus in understanding their participation in learning" (Tobbell et al.,2010. p.264) may also be difficult. For this study, this may be particularly pertinent as those identities play a strong part in how they engage with learning materials, apply their learning and develop in their careers.

2.9 Gaps in the Literature and Contribution to Knowledge

As demonstrated throughout this chapter there are numerous gaps in the literature which this study aims to address.

Firstly, though IF use has been shown to impact on decision-making skills it has been utilised more extensively at UG level for educational purposes. There appear to be no studies discussing its use at PG level or in professional practice for pharmacists (2.3). However, practicing pharmacists have been shown to bring their experiences into the decisions that they make on a more fruitful and advanced level. As IF is a game of choice that drives a narrative this could fundamentally affect how PG students both engage with and learn from the IF.

Secondly, there is relatively little research on how pharmacists reflect on errors to learn and to change their practice. The pressure and expectation on pharmacists to not only be error-free can also extend to their academic studies, and learning from failure has been under-investigated in all PG areas. Though learning from error has been shown to be beneficial what is uncertain is if this is fundamentally different at the PG level, or in comparison to UGs. As students, PG pharmacists should also have formative opportunities to learn from their errors.

Decision-making has also been shown to be underdeveloped and inadequately taught or researched in pharmacy education at any academic level. This ill-preparedness then extends into practice where pharmacists have been shown to struggle with ambiguity and decision-making, affecting patient care. Learning and practicing application of these processes in a safe, un-pressured environment may be beneficial, incorporating IF experiences and knowledge gained alongside that gained in practice.

There are also very few empirical studies on PG pharmacy education within academic settings in general, and on the various identities which working PG students must adopt whilst also studying. For PG pharmacists who are studying at a distance whilst working this could result in ineffective learning strategies being employed by universities. It also means there is little empirical evidence to guide educators to developing teaching and learning strategies in what can be a very different environment, even challenging for educators to run due to the depth and breadth of experience of their students.

To my knowledge this is the first study that uses IF with PG pharmacy students and the first specifically discussing learning from failure in a PG environment that is both safe for patients and provides some psychological safety for the students. However, this research may not speak to just pharmacists or even just PGs, and the results may prove useful for others in similar positions, providing potential avenues to develop learning strategies.

Finally, pharmacy educational research has a tendency to determine “if” students are learning through assessment score and not “how”. This research hopefully adds something to the “how”, by giving the students a voice.

Chapter 3: Conceptual Framework

In this chapter I describe the conceptual framework that has informed this research. I first offer a brief outline of Green and Jenkins' 2014 conceptual model of interactivity effects to provide context to the chapter (3.1). I then describe how it was used to guide and structure this research (3.2) as well as how it has been used by others (3.3). As interactivity is at the heart of IF I offer a brief discussion of how it is beneficial in education and learning (3.4). I then provide a more in-depth description of the framework itself (3.5) and how it was also used to create the IF story ("Lady and Gent"), in addition to its use throughout this thesis (3.6). I include a brief description of the software used to create the IF (Twine) (3.7) before ending this chapter with a summary (3.8).

3.1 Model Overview

This research was guided by Green and Jenkins (2014) Model of Interactivity Effects in Interactive Fiction conceptual framework. The framework provided the foundations to explore the educational use of IF whilst allowing me to maintain focus on the RQs, ensuring all elements were addressed and connected throughout the research.

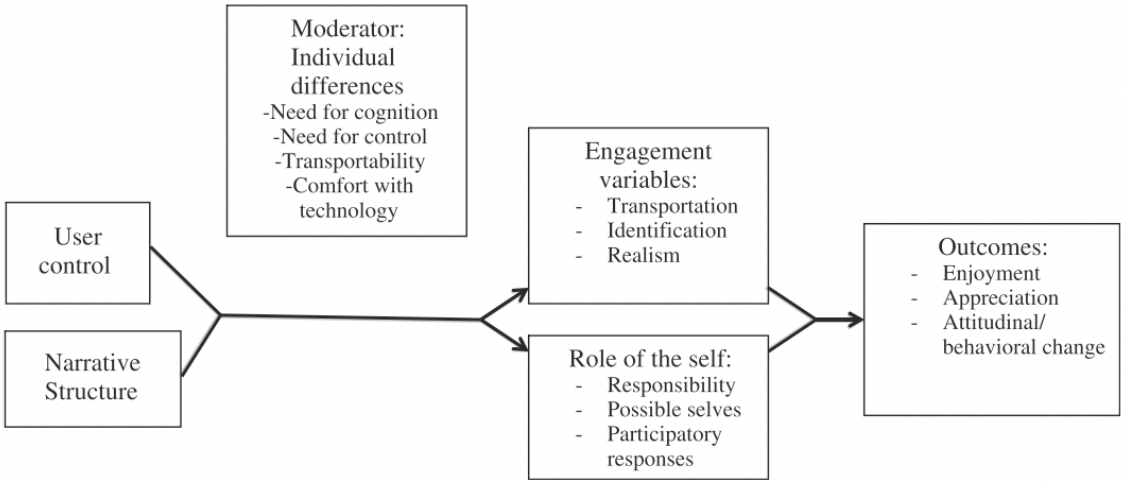


Figure 3.1: Green and Jenkins Model of Interactivity Effects in Interactive Fiction. From "Interactive Narratives: Processes and Outcomes in User-Directed Stories", by M.C. Green, M. Jenkins, 2014, Journal of Communication, 64(2014), p.480. doi:10.1111/jcom.12093.

The framework covers all aspects of text-based IF from design to delivery, and specifically pertains to IF "where the storyline is the most important element, and the interactivity serves to guide the narrative along different pathways" (p.482). A diagrammatic representation is shown in Figure 3.1.

The framework itself was proposed by Green and Jenkins' as a way to explore the potential of interactive narratives for entertainment-education[7], and more specifically for promoting health-related changes in attitude and behaviour. The authors propose the framework as a method "to organize existing research in this area and highlight important gaps for future research" (p.480) making it suitable for use in this research.

As shown in Figure 3.1, the framework consists of numerous headings, grouped together to explore the processes which influence narrative engagement. I offer a brief summary here to provide context and redefine them in in greater depth in 3.5.

1. **User Control**: The degree of control the player has in story events.
2. **Narrative Structure**: the structure and progression of the story/plot.
3. **Moderator: Individual Differences**: How personal characteristics influence engagement.
    - *Need for Cognition*: Enjoyment of cognitive effort.
    - *Need for Control*: Desire to maintain control over the narrative.
    - *Transportability*: Potential to become immersed in the story.
    - *Comfort with Technology*: Ease of navigating the IF interface.
4. **Engagement Variables**: How readers engage with the IF.
    - *Transportation*: Emotional and cognitive immersion. Feeling 'lost in the story'.
    - *Identification*: Connection with the protagonist.
    - *Realism*: How real the choices and consequences feel.
5. **Role of the Self:** The personal involvement of the reader.
    - *Responsibility*: Perceived accountability for the protagonist's actions.
    - *Possible Selves*: Exploration of alternative actions.
    - *Participatory Responses*: Emotional reactions to plot events.
6. **Outcomes**: The effects of the IF on the reader.
    - *Enjoyment*: Overall enjoyment in playing the IF
    - *Appreciation*: Reflective engagement with narrative events.

[7] Entertainment-education is a strategy wherein educational content is integrated into entertaining formats (e.g. documentaries, video games, and IF, in this case) to improve audience knowledge, attitudes, and behaviours.

- *Attitudinal/Behavioural Change*: Potential real-world impact.

3.2 Applications in this Study

As the framework was developed to guide research into IF it is suited for use in this study, and provided structure in shaping the RQs (Chapter 1), research design (Chapter 4), analysis and interpretation of the findings (Chapters 5-7), and in creating the IF itself (see section 3.5).

For example, in constructing RQ2b (In what ways do students reflect on their practice?) and c (How do they feel this reflection affected their clinical practice?) the outcomes section was particularly important as it addresses **appreciation** (reflection on usual practice) and **attitudinal/behavioural change** (change in practice), shaping the question itself.

In the research design (see Chapter 4) it was crucial in the development and structuring of the questionnaire and semi-structured interview questions (Appendix Two). For example, in exploring the IF's usefulness as a pedagogical tool it was important to establish if the IF was **enjoyable (Q3)** (as this would increase **engagement**), and so this was specifically asked to the students. Participants were also asked if they **identified** with their character (Q19) which can aid processes of narrative **transportation**, leading to **attitudinal/behavioural change.** Asking open questions in interview also allowed the participants to describe their own thoughts, feelings and behaviours which pointed to how their personal characteristics and preferences (**role of the self, individual differences,** and **engagement variables)** shaped their interactions and learning.

The framework also shaped the data analysis, presentation and discussion (Chapters 5-7) as I utilised the main framework headings to directly code the qualitative data (Chapter 4.5) and map the findings and discussions, ensuring a deeper exploration and understanding of the results. This allowed for identification of patterns throughout the data, providing opportunities for further analysis to strengthen the findings (e.g. to check if differences in students' current employment

sector resulted in lower **identification**). Each chapter therefore follows the structure of the framework itself.

In analysing and coding the data, I directly applied the headings and subheadings to pinpoint where the IF provided particular learning points for this cohort of participants, and to identify gaps for future research (see further details on qualitative analysis in Chapter 4.6.2).

Additionally, explicitly coding in this way uncovered elements deemed significant by the participants that extended beyond the framework (non-framework elements). This allowed me to offer insights into its pedagogical use and potential for future development by other researchers, which I discuss in the conclusion (Chapter 8.5).

3.3 Previous Applications

Whilst several published (and unpublished) papers refer to Green and Jenkins' framework (e.g. Ball, 2020; Frazier & Gonzales, 2021) few directly apply it to their data collection and analysis. Of those that do, three studies focus on engagement variables: on transportation (Ahn, 2012); to investigate whether the content or the interactivity of the IF is the persuasive element (Oh, et al., 2020); or the interactivity and the time spent playing (Parrott et al., 2017). The studies conclude that transportation – i.e. the degree to which the reader is transported into the story –is the more persuasive engagement variable and makes a greater contribution to the outcomes (see Figure 3.1).

Steinemann et al. (2017) directly applied aspects of the framework to examine the psychological processes of interactivity. They adapted the concept of appreciation to measure a concrete outcome: participants' prosocial behaviour, specifically their willingness to donate their study earnings to charity.

Similarly, Wei et al. (2021) use the framework in a study on carousel advertising as a method of addressing public health issues, viewing the advertisement as a form of narrative storytelling. Harmsen (2018) combined it with Larkey and Hecht's 2010 framework on culture-centric narratives to investigate "the influence of the narrative

in the Delirium Experience on health profession students' learning experiences and attitudes". They state that "it is important to note that these models were not specifically developed to gain insight in the relation between the students' learning experiences and the use of narratives in serious games" (p.4). However, both have been applied in this way to good effect, showing the potential for both its use and adaptation in an educational context, encouraging further application and exploration through this thesis.

To date it seems that no researcher has simultaneously investigated all elements of the framework, instead picking those that are the most applicable to their needs and adapt as, or if, necessary. Table 3.1 presents an overview of the literature concerning the framework, highlighting previously investigated and unexplored sections with potential educational applications. Within this study I have applied the whole framework to allow for more complete exploration of the data. This approach aimed to identify the most pertinent elements for PG pharmacy DL students, address gaps in the current literature, and suggest future research directions.

Table 3.1 Summary of Framework Applications in the Literature

Heading	Sub-heading	Author(s) & Year
User Control		
Narrative structure		Harmsen, 2018
Moderator: Individual differences		
	Need for Cognition	
	Need for Control	
	Transportability	Wei et al., 2021
	Comfort with Technology	
Engagement variables		Oh et al., 2020; Parrott et al., 2017
	Transportation	Ahn, 2012
	Identification	
	Realism	
Role of the Self		
	Responsibility	
	Possible Selves	
	Participatory Responses	
Outcomes		
	Enjoyment	
	Appreciation	Steinemann et al, 2017
	Attitudinal/behavioural change	

3.4 Interactivity

Interactivity refers to the exchange of information or actions between two or more entities (such as people, systems, or environments) which exert influence on each other. This may include conversations, the interaction of users and apps, or even between two systems (e.g. between a smartwatch and a health tracking app) (Green & Jenkins, 2014; Miller, 2014; Mott et al., 2019). Within IF this could be between computer and player, story and player, between groups (who are also interacting with the IF itself) and beyond, depending on the IF's structure and purpose.

In traditional narratives the reader is a passive audience, simply following the plot of their chosen media: be it movies, books and, in the case of pharmacy DL students, the provided written learning materials. Educational case studies included in these materials (often used in healthcare education (e.g., Hanna et al., 2014)), are frequently labelled as 'interactive' but do not necessarily work together to exert influence on each other. Answers are also simultaneously provided in the materials, meaning students have no obligation to engage with the cases as intended.

Ultimately, interactivity transforms users from passive audiences to active participants. This proffers new challenges in the process by complicating the narrative structure to create compelling, immersive, and cohesive experiences (Miller, 2014).

IF, however, provides opportunities to introduce various types of interactivity as it is, by nature, "a story in which the reader has opportunities to decide the direction of the narrative, often at a key plot point" (Green & Jenkins, 2014, p.481). Furthermore, IF – as in this study – provides students with some agency: the "intentional acts and anticipation of the consequences… [including] taking actual action and reflecting on oneself and one's actions" (Kolhoff & Nack, 2019, p.76) and the opportunity to make choices and take control (Miller, 2014). Providing agency to students playing interactive narratives has also been shown to produce a higher degree of understanding, particularly in complex issues and ill-structured problems (Mott et al., 2019; van Enschot et al., 2019), which is beneficial to PG students at an advanced level who are dealing with exactly these kind of issues in practice.

Not only is interactivity potentially more engaging, but interactive narratives have been shown to be “more enjoyable for individuals with higher cognitive capacity” (van Enschot et al., 2019, p.159), such as high-achieving pharmacy graduates. Research in interactivity in IF has even moved beyond the text, encouraging players to interact with their own environment for multi-sensory experiences (by consuming chocolate at certain plot points, for example) (Miller, 2014). Of particular interest to this study are the ideas that IF may “evoke some psychological responses that are not typical of traditional narratives” (Green & Jenkins, 2014, p.480) and “the process of making a decision within a fictional world, where the stakes are lower, might help individuals think through the consequences of various courses of action” (p.493), transposing experience to real world change. This may confer some heightened benefits at PG level as all participants are registered pharmacists, already performing similar tasks. Where the stakes are relatively low in the narrative, the real-life stakes are higher, and this could result in meaningful experiences for the participants. Importantly for this study, the framework also asks the question: “how do individuals respond psychologically to narratives that provide an opportunity for active participation?” (p.480). In contrast to games that require some sort of reward for effort research has also shown that IF players do not require such inducements to play: the interactivity alone may help students learn by exploration, investigation, and by making mistakes by interacting with the fictional environment (Miller, 2014).

3.5 Descriptions of the Framework Headings and Subheadings

Whilst the framework focuses on text-based works other mediums have also adopted the principle of choice, particularly within purely entertainment mediums (Netflix’s “*Unbreakable Kimmy Schmidt: Kimmy vs the Reverend*” (Fey et al., 2020) and “*Black Mirror: Bandersnatch*” (McLean, 2018) for example).

Green and Jenkins’ framework has been developed from “existing theories of narrative processing, entertainment-education, and media influence to suggest ways in which these aspects of interactivity might enhance or detract from the psychological processes that occur when individuals read or view narratives” (p.480) and falls under 6 main sections (as shown in Figure 3.1).

1. **User control:** within the fiction itself (i.e. not technological control). Increasing user control decreases the narrative structure.

2. **Narrative structure:** the structure and progression of the story/plot.

3. **Moderator: individual differences**
    a. ***Need for cognition***: "the extent to which individuals enjoy engaging in effortful cognitive activity" (p.490). For students, this may mean the required effort to both understand the information presented to them as well as analyse and apply it to the situation which they have been given. It may encompass problem solving skills and application of clinical knowledge.
    b. ***Need for control***: the extent to which each individual likes to exert choice and control over their own lives. For pharmacy DL students this may mean having to choose from options in the IF that are more limited than they would like to have. The level of control students may have in their own workplaces may be greater than that which they have in the IF, and some students (and players in general) may like to exert more control over their actions than others.
    c. ***Transportability***: describes the degree to which the story has the potential to make the player (pharmacist and student in this case) feel like they could be in the narrative.
    d. ***Comfort with technology***: how at ease the reader is with the way in which the IF is presented, and the effort it takes to learn to control the IF. The more comfortable they are with what is being presented the less they should be aware of what they are doing and how they are moving through the story, and the less instruction they should require on how to control their movement through each page.

4. **Engagement variables**
    a. ***Transportation***: defined as "cognitive and emotional immersion in a story, accompanied by vivid mental imagery" (p.483) This can encompass feeling empathy for characters, wanting to know what

happens even after the IF ends, and the commonly described sensation of “losing yourself” in a story. Highly effective transportation may mean that the reader can visualise the scenes that are described in their own imagination. Those who are more affected by the contents of a story are likely to have higher levels of transportation (Green & Brock, 2000) and are more likely to experience a change in their real world beliefs. Higher transportation usually correlates with greater enjoyment.

b. ***Identification***: how the reader identifies with their adopted character within the narrative. As transportation makes the reader feel like they have become part of the IF’s world, identification makes the reader feel as if they are the protagonist. ‘Lady and Gent’ features a genderless protagonist in order to be universally applicable. Research by Green & Jenkins (2014) indicates that participants will most often take the path on what they would actually do, and are less inclined to make decisions based on what they think the character would do.
c. ***Realism***: how realistic the narrative is, including the decisions and their consequences at each plot point. The decisions the students must make are those which a non-specialist pharmacist and a non-prescriber might make within normal practice. They are based on my own experiences as a clinical pharmacist working in a large hospital, which aimed to increase realistic features of the story.

5. Role of the self:

a. ***Responsibility***: the level of personal responsibility the reader feels for the character’s actions and the resulting consequences.
b. ***Possible selves***: readers may select to take a path they would ordinarily choose or take a riskier course of action. As players take on different roles within the narrative, and explore decisions they wouldn’t necessarily make, this also translates into the potential for behavioural changes in the real world, or may simply provide a risk free method of exploration.

c. ***Participatory responses***: how the player reacts to events within the narrative as if they were part of the story.

6. **Outcomes:**
    a. ***Enjoyment:*** the degree to which the user has enjoyed all aspects of the story
    b. ***Appreciation***: the degree to which the user reflects on their choices and actions during the game.
    c. ***Attitudinal/behavioural change***: the degree to which playing the IF provokes a real-life change in the individual's behaviour or attitude, linked to the decisions that have been made throughout the IF.

3.6 The Framework as Applied to "Lady And Gent"

Since the task of writing the IF is not the focus of this thesis, I provide only a brief description of how the framework guided its construction for this research. Titled "Lady and Gent" and set in a teaching hospital, the player takes on the role of a ward-based, clinical pharmacist. They are required to perform typical clinical pharmacy services such as medicines reconciliation[8], recommending dosage adjustments, and therapeutic drug monitoring[9]. "Lady and Gent" focuses on one patient who has been admitted with an infection requiring an intravenous antibiotic (gentamicin) which requires careful dose selection and ongoing monitoring due to its toxicity in overdose. The complete story is included in full in Appendix Three and can be accessed at https://aileencmckennaqub.itch.io/ladyandgent.

Whilst it would not be possible to explain the influence of the framework on every single design or writing choice in the game, I have outlined some of these decisions below. For example, to ensure **realism** and **transportability** I drew on my own previous experiences of working as a clinical pharmacist in a hospital including the interactions I had with people, systems, and technology. Extra details were included to increase narrative transportation (e.g. the common occurrence of a patient asking

8. The process in which patients' complete medication lists are verified at transitions of care to ensure accuracy, prevent errors, and enhance safety.
9 The practice of measuring drug concentrations in the blood to optimise dosing and efficacy whilst minimising toxicity.

for directions) to increase **realism** and **transport** the student into the scene, making them **identify** with the protagonist of the story beyond just the professional level. The protagonist was also written in a gender neutral way to ensure maximum **identification** for all participants.

Similarly, UGs are taught to list off a patient's full name, identification number and date of birth when referring to them. However, in reality, this doesn't happen and any member of staff who did this would be considered both odd and be told off for wasting time. Whilst it is not necessarily the most correct way that healthcare professionals should be discussing patients, the most **realistic** way is reflected in the story (e.g. "are you looking after Mrs Tessutti, the lady in bed 6 with the UTI?" and not "Are you Dr Manning, the doctor looking after Mrs Adeline Tessutti, 3 River Avenue, health and social care number AKH557489)?" and is designed in this way to ensure the **transportation**, **identification** and **realism** effects (for example) aren't compromised, reducing the effects of the IF.

Presenting participants with a number of feasible choices only (i.e. no outlandish decisions or claims) also incorporates the elements of **need for control** and **need for cognition**. For example, they may be required to make a choice between speaking to the patient who is slightly confused, or speaking to her husband first. This may give them pause for consideration as both answers are feasible. Similarly, they are required to recommend a dose of a drug used to prevent blood clots (tinzaparin) when patients are in hospital. The dose is presented, and they must judge if this is right before making a decision, if it interacts with other medication (including existing recommendations that they've made) or even if the drug itself is appropriate. In this way, it challenges them across multiple levels.

Clinical colleagues who reviewed the IF for accuracy and appropriateness also commented on these details as being realistic, providing pause for thought, and effectively transporting them into the IF environment (Appendix Three).

3.7 Twine

Twine (https://twinery.org/) – an "open source tool for telling interactive, nonlinear stories" (Twinery, n.d) (see Chapter 4.4.6 for further information on IF development

tools) – was used at all stages of producing the IF. Bespoke documents based on actual guidance were created for incorporation at various points to increase **realism**, along with AI generated images of the patients and hospital wards to aid **transportability** (included in Appendix Three). The title – "Lady and Gent" – was also chosen to reflect the story itself (as described in 3.6 above) but also as a method of piquing participants' curiosity and to improve engagement with the research.

Further amendments were made to correct errors and improve flow (as discussed in Chapter 4.4.6) before the IF was published as an unlisted game on itch.io. Publishing as unlisted ensured that it was not available to the public and only those who have the link would be able to access it (https://aileencmckennaqub.itch.io/ladyandgent). A screenshot depicting available pathways is included in Appendix Three.

3.8 Summary

In this chapter, I offered an overview of the conceptual model that underpins this study: Green and Jenkins' (2014) conceptual model of interactivity effects, providing a brief overview of each framework heading to provide context. I described how I applied this framework throughout this study's design, from formulating the RQs, shaping the questionnaire and interview questions, and guiding data analysis.

Additionally, I described how the framework structured each of the three findings and discussion chapters, which directly utilise the headings and subheadings to present, explain, and discuss the findings in context of the existing literature. I also examined how other researchers in this field have used the framework, highlighting the remaining gaps in the knowledge that this study seeks to address. I also explain my reasons for applying all sections of the framework (unlike previous studies), aiming to provide a more comprehensive approach to this study to address these gaps.

Since interactivity is a core feature of IF I briefly discussed the potential benefits of interactivity in an educational context. Specifically, I discussed how interactivity may increase engagement by allowing readers to exercise agency in their choices,

shifting them from passive readers to active participants in the story. This shift may offer pedagogical advantages beyond entertainment.

I then provided a detailed description of each heading and subheading within the framework, including how they apply and can be of use to the participants in this research and the research itself.

Finally, I concluded with a discussion of how the framework informed the construction of the interactive fiction piece within Twine.

Chapter 4: Research Design

In this chapter I describe the methodology for this research exploring the use of interactive fiction (IF) as a pedagogical tool for learning from failure with postgraduate (PG) pharmacists. I begin by outlining the philosophical foundations guiding this study (4.1) including my stance as a pragmatist (4.1.1), my rationale for employing a mixed methods design (4.2), and my positionality within this research (4.3). This is followed by a description of the research site and participants (4.4), data collection tools (4.5) – questionnaires (4.5.1) and semi-structured interviews (4.5.2) – and how I approached data analysis to answer the RQs driving this study (4.6). The chapter closes with a discussion of the nuanced ethical considerations for this study (4.7) and a summary of this chapter (4.8).

4.1 Research Philosophy

Underlying any piece of research are the philosophical foundations of what the researcher sees as the fundamental nature of reality on which we can acquire knowledge (ontology) and the process by which we create knowledge (epistemology) (Cohen et al., 2017). In considering my approach I therefore had to reflect on my own beliefs: as a pharmacist, as a person, and as a researcher. This research aims to understand how PG pharmacists studying on a DL course engage with IF as a pedagogical tool for academic learning. Additionally, I sought to uncover how their individual experiences with IF can shape their clinical practice. This combination can produce contradictions in both epistemological and ontological stance which I hope to address within this section, and in my choice of pragmatism (see 4.1.1) and mixed methods (see 4.2).

When I consider myself as a pharmacist, I am most comfortable with the notion that knowledge is derived from observable and empirical data, and that reality can be understood through scientific methods and objective measurement: positivism (Austin & Sutton, 2018; Cohen et al., 2017). Not only am I most familiar with it, but much of the literature around pharmacy education focusses on improvement in numbers (Austin & Sutton, 2018), often through test scores for example (e.g. Ambroziak et al., 2019; Smith et al., 2014). Even pharmacy's person-centred

approaches are often reduced to numbers as indicators of quality of care (e.g. De Bie et al., 2011; Ramirez et al., 2022), less commonly focusing on the lived experiences of patients.

However, in undertaking this study my position shifted from pharmacist to social scientist, requiring a renegotiation – occasionally uncomfortably – of those deep-rooted, positivist norms. As a social scientist (and personally) I believe that each individual's experiences and knowledge brings different meanings and interpretations to the world, and that reality is socially constructed and interpreted through these individual experiences: interpretivism (Cohen et al., 2018). In this research I aimed to give a voice to students, and "include the meanings and purposes of those people who are [my] source… to understand how this reality goes on at one time and in one place" (Cohen et al., 2018, p.20).

Interestingly, considering both perspectives, I concluded that as a clinical pharmacist both stances come into play: my knowledge, experiences and interpretations of the world are as central to clinical decision-making and reasoning as the scientific approach to reviewing and recommending medication. Whilst the positivist model suits the more predictable nature of pharmaceutical research this study focuses on participants' experiences—shaped by their previous education and training, social backgrounds, and personal perspectives—which is reflected in how they engaged with the IF itself. This therefore aligns with the interpretivist paradigm.

4.1.1 Pragmatism

Pragmatism is a philosophical approach that investigates practical solutions to real-world problems, focusing on the usefulness of the solution itself rather than adhering to a specific theoretical framework or methodology (Aikin & Talisse, 2023; Biesta & Burbules, 2003). It asks "what works?" and, just as importantly, "what doesn't?". In pragmatism "the goal is resolution of the problem" (Florczak, 2014): an outlook which reflects my own and other pharmacists' experiences, finding acceptable solutions to clinical problems (Austin & Sutton, 2018). Although I align more with the interpretivist paradigm, my study remains grounded in pragmatism, aiming to identify what works in practice through participants' engagement. Whilst their experience with the IF may

be subjective, it highlights – and offers valuable insights into – the factors that shape their interactions. In this context, the fact that they are PGs plays a key role, influencing their engagement in ways that may differ from UGs, thereby demonstrating the potential value of IF for similar participants.

In particular, this research aligns more with the thinking of John Dewey's version of pragmatism: that the identification of a problem stimulates inquiry. This in turn spurs research and results that seek answers, whilst acknowledging that what is true today may not be true tomorrow. This is only one way of looking at the data and the research: a path through my own choose-your-own-adventure of data analysis (Biesta & Burbules, 2003).

Methodologically, pragmatism also allows flexibility and adaptability without being wedded to a specific methodology. The research design is driven by the problem requiring a solution rather than by how the researcher wants to solve it (Aikin & Talisse, 2023). Enveloping the concept of fallibility, it assumes that there is no absolute certainty in knowledge, and that what we know now may be subject to change (Biesta & Burbules, 2003). This is beneficial to the fast-moving paces of pharmacy and online education as technology, teaching methods and workforce expectations rapidly evolve. I do not seek absolute truths and acknowledge that the product of this research contains imperfections and requires continuous enquiry.

4.2 The Rationale for Mixed Methods

In choosing a methodology I considered my stance as a pragmatist, my position as the DL programme lead, potential participant engagement, and how I could most effectively answer the RQs (which not only ask "if" but "how", requiring deeper exploration of topics). I therefore established that using mixed methods was the most appropriate approach to answer my questions effectively (Florczak, 2014; Mertens, 2023), allowing me to embrace both the positivist and interpretivist paradigms. Additionally,

> *"A mixed methods way of thinking also generates questions, along-side possible answers [and] actively engages us with difference and diversity in*

service of both better understanding and greater equity of voice". (Greene, 2008, p.20)

As a pragmatist I also seek to find answers to real world problems and – in the real world – rarely are answers found solely in only quantitative or qualitative data. Each also offers differing – sometimes clashing – perspectives. Mixed methods therefore provided a way to investigate the complex nature of reality and humanity from various perspectives before making any conclusions, and to make sense of the research findings (Cohen et al., 2018; Mertens, 2023). Furthermore, in healthcare science research, quantitative methods are the norm and even academic writing conventions frequently detach the individual from the numbers (Austin & Sutton, 2018). Mixed methods, however, allowed me to identify patterns and trends whilst ensuring that individual voices are heard (Greene, 2008; Venkatesh et al., 2023).

Moreover, by including multiple methods I aimed to enhance the credibility and dependability of the findings. While quantitative validity, defined as "the extent to which a measurement tool measures what it says it measures" (Austin & Sutton, 2018, p. 53), is often evaluated statistically, reliability – the consistency of repeated results – is also crucial. However, the inherent subjectivity of the participants' responses mean that even if they were to respond again their own answers might be different. Statistical tests do not apply to qualitative data, therefore different means are employed to deem the data valid and credible, or what we can alternatively consider as the trustworthiness of the data (Austin & Sutton, 2018).

4.2.1 Establishing the Trustworthiness of Qualitative Data

Lincoln and Guba (1986) outline that traditional, positivist criteria are not well suited to qualitative, interpretivist research, inadequately reflecting the complexities of lived experiences. In qualitative research, terms like trustworthiness, credibility, transferability, dependability, and confirmability are therefore used in place of more traditional markers of quantitative or positivist quality such as validity, reliability, replicability, and generalisability (Creswell & Miller, 2000). These concepts reflect a different way of approaching research quality stemming from the idea that knowledge is not fixed or objective, but instead socially constructed, shaped by

context, and influenced by the researcher's perspective (Lincoln & Guba, 1986). Trustworthiness (with its components like credibility, transferability, dependability, and confirmability) therefore provides a framework for evaluating the quality of qualitative research, more appropriately reflecting the interpretivist paradigm and studies that focus on meaning and lived experience (Lincoln & Guba, 1985). Creswell and Miller (2000) similarly point out that in qualitative research, validity "refers not to the data but to the inferences drawn from them" (p.125), with credibility established through approaches such as member checking, triangulation, and rich description. These criteria therefore do not aim to apply or replicate the same standards as quantitative research, but offer an alternative, transparent, and realistic way of thinking about rigour that values researcher reflexivity, depth, and openness on research processes.

Trustworthiness of qualitative data can be established in a number of ways which I have employed in this research.

Firstly, I employed a member checking process to ensure that both the transcriptions of the data were accurate and that I was interpreting the participants' words correctly (Creswell & Miller, 2000). After each interview was complete and transcriptions were checked for accuracy, participants were invited to review and confirm their transcripts, allowing them to clarify or correct any statements and interpretations of phrasing. As a brief example, one participant clarified what they meant by "inpatient adults of working age" (adults between the ages of 18 and 65) through this member checking process. As outlined by Lincoln and Guba (1985) this technique is "the most crucial technique for establishing credibility" (p.314), helping to ensure the accuracy of the data and helped to ensure the accuracy of data representation and reinforced the participants' agency in shaping the narrative.

The trustworthiness of qualitative data is also based on the dependability and consistency of data interpretation, and the idea that comparable themes and patterns would re-emerge if the study was completed in similar conditions (Austin & Sutton, 2018), however the conditions are never the same because the real world changes. Dependability is also addressed in this research through demonstration of an audit

trail of decision-making: documentation of coding processes in NVIVO 14 (Section 4.6.2) and deductive qualitative coding via Green and Jenkins' (2014) framework, for example. All data were reviewed multiple times to ensure consistency in interpretation. This documentation demonstrates the trustworthiness and methodological rigour as outlined by Lincoln and Guba (1986).

Creswell and Miller (2000) also discuss researcher reflexivity as a method of ensuring the trustworthiness of their detail wherein researchers "self-disclose their assumptions, beliefs, values, and biases that may shape their inquiry" (p.127). In including descriptions of my research philosophy (Section 4.1) and my positionality (Section 4.3), as well as an outline of my personal context (Section 1.1) and the reasons for choosing this research subject (Section 1.2). This aims outline how my role as a pharmacist, DL student, programme lead and researcher may have shaped interpretations and biases. Additionally, the thick, rich description of the "setting, the participants, and the themes" (Creswell & Miller, 2000, p.128) described in Research Site, Context and Participants (Section 4.4), the description of participants themselves (Section 5.1 and Appendix One) aims to establish validity by providing "as much detail as possible" (Creswell & Miller, 2000, p.129) to help readers understand and make decisions on the "applicability of the findings to other settings or similar contexts" (Creswell & Miller, 2000, p.129), though generalisability is not the aim of qualitative inquiry.

Also core to ensuring this trustworthiness and validity is the concept of triangulation: that utilising both quantitative and qualitative data serves to strengthen the validity and findings of each, address potential discrepancies, and minimise or reducing potential bias (Cohen & Manion, 2019; Poth, 2023). Individually, measures of validity differ between the quantitative and the qualitative: the questionnaire providing breadth, the interviews providing depth, and the combination of both providing complementary insights (Burton & Bartlett, 2005). This research therefore also follows a convergent design (Fetters et al., 2013) as I seek "elaboration, enhancement, illustration, and clarification of the findings from one method with the results from the other method" (Venkatesh et al., 2023, p.68).

Initially, I employed a questionnaire to collect both quantitative and qualitative data. I completed an initial thematic analysis before conducting semi-structured interviews to bolster my interview schedule and address any identified gaps (data collection tools are discussed in depth in 4.5). I was then able to adapt my line of questioning to more completely answer the research questions and ensure the robustness of the results (Cohen et al., 2017). This approach also reduced the risk that one cohesive mixed methods study morphed into two parallel studies (Florczak, 2014).

However, as with any study design, this method has drawbacks. Care must be taken to ensure that the data can be integrated and used complementarily throughout analysis and discussion (Austin & Sutton, 2018). Using multiple data collection methods also invariably increases the volume of data for analysis, risking overload (Austin & Sutton, 2018). There are potential difficulties in data presentation and discussion, including concerns about data incompatibility and possible contradictions that arise through analysis (Austin & Sutton, 2018; Cohen et al., 2017). Contradictions, however, speak to the nature of humanity, and reflect my stance that individuals' experiences and knowledge bring different meanings and interpretations to their world. Within this research, I therefore consider contradictions to be positive and hope it reveals paths for future study.

4.3 Positionality and Insider Research

Like the study participants, I am also a pharmacist and have completed two PG pharmacy qualifications (as well as this research), part-time and through DL. Additionally, as both a lecturer and the programme lead for the courses in which the participants are enrolled, I have insights into the course structure, contents, and administration. Each element influenced my approach, potentially introducing subjectivity, of which I tried to remain cognisant throughout. Therefore, it can be concluded that this study qualifies as insider research: a common approach in educational research (Yip, 2024). Insider research offers several advantages and disadvantages which are important to consider in this study and are particularly pertinent to the ethical considerations as discussed in 4.7.

Conducting research with my own students is pragmatically advantageous, providing a unique opportunity to examine a teaching approach designed to meet the needs of students who are also professionals (Lewis & Quinnell, 2024; Yip, 2024). Situating the IF within their normal learning environment provides context, enabling me to tailor questions specific to them, eliciting deeper insights into their experiences and perspectives. It also was beneficial to understanding and interpreting many of the pharmacy specific, technical responses that were provided. Through my own experience in hospital and community pharmacy I was able to frame their responses to further explore their answers, provide context and give deeper insight. Our mutual familiarity also enables a greater understanding of comments on, for example, assessments and learning materials, and may facilitate higher engagement and more candid responses (Mercer, 2007).

However, there are significant challenges to this approach. As programme lead, students may feel reluctant to share their true opinions with me, fearing that their responses could influence their academic outcomes, potentially compromising data validity (Yip. 2024). To address this, I reassured participants that their input was crucial for improving the course, and that all responses would contribute to strengthening the research. I actively encouraged them to bring forward the aspects they thought were poor or could be improved (Lewis & Quinnell, 2024).

Additionally, ethical concerns arise in relation to consent and confidentiality, particularly if students believe their participation could impact their academic outcomes. Moreover, my dual role as both lecturer and researcher introduces the potential for bias in data collection, analysis, and interpretation, as my personal experiences and perspectives may influence the findings. As with pragmatism, the generalisability of this research may be limited beyond this study population due to its specificity (Lewis & Quinnell, 2024; Mercer, 2007). However, in this study's context, IF has been well received and students demonstrated its potential for academic and professional growth, which may aid other researchers in similar settings. Furthermore, using Green and Jenkins' model helped to identify key patterns – including the combination of different elements – without assuming that there are rigid outcomes. As it is a subjective field, the results may be different each time even with the same IF, and even with the same participants.

4.4 Research Context, Site, and Participants

This research was conducted within the School of Pharmacy PG DL centre at QUB: a large, bricks-and-mortar University[10] based in Belfast, Northern Ireland. In this section I offer an overview of the higher education (HE) structure to situate the research, the PG DL centre, and describe the study population.

4.4.1 UK Higher Education (HE) Structure

Throughout the UK, HE degrees are primarily taught and conferred by universities overseen by government bodies in each of the devolved nations. For example, in Northern Ireland universities are overseen by the HE section of the Department for the Economy, whilst in England this responsibility lies with the Office for Students (House of Commons Library, 2024). Despite regional differences, degree structures are similar, and most students first pursue bachelor's degrees (e.g., BSc), integrated master's degrees (e.g., MPharm), or foundation degrees (which offer progression to full degrees on completion) directly after leaving secondary school at 18 or 19 years old. After completing UG degrees, students often enter the workforce or continue to PG study – either full- or part-time – in taught or research programs.

4.4.2 QUB and the School Of Pharmacy PG DL Provision

The School of Pharmacy operates QUB's only entirely PG DL courses which are open to students worldwide, can only be completed on a part-time basis, and require students to be registered pharmacists working in practice. The student population is therefore diverse. As demonstrated even within this study's respondents, there are wide variations in age (21-45 years), professional experience (0-20 years post-qualification, and six pharmacy sectors), and location (UK, Africa, Asia and Europe) outlined further in Appendix One. Students may pursue PG certificates, diplomas, or master's degrees according to their own requirements. They may be choosing to

[10] A Bricks-and-mortar university is one which primarily delivers teaching and learning face-to-face and within a physical campus space.

study for their own development, enjoyment or, most commonly, as a necessity for career development (Appendix One).

4.4.3 Timing of the Research

This research was carried out at the end of the normal academic year (June and July 2024) when students were not actively learning (to avoid adding to their study burden and increase potential responses) or I was not involved in any grading processes, maintaining ethical integrity. This may, however, have impacted on the response rate to the research itself, as participants were not actively checking university emails or participating in the courses.

4.4.4 The Pharmacy Distance Learning (DL) Hub

All learning materials on the programmes are provided on Canvas: QUB's Virtual Learning Environment (VLE). All QUB pharmacy DL students are registered on a non-credit bearing module ("The Pharmacy DL Hub") which functions as a course handbook and meeting area for students. I chose to both recruit participants and collect data through this module as it conferred a number of benefits.

- All eligible students could participate
- All students can be contacted simultaneously, ensuring easy administration
- As the IF scenario was not aligned to any clinical topics, recruiting through a non-clinical module avoided any potential confusion that may have occurred if it were included in an active teaching module
- Canvas supports anonymous submission and – as students must be logged in with their own credentials – participants could digitally sign informed consent forms
- A protected link to the IF could be distributed only to those who had completed the informed consent
- Questionnaires could be restricted to a single submission, avoiding duplication
- Questionnaire data could be collated in a single spreadsheet to reduce error and increase reliability
- Staff access could be restricted during the data collection period to ensure confidentiality and prevent accidental edits or deletion

Recruitment was done through convenience sampling (Austin & Sutton, 2018), relying on students to volunteer through an initial announcement in the Pharmacy DL Hub (Figure 4.1). I included a video outlining the research, describing the IF, and asking them to provide feedback on their experiences with it through an anonymous questionnaire, and potentially an interview. Feedback from previous cohorts highlighted instructional videos were beneficial to student understanding and engagement, which is also in line with the literature from other DL courses (Owen & Philpott, 2014). Three further reminder follow-up announcements were also posted in efforts to increase participation.

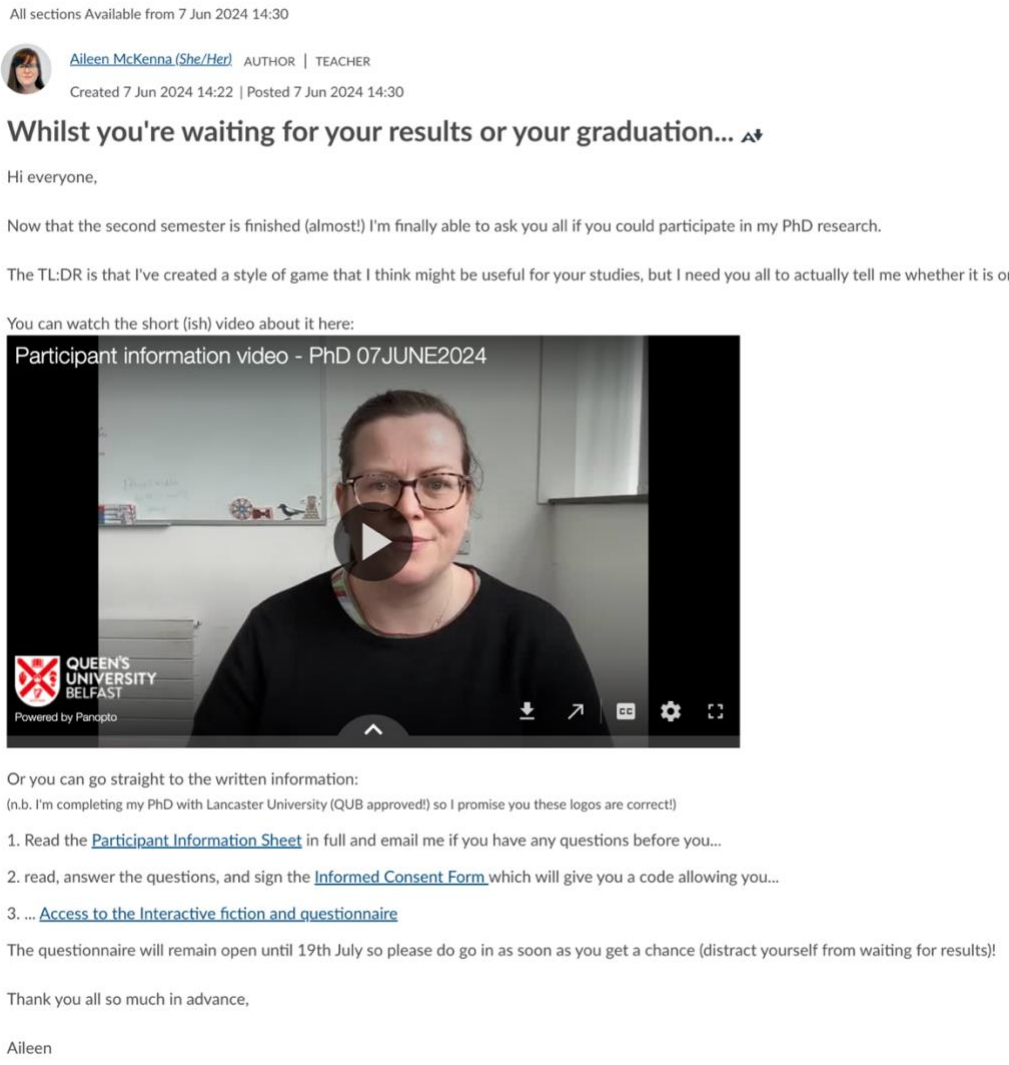


Figure 4.1 - Screen shot of the invitation to participate from Canvas

4.4.5 Creating and Distributing the IF

I created my own IF for this research, named “Lady and Gent”, using Twine - an “open source tool for telling interactive, nonlinear stories” (Twinery, n.d.). Twine is free in-browser or as a download allowing for integration with accessibility tools. The resulting IF essentially functions as a website, allowing players to navigate through the story by selecting actions through hyperlinks. Twine usage appears to be pervasive by IF creators as “its main strength is in simplicity” (Letonsaari & Selin, 2017, p.138) and it can be easily used by non-developers, including those with no coding experience. Additionally, there is an extensive array of peer and user support through Twinery.org, Ford’s 2016 eBook “Writing Interactive Fiction with Twine”, and The Twine Cookbook (Cox & Klimas, 2024).

Participants were provided with a link to the IF on completion of the informed consent forms. As a whole, pharmacists tend to be risk averse (Cox, 2020) and research has also shown that “failure is ego threatening, which causes people to tune out.... Thus, when ego concerns are muted, people tune in and learn from failure” (Eskreis-Winkler & Fishbach, 2019, p.1733). Consequently, to reduce this threat to the ego, participants were required to play through the IF at least twice, choosing different options each time that may be contrary to their normal actions. A reminder of this was added in the final screen of “Lady and Gent” (see Figure 4.2), alongside a direct link back to the Pharmacy DL Hub to complete the questionnaire.

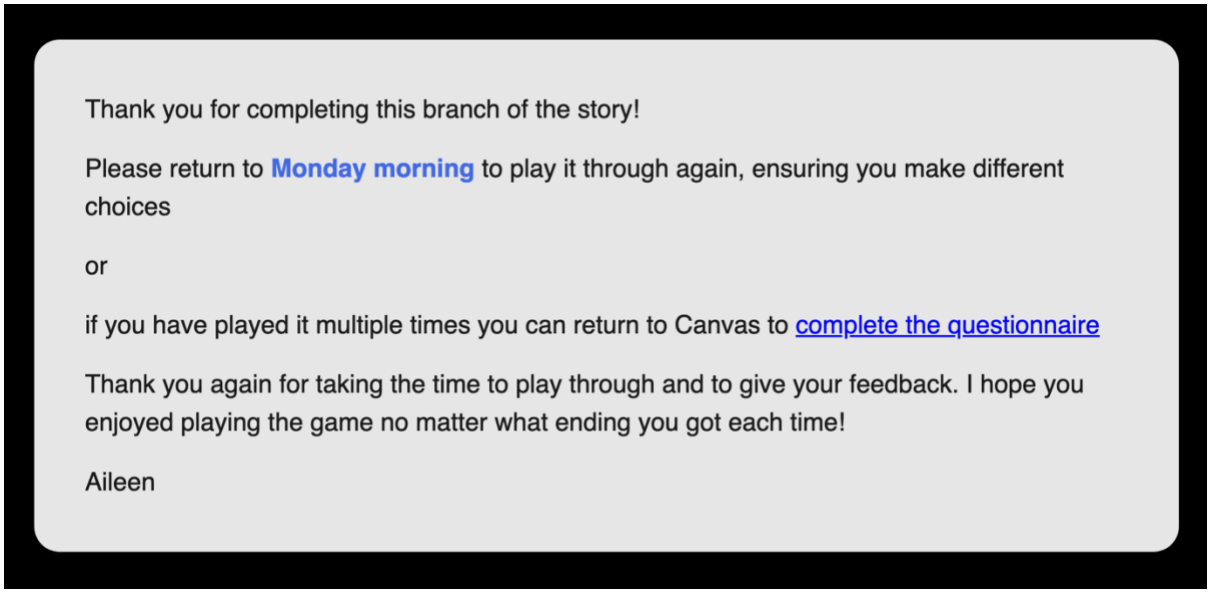


Figure 4.2: The final panel of "Lady and Gent" that directs students back to the questionnaire, or to the start of the story if they need or want to complete it again

4.5 Data Collection Tools

Considering the mixed-methods design of this research alongside the characteristics of the participant cohort, data was collected using both questionnaires and semi-structured interviews. Each method was chosen due to their complementary ability to address the research objectives and provide a robust dataset.

4.5.1 Questionnaires

Questionnaires are a well-established, efficient, and inexpensive method of gathering a large amount of standardised data that can be used to identify trends and patterns through both quantitative and qualitative analysis, can be readily analysed and visualised (Austin & Sutton, 2018; Greene, 2008) and have been used in similar research on IF (Kim & Lee, 2020; Morningstar-Kywi & Kim, 2021; Powell-Dunford et al., 2017). Most participants will be familiar with the structure of questionnaires. They can also be completed asynchronously at a time convenient to participants, allowing for more thoughtful responses or, for those who require it, time for translation (Arundel, 2023).

More practically, online questionnaires can be inexpensively distributed and completed anonymously to ensure respondents can candidly respond without fear of reprisal (Cohen et al., 2018) and, with my participants, they can be distributed through their normal channels of study (The Pharmacy DL Hub). Yet, whilst anonymity is advantageous, it makes it more difficult to follow-up with those who leave questionnaires incomplete or to help clarify any questions which respondents find unclear (Burton & Bartlett, 2005; Lietz, 2010). However, I was available to answer any questions students might have had through the normal communication channels. Online administration may also help to boost completion rates which can be low with questionnaires (Arundel, 2023), and a direct link to the questionnaire was included in the final panel of the IF (Figure 4.2) to help increase the response rate for this study.

As results can also be heavily affected by question wording it was also essential to avoid ambiguity so that the content was easily understood by all respondents. Studies show that “even minor details in the formulation of questions and answers can have a major effect on the responses obtained and ultimately on the conclusions drawn from the research” (Lietz, 2010, p.250).

As no validated questionnaires were appropriate, I created my own in conjunction with Green and Jenkins’ (2014) framework and piloted it with the academic colleagues who also reviewed the IF (Austin & Sutton, 2018). This allowed me to collect pre-coded data through closed-ended and Likert-scale questions, one of the most frequently used techniques to measure attitude in questionnaires (Burton & Bartlett, 2005). Crucially, Likert-scale questions could be combined with corresponding open-ended items to gather individualised comments that provided depth and nuance resulting in a richer dataset for analysis (Peer et al., 2012). Piloting helped identify format issues, resolve ambiguities in wording or format and help improve ease of response, allowing for feedback and revision before distribution to participants (Austin & Sutton, 2018). For example, I was able to correct some spelling errors and reorder questions to allow for an improved flow.

The questionnaire was divided into three sections: demographic data, participants’ experiences of IF in the context of their academic learning, and how they viewed the use of IF within professional practice. The complete questionnaire is included in Appendix Two. This structure was guided by both the RQs and the framework, as it moved from more pedagogical aspects (need for cognition, for example) (RQ1) into active reflection (appreciation) and change (attitudinal/behavioural changes) (RQ2). In each section participants were asked to consider their answers from this specific standpoint, and statements were designed to ensure students answered the questions with the relevant frame of mind (student or professional), however students often provided answers concerning both.

4.5.2 Semi-Structured Interviews

As questionnaire response rates are often low (Arundel, 2023) data was complemented with semi-structured interviews, designed to elicit more meaningful

and rich responses than the questionnaire alone, and to provide flexibility to respond to each student's answer than structured interviews (Burton & Bartlett, 2005). This also served to increase the trustworthiness of the qualitative data, as outlined in detail in Section 4.2.1. Importantly, semi-structured interviews also reflect my natural approach allowing me to engage participants and create a relaxed atmosphere whilst eliciting insightful responses (Austin & Sutton, 2018) that, at times, veered into the unstructured and conversational (Burton & Bartlett, 2005). A copy of the basic interview questions is available in Appendix Two.

During design I also considered conducting focus groups. Due to the composition of the potential cohort, however, (various time zones, working whilst studying and maintaining personal lives) this could cause scheduling and participation issues (Austin & Sutton, 2018). Additionally, whilst students are relatively familiar with me they study independently and seem unfamiliar with each other, potentially causing hesitation or discomfort within a group scenario resulting in a lack of meaningful data (Bloor et al., 2001). This unfamiliarity potentially hindered attempts to recruit further participants through purposive snowballing (Cohen et al., 2018) as participants stated they were not in direct contact with other students on the course.

Unlike questionnaires, interviews could not be anonymous and require an increased time commitment from participants, although they allow the interviewer to identify non-verbal cues not apparent in questionnaires (Venkatesh et al., 2023). Without the freedom of anonymity participants could demonstrate hesitancy in responding negatively especially as I (as programme lead) was the interviewer, possibly dissuading some from volunteering (Burton & Bartlett, 2005). Whilst this hesitancy could have skewed the findings towards the positive, it is not possible to predict what other students may have responded however. Participants self-selected for interview through the informed consent form for the questionnaire portion (Appendix Four).

As mentioned in section 4.2, I identified gaps in the questionnaire responses that I could then address in interviews (Austin & Sutton, 2018). For example, open questionnaire responses did not always distinguish between student and professional viewpoints, therefore interview participants were asked to consider these separately. Notably, even in interview, participants struggled with this

separation but, through discussion, were able to provide interesting and thoughtful answers, demonstrating the benefits of the more flexible interview method. By ensuring both the initial and follow-up questions were structured around the RQs and by applying the framework I could also probe for deeper insights into the IF and the students' experiences, providing a richer dataset (Galletta, 2013). Interviewing is also "well suited to the exploration of complex issues" (Bullock, 2016. p.330) such as student experiences of learning but also that of practicing pharmacists. Interviews therefore provided a space for students to express opinions they may not have had the opportunity to offer in the questionnaire. There are also more nuanced ethical issues to consider in interviewing practicing pharmacists around errors, which are discussed further in section 4.7. In particular, remote, online interviewing was necessary as students were disparately located (see Table 5.1) and face-to-face interviews would not have been feasible.

The comfort of participants is paramount, as a comfortable environment fosters trust between interviewee and interviewer, encourages honest responses, and ensures quality data is obtained (Cohen et al., 2017). Additionally, it was important to ensure the well-being of each participant, especially as discussions may have included potentially delicate topics involving error or harm. Interviews were therefore conducted according to participants schedules and at a time of their choice (Cohen et al., 2017; Seidman, 2019). Each was provided with the interview schedule in advance (Appendix Two) to reduce any anxiety about expected topics and ensure participants had enough time to consider and give thoughtful responses (Austin & Sutton, 2018). To be eligible for interview, students must have exited or be preparing to exit from the course, ensuring there was no expectation that participation (or non-participation) could contribute to their grade. This hopefully provided greater freedom to share their honest opinions, free from fear of repercussion (Seidman, 2019). Participants were also not required to have their cameras on as the video itself would not be analysed.

Literature recommends that researchers "avoid uncommonly used, difficult-to-use software and software which requires complicated registration, and to opt for commonly used software" (Cohen et al., 2017, p.528). Interviews were therefore conducted, recorded, and transcribed using Microsoft Teams, which is QUB's

software of choice, with free access provided for all students. Additionally, Teams is already used throughout the DL courses for meetings and webinars therefore students are familiar with its use. I opened each interview by greeting participants, verbally reconfirming consent and answering any questions they had. The data collection portion began with open-ended questions before transitioning to more structured ones, allowing me to respond to and explore students' thoughts in depth while ensuring I was an active listener throughout (Seidman, 2019).

Transcriptions were checked for accuracy against the recordings and amended for grammar and tone (Cohen et al., 2017). A member checking process was also employed (Cohen et al., 2017) by emailing these transcriptions to participants for feedback, review and correction, or clarification. This allowed participants to verify the accuracy of their responses, enhancing the credibility and trustworthiness of the data (see Section 4.2.1) and ensuring that the participants' perspectives were faithfully represented (Cohen et al., 2017).

Participants were also invited to choose their own pseudonym though none chose to do so, and so have been allocated one (see Table 5.1). Once transcription was complete and checked recordings were deleted, as outlined in the ethics application, included in Appendix Five.

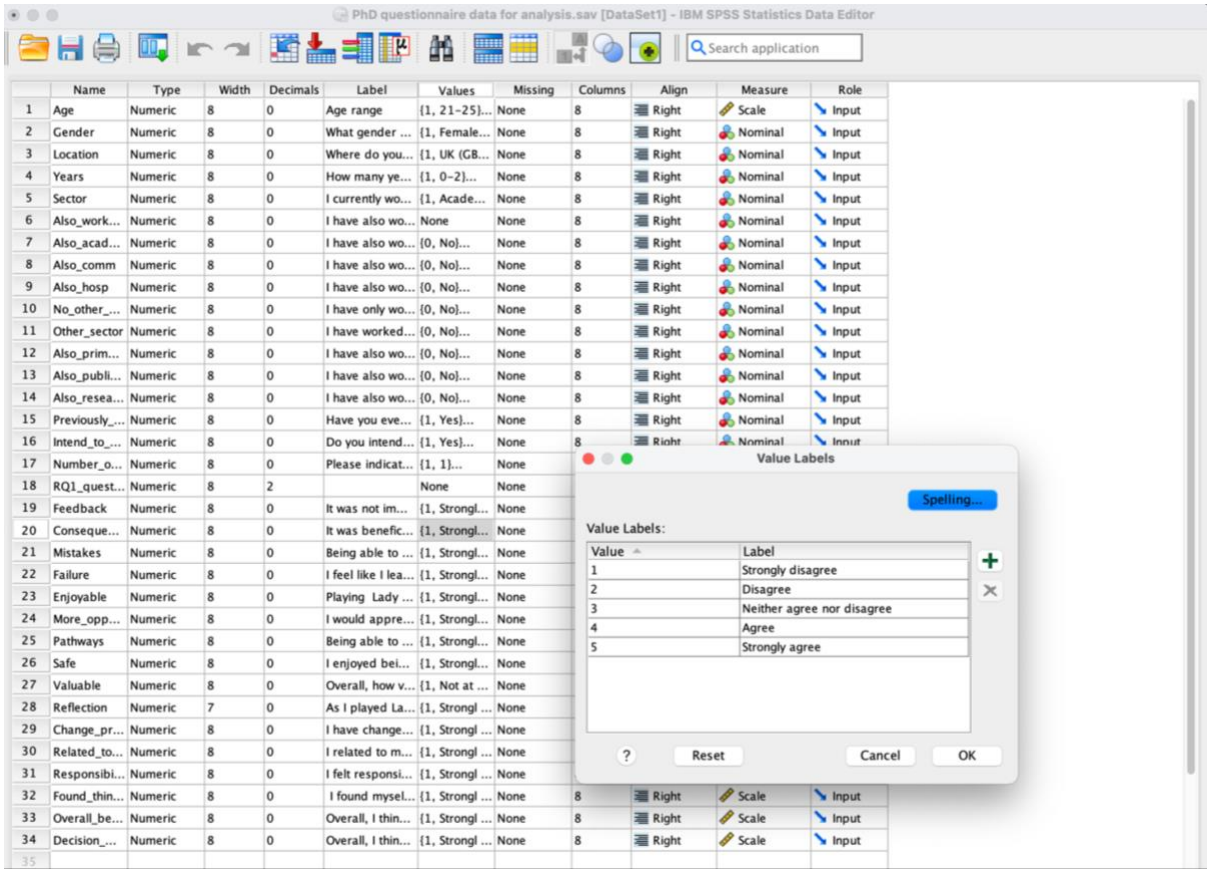
4.6 Data Analysis

There are conflicting opinions on when to start data analysis which is dependent on the purpose of the research, and whether it should be done sequentially or concurrently (Venkatesh et al., 2023). As this mixed methods study was designed to be complementary, I therefore completed an initial analysis to guide the interview portion (4.5.2) but did not complete a full analysis until all data had been gathered (Venkatesh et al., 2023).

At the conclusion of the study all questionnaire data (including open responses) was initially exported from Canvas in the default Microsoft Excel format. This was then further processed according to the quantitative or qualitative nature of the response.

4.6.1 Quantitative Analysis

Quantitative data (from Likert-scales and demographics) was extracted and reformatted to allow for appropriate statistical analysis in SPSS[11] by assigning each survey item to a separate variable, with numerical codes representing responses (e.g., 1 = Strongly Disagree) within the Variable View, as displayed in Figure 4.3.



	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role
1	Age	Numeric	8	0	Age range	{1, 21-25}...	None	8	Right	Scale	Input
2	Gender	Numeric	8	0	What gender ...	{1, Female...	None	8	Right	Nominal	Input
3	Location	Numeric	8	0	Where do you...	{1, UK (GB...	None	8	Right	Nominal	Input
4	Years	Numeric	8	0	How many ye...	{1, 0-2}...	None	8	Right	Nominal	Input
5	Sector	Numeric	8	0	I currently wo...	{1, Acade...	None	8	Right	Nominal	Input
6	Also_work...	Numeric	8	0	I have also wo...	None	None	8	Right	Nominal	Input
7	Also_acad...	Numeric	8	0	I have also wo...	{0, No}...	None	8	Right	Nominal	Input
8	Also_comm	Numeric	8	0	I have also wo...	{0, No}...	None	8	Right	Nominal	Input
9	Also_hosp	Numeric	8	0	I have also wo...	{0, No}...	None	8	Right	Nominal	Input
10	No_other_...	Numeric	8	0	I have only wo...	{0, No}...	None	8	Right	Nominal	Input
11	Other_sector	Numeric	8	0	I have worked...	{0, No}...	None	8	Right	Nominal	Input
12	Also_prim...	Numeric	8	0	I have also wo...	{0, No}...	None	8	Right	Nominal	Input
13	Also_publi...	Numeric	8	0	I have also wo...	{0, No}...	None	8	Right	Nominal	Input
14	Also_resea...	Numeric	8	0	I have also wo...	{0, No}...	None	8	Right	Nominal	Input
15	Previously_...	Numeric	8	0	Have you eve...	{1, Yes}...	None	8	Right	Nominal	Input
16	Intend_to_...	Numeric	8	0	Do you intend...	{1, Yes}...	None	8	Right	Nominal	Input
17	Number_o...	Numeric	8	0	Please indicat...	{1, 1}...	None				
18	RQ1_quest...	Numeric	8	2		None	None				
19	Feedback	Numeric	8	0	It was not im...	{1, Strongl...	None				
20	Conseque...	Numeric	8	0	It was benefic...	{1, Strongl...	None				
21	Mistakes	Numeric	8	0	Being able to ...	{1, Strongl...	None				
22	Failure	Numeric	8	0	I feel like I lea...	{1, Strongl...	None				
23	Enjoyable	Numeric	8	0	Playing Lady ...	{1, Strongl...	None				
24	More_opp...	Numeric	8	0	I would appre...	{1, Strongl...	None				
25	Pathways	Numeric	8	0	Being able to ...	{1, Strongl...	None				
26	Safe	Numeric	8	0	I enjoyed bei...	{1, Strongl...	None				
27	Valuable	Numeric	8	0	Overall, how v...	{1, Not at ...	None				
28	Reflection	Numeric	7	0	As I played La...	{1, Strongl ...	None				
29	Change_pr...	Numeric	8	0	I have change...	{1, Strongl ...	None				
30	Related_to...	Numeric	8	0	I related to m...	{1, Strongl ...	None				
31	Responsibi...	Numeric	8	0	I felt responsi...	{1, Strongl ...	None				
32	Found_thin...	Numeric	8	0	I found mysel...	{1, Strongl ...	None	8	Right	Scale	Input
33	Overall_be...	Numeric	8	0	Overall, I thin...	{1, Strongl ...	None	8	Right	Scale	Input
34	Decision_...	Numeric	8	0	Overall, I thin...	{1, Strongl ...	None	8	Right	Scale	Input
35											

Figure 4.3 SPSS variable view screenshot displaying numerical values assigned to Likert- scale responses.

Within the corresponding Data View, each participant is assigned an individual row, and each column represented a survey item (Figure 4.4)(Peer et al., 2012).

[11] SPSS (Statistical Package for the Social Sciences) is a software package used to conduct statistical analysis of data without the requirement for advanced technical skills or knowledge.

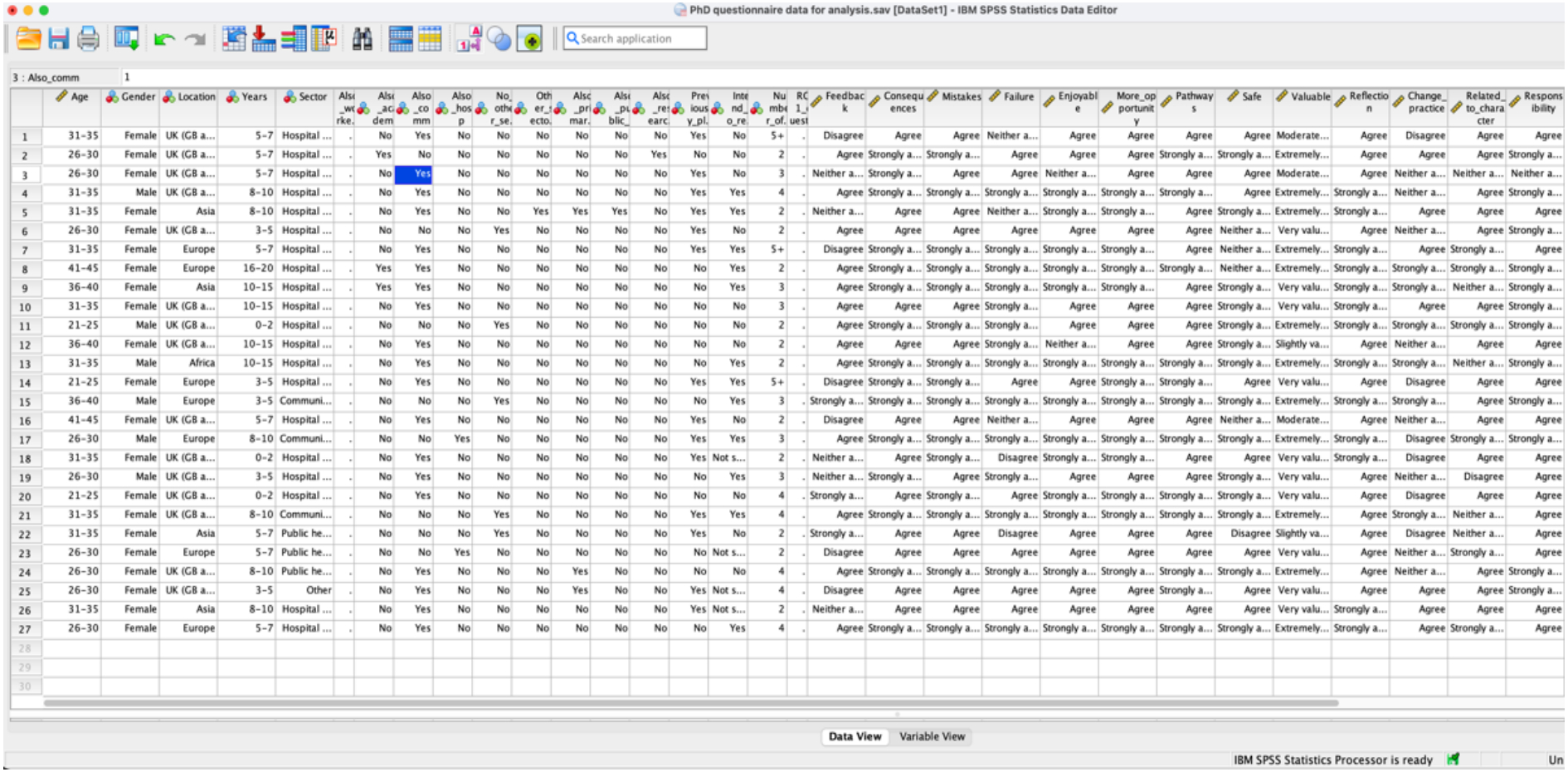


Figure 4.4 SPSS Data View screenshot demonstrating the organisation of individual participants' data.

In choosing how to analyse and present the Likert data I had a number of options (such as presenting as an overall average of agreement with the statement). However, this could cause reduction of the overall scale and would not capture the nuance of some of the corresponding free-text statements (Mavis et al., 2022). However, the general trend overall for ‘agree’ or ‘disagree’ presents the data in context within the qualitative in a simpler way that aids complementarity with the results. Therefore, I have included tables presenting the Likert-scale responses overall total with associated percentage for each point on the Likert scale in the findings chapters. When presented in conjunction with the qualitative data throughout the discussion I have provided an overall trend of agreement or disagreement to avoid minimise confusion (Austin & Sutton, 2018).

To test for reliability and internal consistency of the Likert-scale questions I performed a Cronbach’s alpha test in SPSS which also identifies any items demonstrating poor correlation with the other items (Peer et al., 2012). A value of 0.7 or more indicates high internal validity: that items are closely related and consistently and accurately measure the intended construct (Peer et al., 2012). A value less than 0.7 suggests inconsistency or ambiguity in some items. The overall alpha score is 0.89 (for detailed analysis see Appendix Six), demonstrating high internal validity and reliability and indicating they measure a single underlying construct (Peer et al., 2012).

Additional crosstabulation between questionnaire responses was performed where I observed potential themes merging (e.g. identification as linked to current area of practice) (Mavis et al., 2022). Whilst I performed a few additional crosstabulations none were shown to be statistically significant and so not explored in depth but have been used in the analysis to clarify emerging points. Relevant analyses are included in Appendix Six.

4.6.2 Qualitative Analysis

Qualitative analysis was carried out using NVIVO 14, a qualitative data analysis program used to organise, code and analyse unstructured data to facilitate the identification of patterns, themes, trends and insights (Cohen et al., 2017; Seidman,

2019). All qualitative comments from the questionnaires and interview transcriptions were imported into NVIVO 14 as PDF documents to ensure the integrity of the data throughout, and to prevent accidental amendment or deletion.

As this study employed Green and Jenkins' (2014) conceptual model of interactivity effects, deductive analysis of the qualitative data was performed using the pre-determined code categories (Saldaña, 2021). As the scope for coding the data was wide (incorporating all headings) I approached it a heading at a time to ensure I accurately identified responses as objectively as possible, to identify coding errors, and to refine my process whilst becoming familiar with the data (Austin & Sutton, 2018; Mavis et al., 2022). This also allowed me to ensure validity and reliability of the data (Austin & Sutton, 2018). Data was fully coded on the sixth review. As responses often corresponded with multiple headings this resulted in occasional overlaps. I then reviewed these further to refine, and either retain or remove, duplicate codes.

Once coding was completed I was then able to retrieve all the data related to each code in the relevant sections of the texts and review it all together within NVIVO, as recommended by Gibbs (2018). This allowed me to summarise the results from each code for presentation in the findings and discussion (Chapters 5-7). This also then allowed me to review the coding for accuracy, identify patterns and variations in my own coding as well as retrieve relevant illustrative quotes. An example of an excerpt of coding in NVIVO 14 is shown in Figure 4.5.

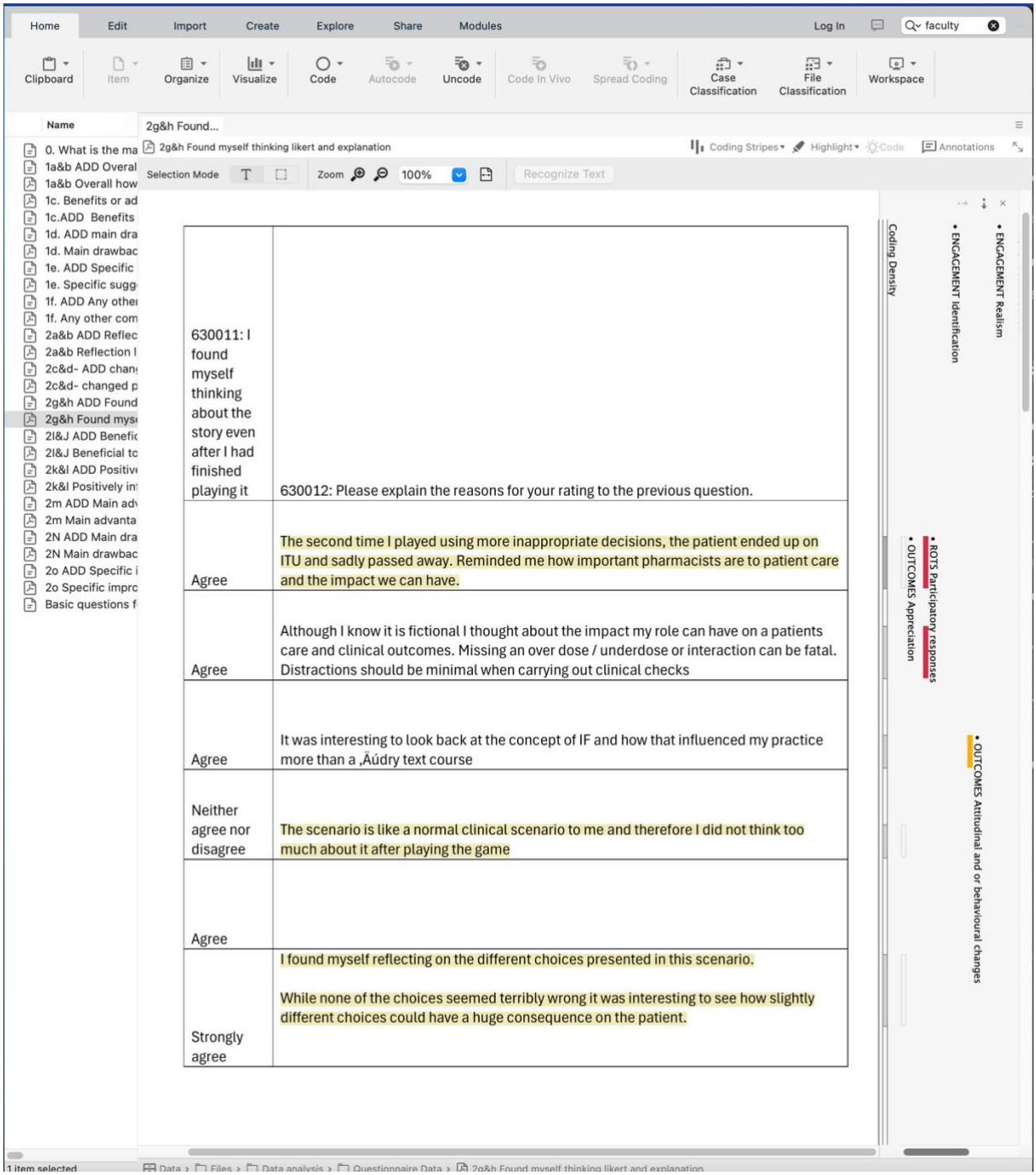


Figure 4.5. Example of the data coding as shown in NVIVO 14. The coding for "Outcomes: Appreciation" is highlighted

4.7 Ethical Considerations

Ethics approval was granted by Lancaster University Faculty of Arts and Social Sciences School ethics committee prior to study commencement (confirmation included in Appendix Five). Participant information leaflets were provided prior to study commencement. Signed informed consent forms were required for each data

collection method before participants could take part. Using a prewritten, standard script, I reconfirmed consent (including consent for recording) with each interview participant before commencement. Participant information sheets, informed consent forms, and the script for reconfirming consent are included in Appendix Four.

As all participants must also be registered pharmacists extra consideration had to be given to the potential for the students to (what is colloquially known as) “red flag” themselves (e.g. detailing an incident which may have resulted in patient harm). Students are made aware at enrolment that QUB has a duty to follow the regulations for both UK pharmacist registration bodies, and may be required to report unsafe or illegal practice, or anything that could cause disrepute to the profession (e.g. plagiarism, breaking patient confidentiality or causing actual patient harm). Such regulations do not exist for non-UK based students however, and so if any of these students raised concerns this would be discussed with the School of Pharmacy team, as is standard practice.

From a clinical standpoint there were potential risks in using clinical information that can differ between location (clinical guidelines, for example). QUB pharmacy DL students are informed on numerous occasions that all course materials are based on UK clinical standards and guidance. This was reiterated in the informed consent before being given access to the IF itself (Appendix Four).

Additionally, participants were making decisions in the IF that could become uncomfortable or cause distress. Likewise, if students chose a route leading to a poor outcome through a decision they would make within their usual practice, then this could also cause distress or discomfort. However, identifying such errors within this environment is preferable to in-practice. It is also my duty as a pharmacist to ensure patient care, and participants were required to try different options and make mistakes as a learning process. Students were free to discuss any concerns with me if they wished, as they would be normally, and were informed of this on the participant information sheet and informed consent forms (Appendix Four).

4.8 Summary

In this chapter I outlined my research philosophy and pragmatic standpoint which led me to the use of a mixed-methods design. I also described how the use of anonymous questionnaires complemented with semi-structured interviews could be used to gain meaningful insights to answer my research questions. This was followed by a description of the research context and participants. I included an outline of how I distributed and collected data from my questionnaires through the Pharmacy DL Hub, and subsequently analysed the quantitative elements in SPSS and the qualitative through NVIVO 14.

Chapter 5: Interactive Fiction and Academic Learning: Findings and Discussion

In this study I combine the findings and discussion to reflect the mixed methods structure, allowing me to more easily integrate my interpretation of the findings and the literature alongside the quantitative and qualitative data. There are three findings and discussion chapters providing a holistic insight into how the participants engage with IF as students (Chapter 5), professionals (Chapter 6), and through the complex intertwining of both identities (Chapter 7). Each chapter utilises the main headings of Green and Jenkins 2014 conceptual model of interactivity effects (Chapter 3) to provide structure. I present and discuss the data beneath the relevant heading, alongside the existing literature. As some pertinent findings lay outside the scope of the framework, they are included at the end of this chapter (5.4).

Whilst there is a relatively small number of participants a significant amount of data was generated that shows scope for future research, which I have highlighted within the appropriate sections and summarised in Chapter 8: Conclusion and further work.

Whilst I would like to give voice to every comment from participants it is not possible within this study alone. I have therefore selected representative quotations in combination with the quantitative data to give an overall view and a discussion of the trends and patterns. Interview participants are referred to using pseudonyms as described in Chapter 5.1. Questionnaire participants have been assigned a numerical identifier (e.g. P16 for participant 16) to ensure that quotes are attributable to individuals and as many views as possible are represented.

In this chapter I first briefly describe the study participants (5.1) then present and discuss the quantitative results from the questionnaire (5.2). I then complement this with the qualitative data relating to participants views on IF as a pedagogical tool (5.3) according to the relevant framework headings (and associated subheadings) of user control (5.3.1), narrative structure (5.3.2), moderator: individual differences (5.3.3), role of the self (5.3.4) and outcomes (5.3.5), offering a reminder of the definition under each. Pertinent findings that lie outside of the framework are discussed in 5.4. Finally, I summarise the findings for this chapter in 5.5.

5.1 Participants

All students enrolled on the pharmacy PG DL courses (a total of 250) were eligible to take part in the study and complete the questionnaire portion. To meet the ethical requirements of this study only those who had completed all their assignments and who were awaiting graduation (a total of 45) were eligible to take part in the interviews.

Although 55 students signed the informed consent form only 27 students completed the questionnaire (an overall course response rate of 10.8%). Nine initially volunteered to take part in an interview. Four did not respond to subsequent invitations therefore a total of five interviews took place. Interview participants have been allocated pseudonyms throughout this thesis, as outlined in Table 5.1.

Table 5.1 Descriptions Of Interview Participants

Pseudonym	Gender	Location	Area of practice	Other information
Penny	Female	England	Hospital	Specialises in mental health. Qualified for 5 years. Additional experience in community pharmacy.
Aisha	Female	Saudi Arabia	Hospital	Additional experience in community pharmacy and education.
Steven	Male	Scotland	Hospital	Specialist antimicrobial pharmacist and independent prescriber (practicing).
Maria	Female	Wales	Hospital	Renal specialist pharmacist. Newly qualified independent prescriber (not yet practicing).
Oonagh	Female	Republic of Ireland	Hospital	Based in the Emergency Department. Also has several years' experience in community pharmacy.

Although this number is small it reflects the general constitution of the course and the range and population of the enrolled students (Seidman, 2019) as shown in Appendix One. Participants were forthcoming in interview about what they liked and did not like, and their ideas for the IF itself. Interviews reached saturation: a point where all dominant themes were included (Venkatesh et al., 2023). Though I would have ideally liked to conduct more interviews this was sufficient for this research as, by the final interview, no new relevant insights were obtained (Seidman, 2019; Venkatesh et al., 2023).

5.2 Overview of the Quantitative Data

Participants were asked to indicate how valuable they thought IF could be in their studies as an overarching statement (Table 5.2).

Table 5.2 Overall, how valuable do you think learning through IF could be for your postgraduate pharmacy distance learning experience?

	Extremely valuable	Very valuable	Moderately valuable	Slightly valuable	Not at all valuable
	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)
Overall, how valuable do you think learning through interactive fiction (IF) could be for your postgraduate pharmacy distance learning experience?	12 (44.4)	10 (37.0)	3 (11.1)	2 (7.4)	0 (0.00)

The majority of participants stated that the IF could be very (37.0%) or extremely (44.4%) valuable in their studies, whilst 11.1% thought it had moderate, and 7.4% slight value. Encouragingly, no participants thought that it would not be valuable at all. Whilst no studies have asked students the value of IF in their academic studies, research by Mohammad et al. (2018) and Osae et al. (2022) reported that students found their simulation or CYOA effective for learning, as did Morningstar-Kywi and Kim (2021). Within each of these papers the participants reported increased decision-making confidence and ability through the use of realistic cases, and by allowing students to learn from their own mistakes.

Results from this study seem to be promising for PG students as participants responses were more positive overall than those form previous studies with UGs, as above. This could be as a result of the dual identities that the participants must adopt during their studies and is explored in more depth in Chapter 7.

Table 5.3 contains the data from the first section of the questionnaire which asked participants to consider their responses as learners rather than professionals (see Appendix Two for a complete list of questions).

Table 5.3 Responses to Questions Relating to Participants as Learners

Question		Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
		Number (%)	Number (%)	Number (%)	Number (%)	Number (%)
Q1	It was not immediately obvious that I was receiving feedback through the story narrative	3 (11.1)	13 (48.1)	5 (18.5)	6 (22.2)	0 (0.00)
Q2	Playing “Lady and Gent” made learning feel more enjoyable	13 (48.1)	12 (44.4)	2 (7.4)	0 (0.00)	0 (0.00)
Q3	I would appreciate the opportunity to play other interactive fiction games as part of my studies	14 (51.9)	13 (48.1)	0 (0.00)	0 (0.00)	0 (0.00)
Q4	I feel like I learned more from making poor decisions in the game than by making good decisions	14 (51.9)	8 (29.6)	3 (11.1)	2 (7.4)	0 (0.00)
Q5	I enjoyed being able to make bad clinical decisions in a safe environment	14 (51.9)	8 (29.6)	4 (14.8)	1 (3.7)	0 (0.00)
Q6	It was beneficial to see the consequences of my decisions in the story, even if they were not what I would do in real life.	15 (55.6)	12 (44.4)	0 (0.00)	0 (0.00)	0 (0.00)
Q7	Being able to make and learn from my mistakes in “Lady and Gent” was a valuable learning experience	15 (55.6)	12 (44.4)	0 (0.00)	0 (0.00)	0 (0.00)
Q8	Being able to choose different pathways helped me to understand that there can be more than one right answer	12 (44.4)	15 (55.6)	0 (0.00)	0 (0.00)	0 (0.00)

In retrospect, and despite piloting, the wording of Q1 (“It was not immediately obvious that I was receiving feedback through the story narrative”) may have been ambiguous. However, reliability (demonstrated by a Cronbach’s alpha of 0.89) of the overall questionnaire was not affected greatly if this item was removed (Appendix Six). However, most participants (59.3%) agreed that the provision of feedback was not immediately obvious in the IF itself, whilst 18.5% neither agreed nor disagreed and 22.2% disagreed. This perhaps demonstrates that the intended feedback within the story was not clearly communicated, as detailed in section 5.3.2.2. However, it may also underscore the variety of perceptions regarding what constitutes effective

feedback between students and educators or even students themselves (Bevan et al., 2008; Hattie & Timperley, 2007; Manduoit & Hattie, 2023).

Almost all participants (92.6%) agreed that playing through the IF made learning more enjoyable (Q2) and no participants disagreed, indicating the potential value in making studies more interesting and increasing engagement. This is discussed in more depth in 5.3.5.1.

All participants (100%) agreed that they would appreciate the opportunity to play IF as part of their studies (Q3) regardless of whether or not they found that it made learning more enjoyable (Q2). This shows IF's values in different ways, as if student engagement increases then learning will also proportionately increase. This finding reflects that of other authors such as Benedict (2010), Benedict and Schonder (2011) and Vadiei and Lee (2022) who all reported their students valued the inclusion of similar learning tools in their courses.

5.2.1 Learning from Failure

Whilst the majority of participants agreed they learned more from making poor decisions (Q4: 81.5%) or that they enjoyed this process (Q5: 81.5%), all participants (100%) indicated that seeing the consequences of their decisions was beneficial (Q6) and a valuable learning experience (Q7). These findings are emphasised by the Q8 in which all 100% participants agreed that playing the IF showed there can be more than one right answer. Whilst the reasons for this are explored throughout the remainder of the chapter, this data is useful in establishing that making errors in the IF was valuable to their studies even if it was not necessarily an enjoyable experience. Morningstar-Kywi and Kim (2021) reported UG pharmacy students also found their IFs useful for learning from mistake and error. Beyond IF, students perceive "their own errors to be highly instructive and…factors such as a sense of responsibility and emotional response influenced the educational impact of these errors" (Klasen & Lingard, 2019, p.1263). It appears that this study also demonstrates that IF could be one way in which this learning could be effectively facilitated.

5.3 How Pharmacy PG DL Students Engaged with IF as a Pedagogical Tool

In addition to rating the extent they found the IF valuable for their studies through Likert-scales (Table 5.2) participants were asked follow-up open questions to explain the reasons for their rating. All participants who rated it slightly or moderately valuable were relatively experienced (all between 5 and 15 years qualified) and comments indicated it was less applicable to their learning needs (e.g. P1: “I think this would be good for pharmacists with less experience to apply clinical knowledge, for myself who is a prescriber and experienced with this kind of scenario on my wards it is much less useful”). This perhaps demonstrates that they were focusing more on the clinical content of the IF rather than the interactive mechanism as requested, or that they require more challenging scenarios to match their experience level.

A total of seven participants expressly commented on how long it took to play the IF, with five specifically using the phrase “time consuming”, particularly as they need to balance work, study, and personal lives, demonstrating the tensions that exist between the participants identities (discussed further in Chapter 7).

To explore its value further each semi-structured interview also opened with a question on general impressions of “Lady and Gent” to which all interviewees responded positively, saying that it could be useful for their studies, and (of their own volition) offered additional topics which they thought could add value to future iterations. Some, such as Aisha, expressed surprise at how interesting she found it stating:

> *“I did not expect it to be this engaging, to be completely honest. So I was invested. Like, by a couple of slides in and I’m invested in the patient: I want to know what's going to happen.”*

Whilst all participants – questionnaires and interviews – stated the IF had pedagogical value it was important to identify specific areas where they felt it was useful as well as where it wasn’t to obtain a holistic view of its place in their studies. Though some participants’ responses echoed that of P27 (“nothing coming to mind.

I'd be happy to see it included") many gave quite detailed, nuanced and insightful answers.

5.3.1 User Control

User control encompasses both how players can make decisions that affect the direction of the plot, and the level of agency they feel whilst doing so.

Eight participants referred in some way to the number of options available, suggesting that one of the biggest downsides was that there were "limited options to press" (P16) within the scenario, and that sometimes the option they would have chosen was not available. Penny reinforced this during her interview: "I would say there's probably times at which I wanted to sort of say something that wasn't one of the options". This perhaps demonstrates a point of tension in differing opinions between the IF, the IF creator, and the player.

Whilst using virtual patients, variations in student choice of response may be less of a problem as the patient can 'respond' and adapt according to what the student says, even if that comment is not programmed into the scenario (Kayyali et al*,* 2019). With IF this function is lesser as students must follow the storyline only, removing some of the sense of agency that contributes to impactful learning and engagement (Mott et al., 2019; van Enschot et al., 2019).

Indeed, overall the participants expressed a desire to exercise more agency within the safety of the academic IF environment and to explore potential outcomes. However, whilst increasing agency could provide the ill-structured stories that are more reflective of reality it can also introduce different issues. For example, increasing the level of user control creates highly complex IF structures that can become overwhelming and actually reduce the effectiveness of learning (Green & Jenkins, 2014). This also results in an increase in the cognitive effort required to make decisions as students must process information more quickly to respond effectively. Increasing complexity could also therefore result in more time-consuming IFs resulting in students' frustration and eventual abandonment of the learning.

Therefore, a balance must be struck between the level of agency that can be offered and the learning outcome.

5.3.2 Narrative Structure

Within the framework, narrative structure refers to the plot or story within IF itself. In considering narrative structure I also decided to consider the additional themes and topics of narratives participants often suggested would be useful.

5.3.2.1 Limited Scenarios and Applicability

Respondents generally thought that IF could only work as a complementary learning tool rather than replacing any of the learning materials, and “probably only be used for a few highlights” (P23), or that “from the example provided, I don't see how it would be useful for an MSc” (P12).

Relatedly, participants commented that “not every topic would necessarily be able to use this format as not all can have such black and white options (P20)”. This is echoed by P25 who thought IF would be “limited to simplistic scenarios to keep playable so not all real life options would be covered”. This may indicate a key difference between UGs – who are represented in the literature, but are restricted to their academic knowledge – and PGs – who are not represented and come armed with knowledge beyond the HE institution. Through experience PGs are aware that there are other options, or have an awareness of the clinical factors with a specific patient that may raise questions to allow them to consider other options at the very least.

Reservations about IF use were in a minority however, and most participants actually suggested providing more stories (reflecting the overwhelmingly positive results of Q3)[12] as well more complex IF, “adapting it to different clinical topics as well as medication governance or pharmacy practice topics” (P5) so that they could apply their learning and “actually make us feel more like we absorbed it” (Aisha).

[12] Q3: I would appreciate the opportunity to play other interactive fiction games as part of my studies.

Indeed, whilst some believed there could not be universal applicability some – like Maria – also responded with a specific topic they would like to see covered, demonstrating that others were able to see the potential more fully:

> *"Anything mental health or central nervous system. I was awful in that…. There are so many drugs. There are so many interactions. I think that really would have helped."*

The literature however shows that there is a wide range of applications for IF (see Chapter 2.3) that demonstrate benefits from provoking deeper reflection, covering grey areas and exploration of alterative viewpoints (Pérez Miles & Jenkins, 2017). Indeed, Miller (2014) reiterates the potential wide-reach of IF as stories "can be about almost any topic…although they work best when the plots call for you to be active, to explore, and to make things happen" (Miller, 2014).

Morningstar-Kywi and Kim (2021) have also used IF in 14 different clinical scenarios (Chapter 2.3), stating that anything involving decision-making could, in fact, be turned into IF. "*The Brewsters*" (Spike et al., 2012) explores ethical decision-making in healthcare and is also a useful example of how IF can be moved outside the clinical arena. The diverse application of IF in other disciplines (see Chapter 2.3) such as resource management (Kowald & Burns, 2019) and religious studies (Brooke-Lester, 2018) also demonstrate multiple cross-disciplinary applications. Although the participants were not able to readily imagine the potential applications, the context of this research and the previous literature demonstrate a plethora of uses and, given the breadth of applications, a potential mechanism for interprofessional and interdisciplinary collaboration that could warrant further research.

As demonstrated by Branan et al. (2023), exposure to complex, ambiguous, poorly structured cases at UG level deepens clinical understanding. It may be that the PG cohort's practical experience with such cases beyond academia may explain their enhanced retention and recall. For UGs the application of clinical knowledge, decision-making and consequences are abstract: the patients are not real and their actions have consequences only in the classroom. For PG students however the

learning is more contextual, and therefore the lesson that is learned may have added weight. This suggests that IF may help to improve retention and recall to a greater extent than shown by Benedict et al. (2013) with their UG cohort as the value to PGs is different. Knowledge, for PGs, nestles into a pre-established body of expertise and experience, possibly enabling them to make connections to reality and integrate new information more effectively. This may present areas for future research.

5.3.2.2 Feedback

Whilst feedback was folded into the dialogue and plot in the IF the results from Q1[13] seem to indicate that participants were not always aware that they were receiving any, and this was frequently mentioned by participants as an area for improvement.

Participants often suggest the IF's value could be increased by adding “an option at the end for showing the preferred choices in the patients care and the reason behind the choice” (P7) or a summary of the 'correct' pathway. Interestingly, no questionnaire participants responded that seeing *all* pathways would be useful, suggesting they primarily want to know what to do, rather than knowing what *not* to do and perhaps avoid a poor mark (Flynn & Hardman, 2019; Morningstar-Kywi & Kim, 2021). Only after Steven requested to see the story within Twine did he suggest that it would be useful to demonstrate how complicated healthcare could be, which is discussed further in Chapter 7.1.2.

These responses hint that participants focus on 'correct' answers to allow them to achieve better marks rather than learning about all outcomes or self-reflecting on their own errors or failures. While most simulations and branched narrative games in the literature provided extra feedback immediately when students made poor decisions throughout the game (Benedict & Schonder, 2011; Benedict et al., 2013; Kiles et al., 2021), Morningstar-Kywi and Kim (2021) allowed students to make errors without interruption on first playthrough, but provided each student with individualised feedback and a summary of their individual pathway. This required some extra input from colleagues in computer studies but is actionable and, again, would also provide a mechanism for interdisciplinary research. This also has the

[13] Q1: It was not immediately obvious that I was receiving feedback through the story narrative.

benefit of letting students explore and find out for themselves without interruption to the narrative that may be invoked by pop-ups with feedback, for example.

5.3.3 Moderator: Individual Differences.

This refers to how individual differences between players, such as cognitive traits and technological comfort, moderate how they engage with and are influenced by the IF.

5.3.3.1 Need for Cognition

Need for cognition describes the extent to which players enjoy engaging in effortful cognitive activities.

5.3.3.1.1 Applied Knowledge

One of the biggest benefits that participants highlighted was that playing through "Lady and Gent" gave them an opportunity to apply – and to practice applying – their knowledge and decision-making that is applicable to all levels by using "simplistic examples and…some complex clinical scenarios" (P 4).

It was interesting to note that IF may have afforded some longitudinal benefits for recalling and applying their knowledge as well.

> *"I think because…for example, I can think back to that scenario now, whereas I can't remember the textbook page… And I think also, y'know if you did play it and you get the bad scenario and you do unfortunately kill a patient, I think that sits with you as well and you think "right. I'm not going to do that again"". (Maria)*

Yet, whilst it tested their knowledge it was more valuable than current module tasks "because the assignment part: I feel like you're disengaged" (Aisha). Oonagh echoed this saying the IF would be valuable at "at the end of a module…you'd kind of like apply what you've learned during the module" but also added that the real value was in "things like problem solving skills or decision-making as opposed to the material itself".

This reinforces some participants' responses indicating they enjoyed the increased effort of making decisions and navigating the IF, more so than what is required in current learning materials or assessments. P18, for example, stated: "it made me search for the right information to take the right decision". This appears to indicate an appreciation for a higher level of cognitive engagement than what is achieved by simply working through the module material, echoing the findings in similar IF studies (for example, Benedict et al., 2013; Kiles et al., 2021). Benedict (2010) also found that their students found the CYOA intellectually challenging, whilst Benedict and Schonder (2011) found that the students reported that the CYOA allowed them to apply their knowledge.

5.3.3.2 Transportability

Transportability – the ability of the story itself to make the reader feel as if they are part of the action – also seemed to be valuable, particularly for participants who were not UK-based.

All students on QUB's pharmacy DL courses are advised at the beginning of their studies that the content is centred on UK practice even though it is open to students worldwide. Aisha is based in Saudi Arabia and explained "we were told to imagine ourselves in a UK environment…Maybe this would have helped me while I was doing it… Even I'm thinking like how it would have affected me as a student in the past couple of years". However she also stated that – as she was a hospital pharmacist – "I think if it would be a different environment… I think I wouldn't have gotten into the story as much". In this way she said that it helped her process the course materials more effectively.

Similarly to a general suggestion for more IF, over half of participants indicated a desire to try out scenarios. Suggestions included different areas of academia (e.g. research methods), specialties (e.g. neurology), or sectors (e.g. primary care or community). Responses indicated it may also have been useful to help answer assignments based in a specific area of practice. For example, one assignment requires students to design a research protocol in primary care, which many

students may not be familiar with. Penny stated that completing the IF prior to this would have given her “an appreciation of how the different pharmacy professionals kind of fit in together, and what they do across the sectors. Like a helpful insight”.

Transportability is closely linked to transportation[14], and literature indicates that a higher degree of transportability is a predictor of higher transportation (Bilandzic & Busselle, 2008) which is in turn linked to an increase in attitudinal and behavioural changes (Green & Jenkins, 2014). This would seem to indicate that, through transportability, the IF has the potential to produce changes in educational practice through enhanced understanding of concepts, areas of practice or processes. This may allow students to more effectively understand detail in assessments (for example), or to understand and apply the knowledge gained through learning materials.

5.3.3.3 Comfort With Technology

Comfort with technology refers to the player's ease and proficiency in navigating the IF.

No participants reported any issues with the operation of the game itself, despite only receiving limited instructions on game control, perhaps demonstrating a high level of comfort with the concept as presented. Beyond asking if players found the games easy to navigate (e.g. Morningstar-Kywi & Kim, 2021) most papers do not specifically investigate how it was deemed as such. However, as this IF is essentially presented as a website, I would not have expected many issues relating to comfort with the technology.

A common suggestion for improvement related to the integration of other technology, such as artificial intelligence and voice or video interactivity, to increase realism and interest and to break up the text-heavy format. This could, however, potentially start to blur the lines between IF and simulation as simulation (as delivered online)

[14] Transportation: the feeling of the degree to which players become mentally and emotionally absorbed into the narrative and is often most easily described as being ‘lost in the story’. Transportability is the degree to which the reader is able to feel like this could occur.

generally relies on more resource intensive gaming elements. There is scope, however, to introduce more interactive elements that can be coded within Twine itself such as timed decision-making (to replicate the pressures of working in a dispensary), or dice rolling, which could effectively replicate the chances of a doctor deciding whether they take your advice on board, as just two examples (Cox & Klimas, 2024).

Unexpectedly, participants also commented on concerns around accessibility options and the maintenance of the IF itself, despite no reports of any related issues. P3, for example, cited “technical challenges:… accessible across different devices, and free from bugs…Ongoing technical support may be required”. Maria also expressed this as a concern:

> *“I’m all for online stuff. I just obviously don't know what goes on behind the scenes…If you've got any bugs and glitches, I suppose you need that technical team behind you to kind of iron out all the kinks.”*

Steven however also saw the benefit of producing a simulation-like activity that avoids the time and resources required in simulation production. "It’s not as, I suppose, physically demanding. I suppose you don't need to have a fake ward and you can do it in your own time. So, I suppose for students that's really invaluable”. It was interesting to see him balance up the benefits for students with the demands on lecturers so that it would result in the best outcome for both.

In addition to their own time, participants also commented that creating the IF would be time consuming for lecturers and require maintenance or development costs. Although similar cost and time issues were widely documented in the literature (e.g., Bernaitis et al., 2018), I noted no comparable concerns expressed by participants in those studies as were observed here. It would also be interesting to discern if this concern for academics’ time and resources is primarily at the PG level, or if this was also a concern for UGs.

Other suggestions included making sure the content was accessible and translatable or suitable for screen readers (Maria: “Could it be bilingual? … could have it like

audio descriptive. So for example, you've got somebody who maybe obviously is blind or struggles reading or just wants to plug it in their ears. You've got them reading out the words"). However this function is already available through usual screen readers as the IF is essentially presented as a website and simple testing with a desktop reader (through Apple's inbuilt accessibility options) proved successful.

Technological issues in particular can affect students learning through an entirely online, DL, and asynchronous course. However, I was still surprised by the number of comments relating to accessibility as I had expected participants to concentrate on the contents rather than the mechanics. Research indicates that even minor issues can disproportionately impact experiences, potentially leading to significant drawbacks and reduced engagement, which would be a large drawback alone (Benedict & Schonder, 2010). Suggestions for the integration of more complex technology suggests comfort in IF's use as it stands.

5.3.4 Role of the Self

Role of the self refers to how the player perceives and expresses their own identity within the IF and is influenced by their own personal characteristics, experiences, decisions, and emotional responses.

5.3.4.1 Possible Selves

Possible selves refers to the different identities or roles that players may adopt in the IF. They may choose to take the path they would normally and stay true to their selves, or explore other more riskier decisions.

As can be seen from Q6 all participants (100%) agreed that being able to see the consequences of their actions in the game was beneficial to their learning experiences, even if this was not the actual course of action they would take in practice.

By asking participants whether they found that the ability to learn from their mistakes was a *valuable* learning experience we can offset the effects of whether or not it was

enjoyable in Q5 (as enjoyable does not always mean valuable for learning, and vice versa (Pope, 2010)). Whilst some people inherently enjoy being able to explore their other possible selves others do not, but participants generally agreed that they learned valuable lessons.

Though no questionnaire participants stated outright that they enjoyed playing as their other possible selves in response to this question – perhaps again, due to the fear of the consequences associated with making errors (Hamm, 2018; Smith et al., 2024) – a number of different answers hinted at it. For example, rating it "extremely valuable" P7 "liked the fact that you could choose different options and could see the consequences for the decisions made".

The benefits of conducting mixed methods research was especially useful in establishing the role of possible selves in students' learning. In posing questions like Q4, Q6 and Q7[15] we can ascertain *if* participants saw these as benefits, but in asking open questions and exploring this more in interview we can really ascertain *how* it is beneficial.

Reflecting the mixed responses to questions Q4, Q5 and Q6[16] (though mostly positive) respondents cited concern at making poor decisions, and considered it a drawback in the IF. Steven also expressed initial discomfort with the idea of deliberately making errors – which may reflect the risk-averse nature of pharmacists (Cox, 2020) – and echoed other participants' worries that they were being monitored or would receive bad feedback:

> *"I think it was nice because you didn't feel like you had to get the answer wrong. So actually there was a curiosity in terms of "I know this is wrong but I'm just going to click it anyway to see"… And definitely once you feel more comfortable - and once I was happy that Queen's wasn't going to steal my*

[15] Q4: I feel like I learned more from making poor decisions in the game than by making good decisions – 81.5% agree. Q6: It was beneficial to see the consequences of my decisions in the story, even if they were not what I would do in real life – 100% agree. Q7: Being able to make and learn from my mistakes in "Lady and Gent" was a valuable learning experience – 100% agree.
[16] Q5: I enjoyed being able to make bad clinical decisions in a safe environment. See previous note for Q4 and Q6.

certificate away - I was like, I'll just, y'know, I'll be thinking about someone in my head. Like, "I wonder how they would do it?""

In the ensuing discussion, he described the experience of deliberately making mistakes and playing as someone else as being valuable. This approach aided in understanding and reflecting on both his own and other peoples' processes and decisions, and helpful to see where one wrong turn could affect, for example, the course of a whole assignment.

Whilst Penny stated that the IF was advantageous for seeing potential pathways she was also very clear that she did not find that enjoyable.

"I could see that obviously there would be different pathways, but some of them I just wasn't willing to pick a different answer….I just knew that picking it would have definitely meant a bad outcome. So I was like, "nope: not doing that"."

This seems to indicate that there is still a level of discomfort around trying out different decisions, and a fear of failure itself even if that failure is only known to the student. Oonagh also stated in her interview that she hated making mistakes and that – whilst she could see the value in it – it was not an enjoyable experience for her.

Whilst it's reassuring that pharmacists are cautious, their reluctance to explore errors – even when unmonitored and expressly instructed to do so – may reflect a fear of reprisal that speaks to the nature of pharmacy education and even to pharmacy practice itself. This hesitation also poses challenges for research in this area, as well as impacting on their potential learning experiences. This observation alone may present numerous potential areas for future research across various disciplines. For example, it may be beneficial for students to adopt the role of another healthcare professional, or to become a patient who has spotted an error with their medication, and explore the consequences of these scenarios.

When looking at the evidence in the literature of the grave consequences of mistakes or errors however (including criminal prosecution, see Chapter 1.4) it is perhaps understandable that this fear exists. Nevertheless, it is interesting that participants (especially Steven, in this instance) seem to have suppressed their willingness to explore error in the fear of being observed while making wrong decisions or errors.

Perhaps a little contradictory to this was that the ability to take risks and see potential outcomes was also stated as one of the benefits of IF to participants' studies in response to Q6[17]. This ties in with the recommendations of Smith et al. (2024) that embracing learning from errors within pharmacy "helps learners to frame error as an essential part of the learning process, and therefore reflect on their mistakes to improve their consultation skill" (p.421).

As we can see from the literature, making errors is often seen as ego threatening (Martin, 2012) and can be detrimental to students learning (Smith et al., 2024) as well as to pharmacists' clinical practice (Ferguson, 2015; Hamm, 2018). By asking participants to pick multiple different paths in their playthroughs it was hoped that this could remove the ego threatening nature, however this doesn't seem to have been effective for all. This may again speak to individuals' preferred learning and comfort but is worth exploring further in future studies.

5.3.5 Outcomes

Outcomes refers to the overall effects from making decisions in the IF and may include changes in attitudes, beliefs, or behaviours.

5.3.5.1 Enjoyment

This refers to the degree in which players enjoyed engaging with the IF and the story itself.

[17] Q6: It was beneficial to see the consequences of my decisions in the story, even if they were not what I would do in real life – 100% agree.

Throughout the questionnaire and interviews participants consistently stated that using IF was a more enjoyable and engaging approach to learning, especially compared to the current presentation of their learning materials. They also indicated that they would be more likely to complete the module materials if presented in this format. As just one example P9 commented that they “really enjoyed it and I believe it would be a good addition to the modules curriculum as a fun way for distance learning students to engage with their studies and a change from the traditional way”. They continued, saying it “compounds the purpose of why you're learning and how the knowledge you're gaining can be applied in the real world”: a theme that will be explored more in Chapter 7.

In analysing how participants found it enjoyable, the interactivity itself was cited as both fun and advantageous and meant they would be more likely to complete case-studies if presented as IF (Benedict, et al., 2013). P21, for example, responded: “I find that the interactive part keeps me interested, and it doesn't feel like learning as it is fun”. This was reiterated by Oonagh:

> *“I suppose if you compare it to our current Queen’s modules. They’re like big lectures, and you go through them, which – y’know, has to be done - but I think if there is something like that? …I think if it was something like an interactive game, I'd definitely find it a lot more engaging. And I think you'd probably be more likely to do it.”*

Most participants (81.5%) reported that they even found enjoyment in making ‘bad’ clinical decisions to varying degrees (Q5), adding to the overall enjoyment of the IF within their studies. This reflects the findings of Morningstar-Kywi & Kim (2021) in their research with UG students. However, it was also interesting to note that even those that did not find the failure aspect enjoyable reported that they found it useful (P22 for example, stating “The very negative outcome where patient died was quite morbid and serious”).

Enjoyment also came to the fore in the interviews, where participants generally became a little more animated in their discussions when asked how they found the IF in general.

"If I am comparing it to the normal assignment format that we had previously, this was definitely more fun… I was sleepy, y'know, but it got me engaged. Like, "Ohh no, I want to see how…" and then I went back. "No, I want to know how this is gonna go through! I want to know how this is gonna go through, and I want to do it again…but I was like, happily involved. Since I was engaged, and I felt like I have to do something." (Aisha)

This is reinforced by the overwhelmingly positive response to Q2[18]. This alone could prove advantageous, as students that are more engaged have been shown to learn more, and more effectively (Barnett et al, 2016). For educators of DL students such as myself, this potential for increased engagement could provide reassurance in the absence of face-to-face interaction. This may be especially useful when there is limited evidence of how students engage with learning materials or apply their knowledge beyond formal assessments, discussion forum posts, or email inquiries. More traditional methods (e.g. large scale, didactic lectures, or whole course webinars) may not translate well to effective engagement in DL situations, especially as they are usually conducted within students' personal time. IF may provide an alternative for some of these situations.

These findings tie in with the literature on IF where UG students generally find the IF more engaging and enjoyable than didactic lectures, for example (the equivalent of which in an asynchronous course may be written learning materials or pre-recorded videos) (Morningstar-Kywi & Kim, 2021; Litten & Stewart, 2023) and more enjoyable in general (Bernaitis et al, 2018; Kiles et al., 2021; Osae et al, 2022).

5.4 Non-Framework Elements

Green and Jenkins' 2014 conceptual model of Interactivity effects was developed as a way to explore the educational value of IF, not as a pedagogical tool. It therefore stands to reason that some responses would not be codable through the framework

[18] Q2: Playing "Lady and Gent" made learning feel more enjoyable – 92.6% agree

and so I have included these here. The framework is not under investigation in this research, and I did find it extremely valuable in analysing, presenting and discussing the data. These non-framework elements perhaps show areas for development of the framework itself. They may be useful for researchers considering its use, or perhaps suggest future areas that could be incorporated if used for pedagogical purposes.

5.4.1 Providing Structure for Self-Evaluation of Learning

Participants reported that the IF provided structure for evaluating their own learning and pinpointed areas for development. I have classified this differently to appreciation – the degree to which participants reflect on their choices – as participants are not necessarily reflecting on their choice itself, but that their knowledge has been identified as insufficient regarding which choice to make. In Maria's case she suggested the IF would be a useful way to build and test her own knowledge of evidence-based decisions. Likewise, P14 stated that the IF is beneficial for their learning by "using what you've learned to make sure it is retained and understood, and if you don't understand, the feedback from the game still shows you consequences to help you look up why your decision may not have been optimal".

This also suggests that using the IF provided a way for participants to reflect on their own academic strengths and weaknesses in *how* they are learning to identify specific areas where IF would be beneficial. It also indicates that IF may potentially add value to their learning, reflecting the findings of Benedict and Schonder (2011), who also reported that students believed that more CYOA should be incorporated into their teaching.

5.4.2 As Formal Assessment

A significant minority of participants suggested that the IF could be used instead of current assignments or assessments in the course. Whilst this seems to indicate that students still focus on assessment, they are actually suggesting a different *kind* of assessment and associated learning. Assessment would give them only one chance

to complete the IF and the completion requires application of multiple skills. To complete it successfully students would need to read, review and have a deeper understanding of clinical knowledge, critical thinking and clinical reasoning skills. This would, however, more accurately reflect what they are doing in their clinical practice and give them a more authentic experience. This also ties in with their statements that they found it enjoyable (5.3.5) and that they would like to complete more engaging and complex tasks such as this in their learning materials.

One type of assessment in the UK is known as the situational judgement test[19], and IF was proposed as "aptitude testing or part of the recruitment process for people who may not be fully familiar with, y'know, the way the healthcare works…I think it's really valid for any stage of study from undergraduates to, you know, foreign students, postgraduates, IPs" (Steven).

Another way in which it could be incorporated is to set an assignment that requires students to design and develop an IF themselves. This would be resource intensive and require a lot of training if they were to produce a whole story. There may, however, be scope to develop a proforma that could then be completed by the students, or they could work in groups to develop it.

5.4.3 Group Work and Development of Community

There is little student-student interaction in the DL courses – either formally or informally – and participants suggested that "with IF use it will be possible to promote students' cooperation and discussions" (P17) through both small group work and in large webinars.

Interview participants in particular became inventive in this area, providing many interesting ideas including multiplayer options (where students take on the role of different characters within the story and must respond to the others' decisions to reflect usual experiences), working together to solve complex cases (including interprofessionally), and using IF as a debating platform or to develop teamworking

[19] Situational Judgement Tests are used more extensively in medicine and assess practical decision-making in realistic scenarios.

skills in a safe environment. However, depending on the steps taken some of these may turn into role-play rather than IF and care would have to be taken to maintain the format.

Indeed, this was proposed by Aisha, who became more involved and animated in this idea during the interview. Although she stated that she finds it “nice with the freedom to do all my mistakes myself” (again suggesting a need to maintain professional integrity) she also thought that “if it's a bigger or a more complex story then maybe it can be done in, like, groups. You know like there would be a discussion group and then three or four people they can be like, “we have to troubleshoot this””. However, she did state that for more simple cases, such as in Lady and Gent, “it couldn't have handled more than one person at a time.”

Aisha also suggested that integrating Mentimeter[20]® could be a way to introduce group work and increase engagement to the course and as a way for students to come together to learn and share their experiences:

> *“but the answers will be anonymous so that everyone will not feel like “oh everyone knows I did a mistake”. But the same time everyone will get their own results”*
>
> *[Like the freedom to write what you think, rather than what you* think *you should think?]*
>
> *Yeah, exactly, exactly.”*

It is notable that Aisha also wanted to preserve her professional face/integrity– to act as a student whilst maintaining face as a professional - so that she would not be judged for not knowing something even while working in groups.

[20] Mentimeter (https://www.mentimeter.com/) is a platform used to create interactive presentations, polls, and quizzes to engage audiences in real-time.

It was interesting that participants suggest groupwork as this is often how the IFs were used in the existing research at UG level (Mohammad et al., 2017; Morningstar-Kywi & Kim, 2021), although Bernaitis et al. (2018) found that students considered it to be more suited to individual work. Considering that both approaches have been used and have been well accepted and evaluated in the literature, it may be worthwhile to consider embracing both approaches for PG pharmacy DL students. This would provide them with opportunities to work together, but also to develop individually depending on the module, the topic, or their individual learning needs.

5.5 Summary

In this chapter I presented and discussed the findings relating to the participants as students and in the context of the existing literature. I have also offered my interpretations of the data and suggested areas for further research. I now provide a summary of the findings.

Overall, the findings were positive. Participants indicated that they considered IF to be a valuable pedagogical tool that could be incorporated into their academic learning, suggesting the integration of more IF in various topics throughout the course. IF was considered an enjoyable (but complementary) way to safely learn from the consequences of their decisions, apply their academic learning, and reinforced the ambiguous nature of patient care, highlighting there can be more than one right answer. Whilst a small number of participants stated that they did not enjoy the process of making poor decisions (deliberately or otherwise), they reiterated that it was, nevertheless, a useful learning experience, and the safe environment was beneficial in learning to apply their knowledge.

Participants suggested multiple different ways in which it could be of further benefit including more complex cases, ethical decision-making and in learning about other sectors of pharmacy to give a deeper level of understanding. They also suggested using it for assessment purposes and as group work to develop a sense of community, working together to deal with complex clinical cases. This was

considered an addition to solo use, noting that it would be not be a complete substitute for existing materials.

Whilst they found many positives they also found some drawbacks, particularly around the level of overt feedback provided, the number of options that were presented, or did not consider it to be applicable to all aspects of their PG studies (e.g. research design). More experienced pharmacists were less likely to find this scenario challenging, and all participants suggested more complex and intellectually challenging situations. A number of participants also expressed concerns around ensuring the IF was accessible and available in multiple languages, and that it was maintained well.

Whilst these findings reflected the literature on IF they appear to go beyond that of what was found with UG students as, with the benefit of experience, suggestions for improvements were possibly beyond UG perspectives. For example, participants suggested adding more options to the scenarios, based on what they do in practice. They also suggested that academic learning could be improved by making it more authentic, enabling them to apply and grasp poorly understood concepts in realistic contexts. Indeed, it seems to have had a greater impact on PG students perhaps because they are already performing these tasks making their application less theoretical and abstract than it might be at the UG level. This is discussed further in Chapter 7.

A tabular summary of the findings according to the framework headings is included in Appendix Seven.

Chapter 6: Interactive Fiction and Professional Practice: Findings and Discussion

This chapter presents and discusses the findings from this research in relation to the use of IF as a learning tool in PG pharmacy DL students' professional practice, particularly regarding reflection and how this can affect their clinical practice.

The findings and discussion for this chapter are presented similarly to that of Chapter 5. I begin with a short overview of the quantitative questionnaire data (6.1) including a short discussion of how reflection through IF can affect clinical practice (6.1.1) and decision-making abilities (6.1.2). I then present the qualitative responses (in conjunction with the quantitative) on IF as a learning tool for professional practice (6.2) according to the relevant headings of Green and Jenkins (2014) conceptual model: moderator: individual differences (6.2.1), engagement variables (6.2.2), role of the self (6.2.3), and outcomes (6.2.4). Each heading also includes the relevant subheadings from the framework, and I offer a definition of each under each subtitle as a reminder. I end with a summary of the findings for this chapter (6.3).

As per Chapter 5, participants have been allocated either a participant number or initials. Descriptions of the interview participants can be found in Chapter 5.1.

6.1 Quantitative Responses to the Questionnaire

In the same way that IF's value to participants in their studies was ascertained in Chapter 5, it was also necessary to ask participants if they found the IF could be beneficial to their professional practice (and in what ways) through Likert and free text questions, and semi-structured interviews. Table 6.1 contains the responses to the relevant Likert-scale questions from the 27 respondents (see Appendix Two for all questions). As these questions form part of the overall questionnaire the numbers are sequential to that in Table 5.3 Q11 shows that only one participant (2.7%) disagreed that IF could be beneficial to their professional practice.

Whilst research into the use of IF has not been conducted with PGs in the literature Morningstar-Kywi and Kim (2021) demonstrated that IF helped UGs develop their decision-making skills. Additionally, faculty staff involved in delivering the teaching

within the study considered it to have aided in real-world application of knowledge for their students.

Table 6.1 Responses to the Questions Relating to Participants as Professionals

	Question	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
		Number (%)	Number (%)	Number (%)	Number (%)	Number (%)
Q9	I found myself thinking about the story even after I had finished playing it	10 (37.0)	15 (55.6)	1 (3.7)	1 (3.7)	0 (0.0)
Q10	As I played "Lady and Gent" I reflected on elements of my own professional practice	13 (48.1)	14 (51.9)	0 (0.0)	0 (0.0)	0 (0.0)
Q11	Overall, I think my experiences through playing "Lady and Gent" were beneficial to my professional practice	10 (37.0)	15 (55.6)	1 (3.7)	1 (3.7)	0 (0.0)
Q12	Overall, I think my experiences in "Lady and Gent" could positively influence my decision-making abilities in my daily practice	9 (33.3)	16 (59.3)	1 (3.7)	1 (3.7)	0 (0.0)
Q13	I have changed or will consider changing some of my practice as a result of playing the interactive fiction	6 (22.2)	7 (25.9)	8 (29.6)	6 (22.2)	0 (0.0)
Q14	I related to my character in the story and/or to the story itself	6 (22.2)	15 (55.6)	5 (18.5)	1 (3.7)	0 (0.0)
Q15	I felt responsible for the actions of my character in the story and the outcomes for the patient	12 (44.4)	14 (51.9)	1 (3.7)	0 (0.0)	0 (0.0)

N.B. Questions Q9 - Q13 have associated free text sections which are included in context of the qualitative data in section 6.2 below.

6.1.1 Reflection and How It Can Affect Clinical Practice

All participants (100%) agreed that they reflected on their own practice whilst playing the IF and were also asked to explain their answer (see 6.2.4.1below).

Almost all participants (92.6%) agreed that they found themselves thinking about the story even after they finished playing (Q9), suggesting IF may have potential for longer-term knowledge retention. In the literature, students have generally demonstrated increased knowledge retention through simulation or IF use, as indicated by improvements in assessment scores (e.g. Bernaitis et al., 2018; Morninstar-Kywi & Kim, 2021). However, this does not ascertain effects on longitudinal retention. UGs are more likely to be focused on learning for assessments that usually happen within the same semester, for example, than PGs, who may be applying what they learn to practice both immediately and on an ongoing basis. The persistence of IF-related thoughts however, may convey a safer version of Ferguson's assertion that "harmful errors can stay with health professionals for the rest of their lives" (2015, p.2). This indicates ongoing reflection and potential knowledge integration into lived experiences, a feature of deeper reflection and learning (Mantzourani et al, 2022; Tsingos et al., 2018).

Almost all (92.6%) participants also agreed that the IF could be beneficial to their professional practice (Q11) and aid development beyond the pedagogical aspects discussed in Chapter 5.

6.1.2 Decision-Making Abilities

Despite 92.6% of participants agreeing that their experiences with IF could positively influence their decision-making abilities (Q12) only 48.1% agreed that they have changed or will consider changing some of their practice (Q13) as a result of playing the IF. 28.6% remained neutral and 22.2% disagreed showing that the potential for action does not automatically translate into action itself. Whilst this is seemingly reinforced by Kiles et al. (2021) who stated that UG students struggle to put their decision-making skills into practice, the important distinction is that these are PG students (see Appendix One). Reflection may therefore influence their practice but does not necessarily change it. As they are all qualified pharmacists with varying

levels of experience, it may just mean that they are comfortable with their own processes and give them pause to reconsider, though they may maintain their usual practice.

As attitudinal change is also affected by the degree to which participants identify with the character and the decisions they make (Green & Jenkins, 2014), the results from Q14 (I related to my character in the story and/or the story itself – 77.8% agreed) also seem to indicate some potential for IF to affect real world changes. As the IF was based in a hospital further cross-analysis was undertaken to ascertain whether participants' current employment sector affected identification (Appendix Six) which could explain why 18.3% neither agreed nor disagreed and 3.7% disagreed that they related to the character (Q14). As discussed in 6.2.3.1 below, the IF resonated and connected with participants in different ways and to different degrees, highlighting that learning preferences and experience is a factor in engagement.

Development of decision-making and critical thinking skills with UG students through IF, branched narratives or CYOA has been discussed in several studies (see Chapter 2.3) (e.g. Bernaitis et al., 2018; Smith et al., 2014) and was also investigated in this thesis at a PG level. However, the results from this study appear to be more positive than the existing IF literature around decision-making (and critical thinking) development. Mohammad et al. (2018) for example, found that 8.4% of participants disagreed or strongly disagreed that their critical thinking was stimulated during their DecisionSim® session. A similar question (Q12[21]) in this study found that only 3.7% disagreed, and no one strongly disagreed. It would not be possible to establish from this thesis alone if this difference is due to the PG nature of the participants but could be interesting for further investigation, and to establish if the act of practicing as a pharmacist has influence on this perspective.

Similarly, feelings of responsibility for the character's actions are also associated with greater attitudinal/behavioural change (Green & Jenkins, 2014), and so

[21] Q12: Overall, I think my experiences in "Lady and Gent" could positively influence my decision-making abilities in my daily practice - 92.6% agree.

participants were asked to respond to question Q15[22] in the mindset of professionals rather than students. As 96.3% of participants agreed that they felt responsible for the character's actions, this would indicate that there is strong potential for IF to produce attitudinal or behavioural changes in the real world (Green & Jenkins, 2014; Jenkins, 2014). Alternatively, the participants in this study occupy real life positions and so know what this looks and feels like. This is not abstract for them, but a lived experience.

However, whilst the participants responded that they felt a strong sense of responsibility for their character's actions (as above) (Q15) overall they seemed to relate to their character less strongly (Q14)[23]. This seems to show that the degree of identification participants felt with their character was less of a driving force for any potential change than responsibility, and is discussed in more detail in Chapter 7.

6.2 IF as a Learning Tool for Professional Practice

Whilst 77.8% of participants agreed that their experiences in IF could be beneficial to their professional practice (Q11), one participant (3.7%), P12, disagreed stating: "I'm already well versed in gentamicin management and did not learn anything new relevant to my practice". This finding in itself is useful as it reflects the influence of the participants' existing knowledge and experience (or lack of) in their learning, allowing them to relate to the scenario in different ways. Interestingly, participants who provided similar responses did not comment on aspects of the story beyond the pharmacological management of the patient. This may suggest that they focused only on the clinical knowledge in the IF rather than holistically considering all potential elements that could provide development (e.g. critical thinking skills).

6.2.1 Moderator: Individual Differences

[22] Q15: I felt responsible for the actions of my character in the story and the outcomes for the patient - 96.3% agree.
[23] Q14: I related to my character in the story and/or to the story itself - 77.8% agree.

This refers to how individual differences between players, such as cognitive traits and technological comfort, moderate how they engage with and are influenced by the IF.

6.2.1.1 Need for Cognition

Need for cognition describes the extent to which players enjoy engaging in effortful cognitive activities.

The data showed a trend that indicated participants' would have liked to have been challenged more in non-clinical situations, and many of their suggestions for changes reflected this.

Steven, for example, described the practical developmental benefits of IF in various ways, particularly highlighting its impact across different clinical areas. He emphasized how IF supports pharmacists not only in clinical practice but also in expanding and challenging their knowledge application beyond purely clinical tasks, presenting them with more challenging environments or situations. One scenario in particular stood out:

> *"On-call[24]: no one really prepares you for on-call. And everyone sort of says, "oh, you can only really know how to do it once you do it and you just need to get it over with". But is that the best way that we can prepare our, y'know, [junior pharmacists] who have been qualified four months how to deal with being woken up at four in the morning and having all these questions fired at them? Probably not."*

Pharmacists outside the UK, who currently do not perform clinical pharmacy tasks and have limited scope for practical application, expressed similar views. They

[24] Pharmacists, usually those in junior roles in hospitals, perform on-call duties outside regular pharmacy department hours and usually between normal day shifts. "Being on-call" generally includes providing pharmaceutical advice to medical and nursing staff and managing the provision or sourcing of emergency medications unavailable on hospital wards. These may be particularly unusual emergency requests (e.g. sourcing anti-venom in the UK, or providing emergency chemotherapy for the treatment of Acute Promyelocytic Leukaemia) that would also not be common during operational daily hours and are difficult to predict or train for.

stated that IF would be useful to continually challenge their professional knowledge and skills, fostering growth and development throughout their careers.

One notable pattern among the responses from hospital pharmacists was their tendency to pause at certain points in the game where all decisions seemed equally correct. This allowed them to reflect on their choices, considering what they would do when given the time to think outside the workplace. Oonagh, for example, stated:

> *"there's a few questions during it where I thought there's kind of no obvious right answer. You're like "do you check with the patient themselves or do you check with the husband and…?""*

Steven also discussed experiences that you are not (or cannot be) trained to deal with:

> *"A patient makes a complaint about you. That can be quite a difficult one… these are all the skills that no one teaches you and you just sort of have to hope that you come across it, but also don't hope? I mean no one hopes that they come across a complaint. And certainly I've dealt with it before and it's been really useful to know the process and things like that, but no one tells you until you come across it".*

As discussed by Luetsch (2018) the role of the pharmacist is rapidly changing and pharmacists are required to "develop new skills, to successfully negotiate and integrate increasing responsibilities, accountability and complexity into their practice" (p.528). As these responses and ideas are coming from those pharmacists in practice who are completing these tasks, it therefore lends weight to IF use as a way to develop these skills.

As discussed in previous sections, participants freely commented throughout the other free-text questions on the ways they would make changes, although they were also specifically asked to comment on Q13 in free-text questionnaire responses and in the interviews.

6.2.1.2 Transportability

Transportability describes the ability of the IF to make the reader feel as if they are a part of the action within the story.

In a professional context, just under half of all questionnaire participants (and all interview participants) embraced IF as a practical and useful way to learn how to work in (and to learn about) new environments, and as a way to upskill through immersion. Steven commented on how IF would have been useful for training pharmacists to work in critical care as the demand suddenly increased during the COVID pandemic: to “instil confidence in those who aren't doing it”, to learn about prioritisation of patients, the wards themselves, and to become familiar with processes.

Similarly, one European respondent (P16) commented that

> *“In a postgraduate distance learning course, students do not have the opportunity for firsthand clinical experience also in my country community pharmacists lack clinical experience and reasoning so this interactive tool could replace (not completely!!!) this gap.”*

Overall, 77.8% of participants reported they related to the character or story (Q14). However, 20% of the hospital pharmacists who participated responded neither agree nor disagree, or disagree. I initially suspected this might be due to participants working in non-clinical areas (such as described by P16), potentially reducing their transportability within the IF. However, further analysis revealed that only one participant was based outside the UK, suggesting that the narrative has the potential to evoke a sense of immersion and engagement, even if they do not exactly align with participants' real-life experiences.

Oonagh also thought that it would be useful for testing and applying knowledge especially when moving between pharmacy sectors. She related it to her own recent experience of moving from community to hospital, especially as someone who had been qualified for a while:

“I think, most certainly in my place, most of the hospital pharmacists had been there for years. So you just come and they assume: oh, you know all about this. And you're like: I'm learning on the job.”

There is little in the literature that investigates transportability as opposed to transportation (Ahn, 2012; Jenkins, 2014), although they are linked. As “high need for cognition and high transportability predicts attitude change for interactive narrative readers” (Jenkins, 2014, p.iii) it also seems that the participants in this study have a high propensity for professional change through the use of intellectually stimulating scenarios and the ability to explore other areas of practice. The literature demonstrates that simulations have provided comparable experiences in developing critical thinking and decision-making skills with both UG and PG pharmacists. This also extends to clinical practice across diverse environments and professions (Anderson et al., 2021; Koivisto et al., 2017).

6.2.2 Engagement Variables

Engagement variables refer to processes that influence how players connect, react and respond to the IF.

6.2.2.1 Transportation

Transportation describes the degree to which players become mentally and emotionally absorbed into the narrative and is often most easily described as being ‘lost in the story’.

Like transportability, transportation also played an important role in how participants saw the IF as being beneficial to their practice, particularly when it came to experiencing the same feelings produced by real-life error making. A general trend observed in the data was that participants frequently described the IF as a real scenario or patient interaction, suggesting a high degree of transportation.

P14 strongly agreed that IF could be beneficial to their professional practice (Q11) and described the experience of making decisions in the IF useful as it was

> *"more like real life... The same way it is hard* [read as: difficult] *to make the same mistake in real life, would be the same way, you would make a mistake in this safe environment and have that registered in your brain as a real life experience and help you not make the same* [mistake] *on real patients in real life, which in the end would improve our day to day practice."*

The benefits of this interaction feeling 'real' seems to add more emotional impact simulating the same emotions that are experienced when making a mistake, helping participants to avoid these same real life situations.

Likewise, P4 stated "I think every clinical scenario, lived or told by a colleague has more value and impact than text… It was interesting to look back at the concept of IF and how that influenced my practice more than a text course". It is interesting to note how some participants seemed to detach this completely text-based IF from actually being text, perhaps indicating that the experiences and emotions felt more like a real life interaction and indicating a high level of transportation.

As demonstrated in the literature, greater transportation can result in a greater degree of attitudinal/behavioural change (Green & Jenkins, 2014), however changes will also be related to participants' experience and working environment. If a pharmacist is already competent and knowledgeable then IF may augment (rather than change) their capabilities, extend their understanding (rather than altering), and give breadth and depth to their professional knowledge rather than adding new components. These effects are demonstrated in the literature through prosocial behaviour (Parrott et al., 2017) and increased sympathy and empathy (Pérez Miles & Jenkins, 2017) even across mediums (Bilandzic & Busselle, 2008). It also appears that IF has the potential to produce similar reflection and attitudinal changes with PGs through transportive processes.

6.2.3 Role of the Self

Role of the self refers to how the player perceives and expresses their own identity within the IF. It is influenced by their own personal characteristics, experiences, decisions, and emotional responses.

6.2.3.1 Responsibility

Responsibility refers to the level of personal accountability players feel for the choices they make within the IF and the resultant consequences.

Q15 demonstrated that 96.3% of participants agreed they felt responsible for the actions of their character in the IF, which was also reflected through the free-text responses. Notably, no participants disagreed with the statement.

The responsibility participants felt for the character's actions seems to have had a positive impact on professional practice, "since the game forces you to take decisions as the main player, it will definitely affect the outcome and improve my decision-making skills and ability. Also it will make me more careful with my decisions and more careful to follow up with patients before discharge" (P9).

We know from the framework that "internal attributions of responsibility can lead to attitudinal and behavioral change" (Green & Jenkins, 2014, p.488). Ahn (2012) also demonstrated that increasing responsibility produces attitudinal and behavioural changes in IF readers. This finding also appears to have been reinforced in this study.

In the existing IF literature within healthcare, there is surprisingly little that discusses the impact of responsibility the students felt for patients' care. This perhaps speaks to the core differences between the populations studied. For UGs, IF tasks "helped the students understand their roles as medication experts and gave them responsibility to their patients" (Smith et al., 2014, p.5), whereas PGs already understand it because they are performing the tasks already. Therefore whilst this responsibility may exist theoretically for UGs it is much more tangible for PGs, increasing impact as they see the consequences of the decisions they would be making on a day-to-day basis. For PGs it appears to function more as a way of

“highlighting the importance of our role in the hospital and patient care… some days you can feel like you're not an important part of the team and feel unappreciated but it has given me confidence to get stuck in and involved and that my role is very important” (P9). In addition, the impact also seems to be greater as participants were allowed to make ‘wrong’ decisions freely and experience the consequences.

6.2.3.2 Possible Selves

Possible selves refers to the different identities or roles that players may adopt in the IF and may choose to take the path they would normally and stay true to their selves, or explore other more riskier decisions.

As discussed in Chapter 5, few participants truly embraced their other selves in the way described by Green and Jenkins (2014) by taking “a more risky path through the narrative” (p.487). However it seems that the vast majority of participants explored the different pathways more as of a method of appreciation than of exploring their possible selves. This also reflects Green and Jenkins (2014) findings that “interactive narrative readers most often make decisions based on what they would actually do” (p.485) and that “if the character had been more distant from the participants’ own circumstances, perhaps it would have been less threatening to choose the “negative” option (p.488)”. Whilst they are not playing wholly as themselves, in some ways they are playing as the whole part of a single identity within that self: the professional one that often defines them, even into their non-work lives. Therefore, whilst it may be fictional a part of it is still them, potentially making them be more cautious and less willing to explore. These responses are therefore included in 6.2.4.1 below.

Questionnaire responses sometimes indicated that participants found the process of deliberately making wrong decisions useful, however. P21, for example, enjoyed playing as their other self and outlined the benefits:

> *“You can go through the same scenario and learn what happens when you make the wrong decisions. I found this fun, interesting and helped me remember.”*

Much of the existing literature describes the benefits of trying out decision-making in a safe environment, however there is little about the development of other skills (such as navigating ethical dilemmas) beyond that of the group work within the context of pharmacy (Benedict et al., 2013; Bernaitis et al., 2018; Osae et al., 2022). Given that it would be potentially irresponsible to allow UGs to make as many errors as they want without having a full grasp of the consequences, it could be interesting to explore this more with PGs.

6.2.4 Outcomes

Outcomes refers to the overall effects from making decisions in the IF and may include changes in attitudes, beliefs, or behaviours.

6.2.4.1 Appreciation

Appreciation can be likened to the processes of reflection (Green & Jenkins, 2014). Although there are some differences (particularly within the context of fiction and reality), both appreciation and reflection involve meaningful engagement with concepts or experiences that lead to personal or professional growth. It can therefore be a very personal process (Mantzourani et al., 2019; Needham, 2024; Tsingos et al., 2015). Reflection plays a large role in pharmacists continuing education particularly through their own professional environments.

As demonstrated by the results to related questions, participants reported that there was strong reflection throughout play: though often not on *how* but simply *if* they reflected.

However, Q10[25] asked participants to focus specifically on reflection and included an associated free-text answer wherein all participants stated that they reflected on their practice as they played the IF. 92.6% also agreed that they continued to think about the story afterward (Q9), possibly self-referencing with their own experiences (Green & Jenkins, 2014) and demonstrating processes of deeper reflection (Tsingos et al, 2015). This aligns with findings that “fatal and harmful errors can stay with health

[25] Q10: As I played “Lady and Gent” I reflected on elements of my own professional practice – 100% agree

professionals for the rest of their lives" (Ferguson, 2015, p.2), suggesting the IF provided a sense of a real-life experience. In fact, P13 responded that "It becomes easy to remember a life experience and this felt like one" and P10 noted that they were "still thinking about it until now and how one of the scenarios ended with Adeline passing away."

Additionally, if (and how) participants related to their IF character (Q14) and felt responsible for their actions (Q15) can be included in this section as the elements of identification and responsibility has also been shown to produce reflection (Green & Jenkins, 2014), and lead to attitudinal or behavioural changes. Whilst not specifically asked to explain their answer for Q14 or Q15, both showed high levels of agreement (see section 6.1). Some participants voluntarily addressed this in other responses which have been included in this section, notably offering examples that speak to their dual identities as both professionals and students. As reflection can be a very personal process (and a sensitive subject when it comes to errors) it is perhaps worth noting that participants may have only submitted those responses that they felt comfortable sharing in the questionnaire (despite providing anonymity) and in interview. Conversely, P16 said they were "able to reflect but...move past this and onto something else" perhaps demonstrating that, though they reflected, not all reflection was to a deep level and that the experience is dependent on the individual. As with processes of decision-making, it may also be difficult for participants to recall all their reflections or to put them into words. Some reflections may have occurred in the moment and, as they played on, were forgotten, or provided enough within that instance to not require further contemplation.

As there was extensive discussion of reflection I have grouped together the responses in themes below.

6.2.4.1.1 Peer Discussion

A minority of participants stated that they had found the outcomes in the IF useful for prompting peer discussions of the case. P20, for example, reported discussing the IF with colleagues and "reflected how they would have dealt with this" saying they "found it a very useful task as we don't often have the time to reflect."

This perhaps demonstrates the potential for IF as a structure to encourage reflection and prompt discussion between groups, as it has been used in the majority of the existing IF literature (Benedict, 2010; Benedict & Schonder, 2011; Lichvar et al., 2016; Litten & Stewart, 2023). Whilst I have included it in this chapter it could also easily sit within Chapter 5 as it could be a useful prompt for discussion in group settings and for the development of community.

As in Bradley et al. (2009) peer feedback on significant event analysis could also play a role in improving safety. Though their findings were based on anonymous feedback, as suggested by this study's participants, this could be a way to learn to communicate with other healthcare professionals as suggested in 6.2.2.1.

6.2.4.1.2 On Potential Outcomes and Consequences

The majority of participants stated the IF provoked reflection on the differing outcomes and on how "none of the choices seemed terribly wrong [but] slightly different choices could have a huge consequence on the patient" (P8), and of how the IF's replayability was a beneficial way to explore this. Participants also reflected on how playing the IF made them consider how different decisions they make can help prevent future errors and, as P13 responded: "It would save me from making the same mistake that I would have seen through this safe environment".

However, Smith et al. (2014) demonstrated that only 32% of UG students replayed the simulation in their study when it was made freely available, despite the positive effects in the study itself. This is reflected in the results to the question (posed in the demographics section of the questionnaire (Appendix 1)) which asked participants if they intended on returning to the story again for any reason. 44.4% responded that they did intend to return, 40.7% stated they did not, and 14.8% were unsure. However, as participants in this study were required to play through the IF a minimum of twice they have already repeated it, seeing different decisions and combinations or pathways. This study also has a relatively small cohort and so the results cannot necessarily be generalised. However it could show a limited scope for PG participants too, especially if they are having to complete it as a supplement to

the learning materials as suggested in Chapter 5 around their other commitments (as discussed in Chapter 7).

It was also interesting to note that many respondents only played through the IF the minimum required amount: twice (see Appendix One). So whilst they may understand there is more than one pathway they don't necessarily understand the extent to which there are many pathways.

Whilst working in practice, pharmacists are often under pressures that can result in errors or mistakes being corrected and then forgotten, so if experiences through IF can prompt mindful reflection of the work then this could help to reduce these errors in a less pressured environment (Black & Plowright, 2007; Pezzolesi et al., 2013).

6.2.4.1.3 On Their Decision-Making Skills

As established in Q12, the majority of participants believed that their experiences in the IF could positively influence their decision-making, and this trend was reflected in both the free text responses and in interview.

P5 responded that their decision-making skills were tested as "the scenario covered different clinical areas such as antibiotics, drug interactions, renal disease and thromboprophylaxis in one case, simulating a real life case and helping me to consider all factors in making clinical decisions in a single patient case. It also tests drug dosing, adjustment, interactions and good pharmacy practice skills". This perhaps demonstrates that, though the skills they had to employ to complete the case were not necessarily challenging (6.2.2.1), they covered many normal bases, and reflected the realities of clinical practice.

Penny, for example, also stated that it made her reflect in a similar way "in terms of daily decision-making, it probably just made me reflect a little bit more on, like, *what* decisions and sort of how that might have an outcome".

Within most of the literature on simulations, IFs, and CYOAs previously discussed there were inbuilt feedback mechanisms as students progressed that provided them

with the means to get the correct answers (Kiles et al., 2021; Lichvar et al., 2016; Vadiei & Lee, 2022). P6 stated that the absence of this in Lady and Gent “makes you reassess your usual practice in a self-reflection format rather than being simply told what is right and wrong in terms of review process”. This could demonstrate that learning and reflecting on errors in this way also imparts a degree of psychological safety (Torralba et al., 2020). Additionally, the narrative provides students with self-feedback, as the consequences of their choices directly reveal the outcome.

While some of the existing IF literature uses pre- and post-surveys to measure knowledge increases with UGs (Kiles et al., 2021; Mohammad et al., 2018), this study offers evidence and insight into the nature of the reflection produced by IF. It may demonstrate the deeper perspectives that come from being a practicing pharmacist rather than a student. Whilst no solid conclusions can be drawn it provides an interesting perspective for potential future research and could provide insight into how educational interventions and practices could be shaped for these professionals.

6.2.4.1.4 On Professional Responsibilities

Whilst reflecting on their own practice, many participants also reflected on pharmacists’ place within the wider healthcare team, their roles, and responsibilities to patients.

> *“There is a potentially false sense of safety that if we don't get to follow up on someone there is others involved in their care and they will likely be ok. However this story showed how the involvement of a pharmacist may have made a significant difference to the patient's outcome through some very simple interventions”. (P27)*

For some the IF also allowed them to reflect on the fact that they are not responsible for all steps in a patient’s care, or “particularly how, I'd say, external stuff affects your job role and your decisions that you make” (Maria) as well as “how different elements may impact the decisions you make. Not only that but also impact prior decisions” (P16).

This can have a positive effect on pharmacists' confidence, especially when we are seen as the last port of call to prevent or identify errors, as discussed by Ferguson (2015) and in decision-making. And, as previously discussed, increased feelings of responsibility for the outcomes in the IF can translate to greater attitudinal or behavioural change. These results also seem to indicate that a more birds-eye view of the processes, as demonstrated through the IF, made them consider they are not *solely* responsible for them, perhaps alleviating some of the pressure that comes from this responsibility.

6.2.4.1.5 On Practices, Processes and Work Pressures

Similarly, some participants stated that the IF made them simply consider their own current practices and – rather than identifying any changes – they considered how their role demands they balance speed and accuracy with effective decision-making. Juggling all these elements can present difficulties.

> *"It has highlighted how easy it is to forget to do essential checks that are part of our role as clinical pharmacists and the consequences of not doing them or of making the wrong decisions. It has highlighted how one should prioritise certain aspects of the job before starting other tasks." (P8)*

Maria currently works in a renal dialysis unit. She reflected on the differences in practice between clinical areas, and how easy it is for her to forget that not all clinical departments or areas operate on the same principles.

> *"If you had this patient in an acute medical ward, they would be like, "yes, we're going to stop ramipril", "Yes, we're going to stop ibuprofen" and all of these... So it was quite nice to remind me of, like, no, no: these are very important things. You stop them in AKI[26]. And also because we have patients on dialysis … I can give them ibuprofen and there's no worry. So that just*

[26] AKI - Acute Kidney Injury. A rapid deterioration in kidney function. Drugs which are cleared from the body by the kidneys may be reduced in dose, withheld temporarily, or stopped completely until AKI resolves.

reinforced we're dealing with such a subset of the population. If I went to A&E[27], I've got to adjust my thinking."

Many participants commented on the usefulness of seeing and experiencing different ways of doing things, and being able to explore the consequences of their actions.

Reflection is thought to be triggered by one of two processes: as the result of "unsettling feelings or uncomfortable thoughts" or "as a result of deliberately structured events aimed at creating the right conditions" (Black& Plowright, 2007, p.150). Which prompt is more impactful may be individual to each person, however IF appears to present both pathways resulting in reflection in all participants but only where the prompt occurs.

6.2.4.1.6 On Interpersonal Interactions

As in Chapter 5, IF seems to have provoked a number of participants to consider their interactions with patients, staff and other healthcare professionals to find ways to improve their own practice. P24 displayed a strong response to the added details and interactions within the story itself, provoking strong appreciation as a result:

"it was especially how the story included all the little decisions you have to make, for example if you should talk to the woman now or wait for her husband.

Or that she didn't like the consulting doctor today, so getting herself ready for more challenging communication perhaps...

The human part of the job that is a constant learning curve."

Whilst the literature on IF in pharmacy does indeed talk about decision-making (as discussed previously) the interaction between the player and the character is not explored. Whilst this would be more likely to come out in group discussions for

[27] Accident and Emergency department. Officially called "Emergency Departments" A&E is now an old reference term that is still in common usage.

example, all students are UGs who would not have the same experiences as qualified pharmacists, even if they were on experiential learning placements as discussed in some of the literature.

Challenging conversations are referenced in Pérez Miles and Jenkins (2017) work, however they do not seem to be prevalent in other areas of the literature. As outlined in 6.2.2.1 the IF was highlighted by Steven as a potential way to explore these challenging interactions by allowing players to react exactly how they'd like, even if that could lead to a poor outcome or failure. It could provide the player with not only an opportunity to learn how to recover from a poor reaction, but also allow them to release some of the frustrations that healthcare professionals often have by acting out these confrontations in a safe environment.

6.2.4.2 Attitudinal/ Behavioural Change

This refers to the degree in which the IF provokes a real-life change in attitude or behaviour.

Perhaps predictably, participants working in areas other than hospital pharmacy appeared to be more likely to report that the IF wouldn't change their practice[28] (see Appendix Six), or that it wasn't applicable to them. For example, one participant who responded "neither agree not disagree" works in public health. Interestingly, this was also true of three hospital pharmacists and, again, reflects the diversity of the DL students' experience. To check if there was correlation between the sector pharmacy participants were working in and their reported change in practice, I performed additional statistical analysis (a chi-square test[29] – see Appendix Six) which confirmed that there was no correlation. This indicates that changes in practice were not bound to one specific sector.

[28] Q13: I have changed or will consider changing some of my practice as a result of playing the interactive fiction

[29] This examines whether the observed distribution of data across categories differs significantly from what would be expected if the categories were independent. A p-value <0.05 suggests that the observed differences are unlikely due to random chance, indicating a statistically significant relationship between the categorical variables. The p-value obtained in the test in this study was 0.484, indicating there was no correlation between where students worked and if they would change their practice.

What was interesting to note, however, was that 50% of hospital pharmacists responded either disagree, or neither agree nor disagree. This may reflect some of the comments that state it was not complex enough or that the IF was in an area they were already very familiar with.

For example, in the free text answer to the Q10 (“As I played Lady and Gent I reflected on elements of my own professional practice”) P1 chose “agree” saying “it made me reflect on what I actually do in practice and if this is the ‘right’ choice and if my clinical practice is safe”. However they subsequently chose “neither agree nor disagree” to Q13 saying “it will not change my practice for better or worse”. So, whilst the IF might prompt reflection, that reflection could result in them concluding that they don’t need to change–which is a valid outcome. This reassurance may be useful for them as professionals.

This was also not exclusive to the hospital setting of the IF. P21 – who currently works in community pharmacy – responded that they strongly agreed they would change their practice after playing the IF and that they will now “think about drug monitoring far more in the primary setting.”

Interestingly one interview participant (Steven) said that he “would be true to [his] decision in the game, or in person” so would be unlikely to change his practice in this scenario, but also recognised the potential for IF to do so in different situations and as a persuasive tool for others. He thought it may be particularly useful as a way to push pharmacists “out of [their] comfort zone. That’s the only way you're going to grow and evolve… I think is the best place to do that for sure.”

For example, he discussed a meeting in which he and some colleagues, who were also independent prescribers, were discussing their roles and attitudes towards prescribing. He suggested that IF would have been useful to the discussion as a mechanism to persuade others to change their attitudes and clinical practice, including towards which decisions they make or are *willing* to make.

"why do pharmacist prescribers have different attitudes to an FY1[30] who is 23 and comes out and will just prescribe whatever you tell them?... we did a bit of a show of hands and we said "we're talking about patients who can't swallow. Would you feel comfortable changing [an antibiotic] to IV[31], or IV to oral?"– whichever way. And everyone put their hands up and said, yeah… Then it's like, well, "how many of you feel comfortable to change from oral cyclizine to IV cyclizine[32]?" And everyone's like, "absolutely not. No, let's not do that". And you think, "but why would you not do that? Why, what's the difference?"... they're like, "oh, well, that's the F1". And I was like, "well, the F1 is just going to prescribe it because you've told them to prescribe it. So why should he put his registration on the line and not you?""

For Aisha the IF was a useful reminder to reflect on the individual patient and not the diagnosis, and that "even that simple UTI it can proceed to something very bad… like a light bulb: even the most simple cases, it can be very complicated".

Whilst this was not an overly complicated case it did highlight to some that not all cases have to be complicated to have a poor outcome, and are more reflective of reality. These poorly structured cases were also explored by Branan et al. (2024) in the critical care setting, and demonstrated that learning through un-structured and more ambiguous cases can help develop clinical reasoning and critical thinking skills. At the PG level and where cases reflect real life this could help to improve daily practice for pharmacists by letting them train to deal with them (and associated skills) in a safer environment.

6.2.4.2.1 Changing Practices and Processes

As in 6.2.4.2 above, many participants also reported that they would instigate changes into their daily practice, even relating to the specific scenario within the IF itself.

[30] FY1 (occasionally F1) Foundation Year 1 doctor. A newly qualified doctor in their first year of training after completing medical school.
[31] IV: intravenous. An injection or infusion of medication directly into a vein.
[32] Cyclizine is used to treat nausea and vomiting. Intravenous administration is associated with much more severe side effects than oral administration.

For example, P27 recounted that the IF "reflected a scenario I had this very week and made me think through the steps I followed when reviewing that patient and whether I might have missed anything". Maria said it reinforced that she should check the patient's results "a *lot*", as it did similarly for Oonagh:

> "*It kind of taught me that like, if there is someone who had something outstanding from the day before, maybe go see them first. …And check the bloods quickly rather than kind of thinking, "oh, I'll leave that gentamicin till later, I'll figure it out later"…just follow up on the few bits first before you go to see someone else."*

Whilst P4 selected neither agree nor disagree to Q12[33] and said "I feel confident and competent in clinical decisions and seek advise [sic] from colleagues or guidelines when needed", the majority of comments pertained to changes in attitude or behaviour on decision-making skills. In a minority of cases, participants said that it would not affect their decision-making abilities, whereas others said that it was extremely helpful in encouraging them to consider more factors for patient care and follow up in their day-to-day practice. Because clinical decision-making includes subconscious and automatic elements (Duffull et al., 2019; Wright et al., 2020), and pharmacists frequently operate on intuitive knowledge, this approach may help them realise how complex decision-making is, and the intricacy of their daily practice.

Similarly, Bradley et al. (2009) showed that reflecting on significant events resulted in change, around 58% of which involved changing protocols and procedures, demonstrating that IF can replicate events that produce change without first causing harm.

As there were a number of different ways in which they said their decision-making abilities were affected these have been grouped below under subthemes that emerged from the coding during analysis.

[33] Q12: Overall, I think my experiences in "Lady and Gent" could positively influence my decision-making abilities in my daily practice

6.2.4.2.2 Greater Consideration of Options and Outcomes

Most participants responded that playing through the IF gave them a greater awareness of the different potential patient outcomes that they would then build into their usual practice to improve patient care. This also seems to improve their decision-making (P25, for example: “Before making decisions, I would consider more potential outcomes”). This also links back to Q8 (Chapter 5) where all participants stated that the IF showed them there could be more than one right answer, which they then seem to have applied to their real-life clinical practice.

Similarly, workload prioritisation and the importance of following-up on patients was also mentioned on a variety of occasions. Some participants specifically referenced real-life scenarios mirroring the IF story itself showing the realism and applicability to real life:

> *“I had a patient started on gentamicin on my ward today so it highlighted the importance of following patients up. It highlighted the fact that decisions I make as a pharmacist could potentially lead to grave consequences for the patient.” (P7)*

This perhaps shows a more holistic change across practice as they gain not only skills but knowledge, in the same way that, for example, Lichvar et al., (2016) showed an increased in students’ knowledge through test scores, whilst also demonstrating that they had developed decision-making skills.

As part of pharmacist decision-making also appears to be from familiarisation, pattern-recognition and previous experience (McPherson et al., 2023; Mertens et al., 2024) it seems that playing the IF allows pharmacists to build these experiences into their repertoire of knowledge for improved decision-making. Whilst change wasn’t produced in all participants however, their comments indicate that they found this useful in different ways, according to their own needs and experience.

6.2.4.2.3 Greater Confidence In Their Decision-Making

As Q12 demonstrated almost all (92.6%) participants indicated that their experiences with IF could positively influence their decision-making abilities in daily practice. Unlike the literature – which focuses on UG applications – participants were able to specifically comment on how their decision-making abilities were affected as professionals, and how these skills had to be primarily learned in practice.

P2 selected 'agree' to Q12 and added a comment indicating that the PG application of IF went some way to making up for a lack of previous practice:

> *"During my undergraduate degree, I feel that opportunities to develop my decision-making abilities were limited. A resource such as this would help improve my decision-making and in turn help my daily practice."*

However, despite this reflection less than half of participants (48.1%) agreed that this IF could result in changes in their practice (Q13), and 29.6% neither agreed nor disagreed and 22.2% disagreed. This was one of the most divided responses in the questionnaire and, as in 6.1.2, seems to suggest that reflection did not always lead to a change in practice. It is crucial to acknowledge that not all participants need practice changes, as their current methods may be effective. As P12 stated, "I follow my own trust's guidelines and am well versed in using gentamicin. This story didn't provide learning to me, only to show that other hospitals may do things differently." This reflection could not produce change for example, as they have to stick to their own hospital's guidance but they still reflected on others' processes. However, this does not mean that IF in general would not aid them to change practice. This was particularly interesting to note in the context of the answers to Q10 and Q11[34] where participants generally agreed that the IF both made them reflect on – and could be beneficial to – their practice, however they then did not seem to match the reflection to this impact, even within the discussions themselves (in the interviews for example). This could indicate that the current benefit of the IF for is in simply producing reflection in the first instance, which can then be built upon later.

[34] Q10: As I played "Lady and Gent" I reflected on elements of my own professional practice -100% agree. Q11: Overall, I think my experiences through playing "Lady and Gent" were beneficial to my professional practice – 92.6% agree.

Beyond the broader impacts on practice, one aspect highlighted in the literature was the enhancement of students' decision-making and critical-thinking skills through engaging with various fictional scenarios (e.g. Smith & Waite, 2017).

6.3 Summary

This chapter presented and discussed the findings from this research in relation to the use of IF in PG pharmacy DL students' professional practice, in consideration of the existing literature. Similarly to the pedagogical use of IF discussed in Chapter 5, participants also reported that they found the IF useful to their clinical practice. The results were more varied, however.

In general, participants also suggested that IF could be a useful way to practice their non-clinical skills such as ethical decision-making, difficult conversations, and communication. They also considered IF to be useful in upskilling in various specialist areas or experiencing and understanding the roles of pharmacists in other sectors. For those practicing in countries which have not yet fully embraced clinical pharmacy the IF was also considered to be a useful way to continue practicing and developing their skills in the absence of real-life experiences, or where these would be difficult to learn in-practice. Specific areas mentioned by participants included on-call and critical care.

Whilst all participants reported that they reflected after playing the IF, there was variation in both depth and focus of these reflections. One interesting point of note for all findings is that often there were patterns within participants' own answers, even if these weren't reflected in the overall pattern. For example, participants who mentioned that they reflected on their practices and processes tended to mention these throughout. Similarly, Penny was very focused on developing her ethical decision-making skills and many of her interview responses referenced this. It therefore seems that each participant found their own uses for the IF (or could see where it would be useful for them), reflecting on their own strengths, weaknesses and learning needs throughout. This was also reflected in the varying levels of experience within the cohort of participants, as more experienced pharmacists were less likely to make real life changes and, although all participants reported reflecting, not all reflections translated into real life change. Each participant's own experience

and history will affect how they engage with the IF and reflect accordingly. Unlike the relatively consistent UG experience, real-world practice is complex and varied, even between pharmacists within the same workplace, inevitably leading to divergent perspectives and knowledge acquisition.

Nevertheless, many participants did report that they would now consider more outcomes for the patient, and that it made them reflect on and improve their decision-making skills by applying their knowledge safely and without fear of repercussion. It may help even just by allowing them to reflect on and realise how far they've come, now performing these tasks and processes relatively naturally. Through feelings of reflection, identification and responsibility in a realistic scenario, participants reported improved decision-making skills and had already instigated some changes to practice as it felt like they had learned from a real-life error.

A tabular summary of the findings according to the framework headings is included in Appendix Seven.

Chapter 7: The Reciprocal Influence of Professional Practice and Academic Study: Findings and Discussion

In this final findings and discussion chapter I present and discuss the results in consideration of participants' intertwined identities as both professionals and students, incorporating data from all sections of the questionnaires and interviews.

Whilst RQ1 explores the value of IF as a pedagogical tool, and RQ2 its value in clinical practice, the divide is not as simple, and the participants demonstrated that they often adopted both identities simultaneously.

As I coded and analysed the qualitative data in particular, indicators emerged that demonstrated much of the learning for PG pharmacists was rooted in their real-life experiences. Indeed, their responses could only come from an awareness of clinical realities, contrasting with UGs who are not yet performing these tasks autonomously but who make up the existing literature. The findings discussed in this chapter may therefore make some of the most significant contributions to knowledge that result from this research.

Like Chapters 5 and 6 I present and discuss the findings according to the headings of Green and Jenkins (2014) conceptual model. Quantitative data is displayed in Chapters 5 and 6 therefore is not presented again. I begin with a short description of why this chapter is necessary (7.1). I then consider participants' responses according to the relevant framework headings (and associated subheadings) of user control (7.1.1), narrative structure (7.1.2), moderator: individual differences (7.1.3), engagement variables (7.1.4), role of the self (7.1.5) and outcomes (7.1.6), offering a definition of each subtitle as a reminder. I end with a summary of the findings for this chapter (7.2).

7.1 The Influence of Practice on Academic Learning

I had initially planned to present this research according to the RQs to address how participants engaged with the IF only as students (RQ1) and as professionals (RQ2). However, their responses often demonstrated that their overlapping identities

shaped their experiences with the IF, often resulting in changes. Indeed, this may have significantly contributed to the generally positive results, especially in comparison to the impact on UG learning: that the fact that they are already performing similar tasks makes it more real, more plausible and, overall, more beneficial.

This crossover of student and pharmacist identities does not appear to have been explored in the literature. My findings are therefore discussed in context of the existing research where possible, but I have also drawn on my own experiences, thoughts, and opinions as a DL student (past and present) and as the DL programme lead. Though there is limited literature on the impact of the dual identities of those who work and study concurrently, professionals who returned to being students found it difficult to readopt the student moniker (Thirtle, 2021) and struggle with managing multiple roles (Brunton & Buckley, 2021; O'Byrne et al., 2023). This study perhaps opens further avenues for research in this area.

7.1.1 User Control

User control encompasses both how users can make decisions that affect the direction of the plot, and perceived agency.

Responses for user control tended to be limited to suggested changes or improvements that participants would make to the IF. A common suggestion was for "more options and different consequences to those actions" (P17) and "more avenues and a bit more flexibility on where you can go" (Penny). This suggests participants would have appreciated more agency in decision-making, or that their preferred option was sometimes missing. Similarly, "People may disagree with the options or have another way of looking at the problems." (P15)

Steven requested to see the IF's web of paths within Twine (Appendix 3) during interview. After showing him the screen he responded:

> *"That is crazy. But is quite scary also because … that chart: you could probably do in real-life with patients y'know? There's probably more than*

seven or eight different outcomes. I think if anything it's a really useful and valuable tool to show even that mind map to students… a really useful reminder of how complex healthcare is, how important each and every cog is."

An important aspect of IF in relation to learning is imparting agency to the player: their ability to make meaningful narrative choices, explore different paths and experience the consequences of their decisions on their own terms (Miller, 2014; Kolhoff & Nack, 2019). Practicing pharmacists usually have a degree of autonomy in clinical practice (Duffull, et al., 2019), but the choices they have experienced in reality were not available, reducing that sense of agency. However learning in this way may require a degree of self-direction which not all students may be willing to actively engage with (Benedict et al., 2013), especially in light of time pressures as discussed in 7.1.2.1.

Dual identities in combination with the agency provided in IF not only appears to provide impact but helps participants engage more deeply with learning and the consequences of their decisions. This could encourage participants to reflect on their practice and experience errors as learning opportunities rather than reasons for punishment (Smith et al., 2024). This impact seems to be enhanced because they are PGs and, unlike UGs, they are aware of more potential routes that could be offered throughout. Even the act of suggesting more options may demonstrate that those participants are more engaged and persuaded by the IF than UGs (Green & Jenkins, 2014).

Participants reported improved real-life decision-making skills, commenting that receiving a positive IF outcome increased their confidence in their abilities to provide a positive outcome for their own patients, improving patient care and professional practice. Importantly, in this way they learn from not only their failures but their successes (Klasen & Lingard, 2019). This may contrast with those who are not yet practicing or have an under-developed pharmacist identity, reducing the impact of IF in the UG period, for example.

Responses indicate a desire to exercise more agency and explore outcomes of decision-making in the relative safety of academia, even beyond IF. However, as the

level of user control increases the structure of the IF itself can become highly complex, overwhelming and actually reduce the effectiveness of learning (Green & Jenkins, 2014). Increasing complexity could therefore result in more time-consuming IFs resulting in students' frustration and eventual abandonment of the learning, but provides an avenue for further research. Green and Jenkins (2014) however, state that "longer exposure to the story material, and perhaps more active thought about the story messages, should lead interactive narratives to have a greater impact on attitudes" (p.491). Therefore, even if it is considered time-consuming ensuring that it is part of the materials may lead to better outcomes as both students and pharmacists. .

7.1.2 Narrative Structure

Narrative structure refers to the plot or story within IF itself. In considering narrative structure I also include the potential scenario topics suggested by participants.

7.1.2.1 Time Pressures

Generally, whilst participants responded that they would like to see more IF in their studies (Q3) some also expressed concerns that it may be too time consuming ("I wouldn't have time to read these stories" (P12)) especially as "you'd have to play it more than twice to kind of get the full idea" (Oonagh).

Participants often included comments to indicate they had limited opportunities during work hours to study, often relying on personal time, prompting them to seek efficient ways to manage their workload. Consequently, they expressed concerns that investing more time in playing the IF would increase their overall study burden, impacting their professional and personal lives as time pressures are exerted from all sides. As P16 stated: "Often with distance learning courses it can be difficult to be allowed the time to read all of the materials, so this may be a different approach to ensuring the most impactful learning points are absorbed". This may require designing and testing multiple, more focused IFs to balance complexity, playtime, and learning outcomes.

This dynamic augments priorities as professional and personal responsibilities collide with academic workload, and the consideration then seems to move from “how can I get the best mark?” to “how can I balance everything?”. This reflects the findings of O’Byrne et al. (2023) who report that working whilst studying part-time can negatively impact on wellbeing, and that many pharmacists do not feel supported by their employers to undertake these extra commitments. Conversely, they also report that many participants “underestimated the time needed for their study along with other commitments” (p.864) which can have an impact on the amount of time students actually plan for.

As the questionnaire demographic data shows (Appendix One) participants indicated that PG study was a necessary part of their job (13 responses related to career progression, and five specifically mentioned it as a job requirement). From experience these students are generally less visibly engaged that those studying for interest, for example (Fan et al., 2024; O’Byrne et al., 2023). This may also lead to a desire to spend less time engaging with the materials rather than simply completing assessments. However, as Green and Jenkins (2014) point out, “Longer exposure to the story material, and perhaps more active thought about the story message, should lead interactive narratives to have a greater impact on attitude” (p.491) therefore it may be necessary to maintain the time required to play in order to see demonstrable changes and opens avenues for further research.

Aisha was the only participant who reported how long it took to play through the IF (40 minutes for more than five playthroughs) however Morningstar-Kywi and Kim (2021) reported that their students usually only required 15 to 20 minutes per case. I could not compare the length of their cases against mine however I would expect PGs to complete faster. As the literature demonstrates, the time taken to make clinical decisions “typically decreases with increasing clinical expertise since the procedure is internalized and cognitive processes are performed more quickly, sometimes even combining or skipping (sub)steps” (Mertens et al, 2024b, p.6). This difference suggests UGs may not engage with IF at the same pace or depth as PGs, reflecting varying levels of professional experience and cognitive processing, presenting an area for future research.

Engagement can be extremely difficult to gauge in a completely asynchronous online course. Additionally, QUB pharmacy DL students have requested their materials are presented in downloadable and printable formats to be completed offline, making usual engagement monitoring almost worthless. However, engagement has been shown to increase in DL courses with the use of gamification (Balalle, 2024) and so IF could be one potential way to increase engagement, possibly in a more condensed format to address time pressures whilst delivering more authentic learning (Green & Brock, 2000). However, “a commitment to learning …must be made by the individual.” (Benedict et al., 2013, p.7)

7.1.2.2 Individualised Decision-Making

Through previous module feedback on the DL courses students have stated that there is limited scope for non-UK students to apply their usual guidance and align practice with their academic learning. Some non-UK based participants suggested that incorporating guidance and standards from their own countries would be beneficial in the IF.

In theory, this would be useful but, practically, could present a number of potential problems. Firstly, this would result in a huge increase in workload for academics and tutors as they strive to cover every topic for students in all the different enrolled countries (17, in the 2024-25 academic year) reducing the time they would have to spend on teaching, research supervision, and other tasks. As the student population is dynamic this would also require tremendous time and resources to update annually in line with the cohort demographics, and would require tutors to maintain currency on all the individual guidelines.

Technologically, this may also not be possible and would need to be investigated further, possibly with the input of specialist educational technologists.

When presented in an in-person, classroom environment Benedict et al., (2013) considered IF “capable of personalizing learning for students, while offering faculty members an alternate approach to facilitate learning of new knowledge and skills” (p. 5). However this was delivered as a simulation where in-game ‘patients’ can be

programmed to respond to most questions. This, therefore, may not be as easily done with IF or when the varied PG experience of the participants is also taken into account.

Individualisation could be attempted through the use of groupwork or by setting assessments that involve the creation of IF by students themselves using their own clinical guidance however (as discussed in Chapter 5.4). To my knowledge this does not seem to have been researched, but could be an effective way to apply the concepts and principles of IF through creation rather than play, acting as both professional and student.

7.1.3 Moderator: Individual Differences

This refers to how an individual's personal characteristics (such as cognitive traits and their level of comfort with technology) shape their engagement with (and are impacted by) the IF.

7.1.3.1 Need for Cognition

Need for cognition describes the extent to which players enjoy engaging in effortful cognitive activities.

Participants responded that the IF was useful as it "requires students to think critically and make informed decisions which helps develop problem-solving, analytical thinking, and decision-making" (P2). Echoing the literature, these skills were considered to be inadequately taught at the UG level, leaving participants ill-prepared for professional practice (Mertens et al., 2024b). Academic delivery also allowed them to safely increase their knowledge and confidence whilst being assessed, before bringing them back to professional practice to be applied with greater authority.

Several participants suggested the inclusion of more complex IF that addressed ambiguous and grey areas of practice and patients with multimorbidities increasing in complexity, challenging them both academically and professionally to help build real-life skills. For example, Aisha suggested incorporating one spiral case that

would gradually increase in difficulty to reflect the reality that the “patient: naturally they will progress... So then we can go through [multiple conditions] with that patient even if it's one case.” These kinds of suggestions would be unlikely at UG level, even simply through inexperience or unfamiliarity with practice.

Complementary skills were also suggested such as negotiation and compromise, conflict resolution, dealing with others’ decisions and patient complaints. These reflect multidisciplinary team working and directly impact patient care, but are not learned through UG experiences. Steven cited an example from his own experience:

> *“Y’know, a consultant questions your clinical judgement in an outpatient clinic. So you prescribe this* [medication] *but you then see a letter and the consultant’s changed it to something else. Y’know, how do you approach that?...What would you do and how does it make you feel?”*

Indeed, conflict between medics and pharmacists was a common suggestion for inclusion, suggesting that participants see IF as a safe and effective way to practice dealing with difficult situations without compromising working relationships. This also presents a potential area for future research.

Finally, clinical guidance was created for inclusion in the IF (Appendix Three) to ensure participants could determine the correct answer. Opinions were however divided as to whether this inclusion was appropriate. P10, for example, considered this a downside as “the traditional practice forces the student to search for the guidelines themselves”. Conversely, P23 found it beneficial as “the interactive game leads you on so you can just focus on the information right in front of you, instead of for example, looking for and looking through articles and guidelines”.

This perhaps demonstrates that there are a variety of ways in which participants feel their skills could be challenged – ranging from the academic to the practical the clinical to non-clinical – but also that, as PG pharmacists, they are able to strongly identify their own professional and academic learning needs. It’s also important to recognise that – unlike UG students studying pharmacy for the first time – the participants had varying levels of prior knowledge, from newly qualified to advanced

practice. Studies such as Branan et al.'s (2024) introduced complex clinical scenarios in critical care and the management of sepsis for example, and Morningstar-Kywi and Kim (2021) covered scenarios from cough and cold to rheumatoid arthritis, showing that a variety of scenarios are possible within the clinical alone.

The results also seem to indicate that participants consider decision-making skills are primarily developed in post-registration practice which is reflected by the literature on decision-making within real-world settings (Mertens et al, 2024; Nusair et al, 2018), however this tends to focus on skills development in prescribers in particular (Croft et al., 2017; Duffull et al., 2019; McPherson et al., 2020). Not all PG pharmacists want to be (or can be) prescribers however, and there is an acknowledgment from the participants that they are still learning at the post-registration level. IF may be one method by which all students can avail of opportunities to develop in this area, whatever their career pathway.

7.1.3.2 Need for Control

Need for control refers to the extent to which the player likes to exert control over their choices in the IF.

In both the questionnaires and interviews participants suggested changes to the IF that seemed to result in reduced control but that reflected the realities of being a pharmacist in practice: timed decision-making, or randomised decisions (e.g. through the throw of a dice) that result in the selection of a non-ideal pathway or reflect decision-making by others (as discussed in section 7.1.3.1). Indeed, rolling a dice may confer an element of psychological safety by removing personal responsibility for 'wrong' choices. Participants suggested these inclusions would develop their decision-making abilities whilst safely handling challenging real-life situations as "after all in the hospital or even community pharmacy you do not have all the time you want to make a decision" (P16). Again, participants suggested these skills had to be learned in practice (similarly to decision-making skills) and considered them

poorly taught at UG level. They appear to consider IF a useful tool to learn, practice and gain confidence in the rapid analysis of information alongside task prioritisation.

As need for control and user control (section 7.1.1) work synergistically, decreasing the control by reducing time or decision-making could result in a relatively complex IF where 'gold standard' options are not available. Students must therefore decide between 'grey areas' and ambiguous options, providing the real life, ill-structured scenarios they suggest (Branan et al., 2023).

Clinical decision-making is the end product of gathering, analysing and processing information for the benefit of patient care (Wright et al., 2019). Information learned from individuals' experiences is essential to the process and as experience grows so does their skill and swiftness in drawing conclusions (Croft et al, 2017; Nusair et al, 2018). It seems that these experiences may also be beneficial even if simulated (as in the IF) and may be incorporated into the pharmacist's arsenal. IF could therefore expand the repertoire of learned experiences beyond their current area or level of practice safely to expand this arsenal and improve patient care and therapeutic decision-making.

7.1.3.3 Transportability

Transportability describes the ability of the IF to make the reader feel as if they are a part of the action within the story.

Participants reported that IF was beneficial as it could "expose us to clinical scenarios which we do not normally encounter" (P5) or that they could "experience other settings/ situations you have not come across previously" (P24), especially if future iterations were designed with different levels of difficulty targeting all levels of professional experience. For example, P24 also responded that they are currently working in public health with previous community pharmacy and primary care experience only, so found that being able to imagine that they were in the hospital environment made it easier to see how they could apply their knowledge and the outcomes.

Both Maria and Aisha commented that IF would have enhanced their experiences with disliked topics by allowing them to visualise how the knowledge could be applied to treat patients in real life.

> *“I suffered a lot with the diabetes module. It's not my favourite topic, to be honest, endocrine. So for example, something like this game with the diabetes module it could have helped me because it's actually putting me in a situation where I'm there with the patients” (Aisha)*

Participants' comments suggest that IF has the potential to effectively transport learners into realistic environments even if they are unfamiliar, enhancing learning by applying knowledge in realistic scenarios. As Steven noted, "it's like being able to be there before you're actually there". Familiar scenarios may reinforce existing confidence in capabilities and knowledge, however applications in more unfamiliar scenarios (e.g. highly specialist areas such as neonatal intensive care) may confer an element of psychological safety, pushing students to develop both academically and professionally. The impact will vary between individuals and their expectations however, but in finding contextual scenarios both accessible and intellectually stimulating it may spark interest in broader domains.

Transportability also seemed be able to provide a greater understanding of other healthcare professionals’ roles which aid in understanding sort transitions of care (e.g. on admission to hospital), limitations of different environments (e.g. care homes), and build empathy and understanding. Oonagh, for example, discussed interactions at a conference where there were a “lot of pharmacists from the UK and they were all saying about primary care. And I was like “oh, what's that?”... So I think if you had a situation written I think you could definitely get a picture of what that job would be like”.

For students who are not currently performing clinical pharmacy roles it could also provide a way to practice and maintain these skills whilst exploring methods of implementation in their own area, providing a way to understand patients (Cragun et al., 2022) or test out clinics and treatment choices in the way it has been used by others (Blevins et al., 2017; Donovan et al., 2021).

7.1.4 Engagement Variables

Engagement variables refer to processes such that influence how players connect, react and respond to the IF.

7.1.4.1 Realism

Realism refers to how realistic the IF is, including the overall plot, the decisions the player can make and the consequences of those decisions.

Generally, participants found IF depicted a realistic scenario that also aided transportation (7.1.4.3). Aisha, during interview, even started to blur the lines between having ‘seen’ the patient and playing the game (“when I was checking out this patient - sorry, the game”). This was reiterated by P8 who found the IF valuable as it is “easier to remember information that is applied to an interactive scenario that is very realistic to one that could happen to you in your job; less abstract”.

Conversely, other participants found the IF unrealistic as “you make decisions in the comfort of your house, not in a stressful environment such as a hospital or community pharmacy” (P16). A couple of participants also commented on how unrealistic they thought the reactions of the healthcare were (“the patients were super sweet, the doctors were super sweet. The nurse was super sweet” (Aisha)) and that they expected more of the pushback they experienced in reality.

Interestingly, this IF was based on my own experiences and interactions however these experiences cannot be expected to be universal. Participants' diverse backgrounds may have impacted their immersion, influenced by their own workplace interactions. While capturing all scenarios is impossible, future IF development could consider this variability to enhance realism, providing multiple kinds of interactions and settings.

Whilst this is only one potential IF it does give scope to change the characteristics mannerisms to allow for development for some of the non-clinical skills highlighted by participants in Section 7.1.3.1 or for the potential to explore other peoples’

experiences – including patients, carers and other healthcare professionals - through interdisciplinary research. For example, it could be beneficial to play the same story but from the perspective of the patient to see how the impact of their decisions can affect people.

As Aisha started to blur the lines between having 'seen' the patient and playing the game this could also highlight how realism can effect real-life reactions and, potentially, changes to both attitudes and behaviour. (Ahn, 2012; Harmsen, 2018). Whilst realism has been more linked to narrative structure by Green and Jenkins (2014) they also highlight that there are many potential areas for future research in this area, particularly in how different individuals react.

7.1.4.2 Identification

Identification refers to the extent to which the player identities with their character within the IF.

Participants often displayed empathy and identification with the character throughout the questionnaire responses and in interview, perhaps even more so than the results to Q14[35] (see Table 6.1) show, possibly indicating that the students identified more with the *role* than the IF *character* they adopt.

However, identification with the role may particularly benefit PG pharmacists, who already perform similar tasks, unlike UGs.This familiarity appears to alter the educational impact and value specifically *because* it requires working knowledge of the professional role and responsibilities. Comparing PG and UG responses to the same IF could further elucidate these differences, and may be an enlightening area for future research.

Many participants could empathise with the character when they were called in for a discussion with a more senior pharmacist ("That's the one thing that I think every

[35] Q14: I related to my character in the story and/or to the story itself.

pharmacist dreads" (Steven)), or could identify with the pressures pharmacists are under on a daily basis to review all their patients amongst their other duties.

Identification with the pharmacist character also helped Aisha, for example, build a connection with the patient and:

> "*since it puts you in the mindset of the pharmacist on duty, I think it helps with the decision-making skills since it encourages you to be more decisive and follow your own choices*."

Identification is not explored in the IF literature, however a number discuss the development of professional responsibility (Benedict et al., 2013; Benedict & Schonder, 2011) however this is different to identification. Indeed, as Sharples et al (2015) conclude the experiences that professionals have often "depart from our initial expectations, and [we] must adapt and reconcile the imagined and lived versions of professional identity" (p.713). It therefore stands to reason that PG pharmacists – as the lived form – will experience the same scenarios differently to the imagined form of UGs, providing both context and greater impact to the IF.

7.1.4.3 Transportation

Transportation refers to players' mental and emotional immersion in the narrative, often described as being "lost in the story".

Transportation, or being "lost in the story", varied among participants. Generally, participants with hospital experience appeared to experience higher levels of transportation than those in other sectors. P17, for example, responded that IF "is like that your living this interaction". Others commented on the benefit of the detail in the introduction ("including how the work day had started and wondering who would be on the ward made it feel very relevant and had me comparing it to my own working day!" (P8)) whereas some deemed them unnecessary, possibly due to time constraints from part-time work and study. This variability highlights that effective IF design is subjective, with differing responses to the same features, and also perhaps to the limited time participants have for study.

It is possible that transportation was both positively *and* negatively affected because the participants are working in (or have experience) of a similar environment. Thus, for some the detail may have been enough to aid transportation, but others may not have found the details provided exactly matched their own experiences and pulled them out of the immersive experience. However, it is important to acknowledge that different people will always have different experiences, and this may not be significant at all.

The degree of transportation has been shown to produce changes in both attitude and behaviour (Green & Brock, 2000; Green & Jenkins, 2014) and so can be effective in producing real world changes as readers are “psychologically transported into the narrative world where they cognitively and emotionally relive the fictional events” (Bilandzic & Busselle, 2008, p.510). Ahn (2012) also notes that individuals with higher need for cognition (section 7.1.3.1) and identification (section 7.1.4.2), as well as emotional responses – as in the findings of this study - also experience greater narrative transportation leading to positive changes in behaviour and attitude.

The results seem to indicate that balancing the detail and length of the IF could be beneficial in both maintaining adequate transportation and increasing its use in future. It would also be beneficially to conduct further research with a larger cohort to investigate these effects further.

7.1.5 Role of the Self

Role of the self refers to how the player perceives and expresses their own identity within the IF and is influenced by their own personal characteristics, experiences, decisions, and emotional responses

7.1.5.1 Self-Referencings and Remindings

Within Green and Jenkins 2014 paper detailing the conceptual model they refer to self-referencings and remindings. These are instances where players are reminded of personal experiences of situations through the IF. In the paper these sit under the

"Role of the Self" heading but are not included in the diagrammatic model. However, self-referencings and remindings seem to have been core to the experiences of the participants in the IF.

There are numerous instances of this phenomenon throughout the responses, however the impact is most neatly demonstrated by Oonagh who had a patient initiated on gentamicin the day before:

> *"the first thing I did this morning was I ran and saw that gent case!...I think when you chose the wrong answers and showed what could very easily happen to the patient, ending up in ICU. I think it definitely hits home."*

For some it was a reminder of the gravitas of the job they perform – especially if they had also qualified as a prescriber or have been qualified for a while – where everyday tasks (such as checking for interactions and medicines reconciliation) can become so routine that the participants often lost sight of their importance.

> *"I remembered how many times I've never asked a patient about their over the counter meds in med rec*[36] *because I just don't have time and no one gives you the right answer anyway. And then, y'know, you hear some of these instances... So I think it is really easy to forget and it does make me reflect and think, gosh"* (Steven)

Green and Jenkins themselves present potential conflicting outcomes for self-referencing and remindings, hypothesising that the negative emotions associated with questionable actions may feel threatening to the reader, reducing the impact. However, they also state that the similarity of the player to the character could in fact balance this out and produce more favourable effects.

This study suggests that designing protagonists to reflect the participants enhances engagement and that negative emotions, like fear of failure, may drive deeper

[36] 'Med rec' and 'meds rec' are commonly used abbreviation of 'medicines reconciliation': a process where pharmacists verify and document patients' complete medication lists at transitions of care (e.g. at admission to or discharge from hospital) to ensure accuracy, prevent errors, and enhance safety.

learning and changes in behaviour. This may be a “double-edged sword” that requires further exploration but may not inherently problematic, especially if it reminds some participants of the weight of their decisions, as it seemed to do.

This however is a relatively small study and so would require further exploration, though I would suggest the addition of “self-referencing and remindings” to the overall diagrammatic representation of the model would be useful for future researchers to ensure it is included and investigated more thoroughly.

7.1.5.2 Responsibility and Participatory Responses

Responsibility in IF refers to players' sense of responsibility for their choices and the consequences. Participatory responses refer to how the player reacts to events as if they were part of the story. Participants' responses relating to responsibility however often incorporated participatory responses therefore, these elements are discussed collectively, though both sit under “Role of the self” within the framework. This again appears speaks to the fact that these participants are both students and pharmacists: that the responsibility they felt led to heightened responses precisely *because* they know that their reactions were possible. This may point to a difference in engagement between the PG pharmacy population and the uses discussed by Green and Jenkins (2014): health-education and enjoyment.

Most participants either agreed or strongly agreed that seeing the errors and mistakes in the game and the consequences of these were good learning experiences (Q4, Q5, and Q6)[37], and for some participants the sense of responsibility was a crucial factor in determining the impact of IF: this was their patient.

Aisha, for example, demonstrated a strong sense of responsibility for her decisions, even revealing she thought “No! it's not too late! Just give me another option so I can go save her!” when it was clear the patient was deteriorating.

[37] Q4: I feel like I learned more from making poor decisions in the game than by making good decisions. 81.5% agree. Q5: I enjoyed being able to make bad clinical decisions in a safe environment - 81.5% agree. Q6: It was beneficial to see the consequences of my decisions in the story, even if they were not what I would do in real-life – 100% agree.

However, it was clear that many – including Aisha – were conflicted about the benefits and drawbacks to the sense of responsibility conferred by the IF. P21 responded that the weight of responsibility could “scaremonger people if they make the wrong decision” however finished with “...but then again this is the place to make the mistakes where no harm can come to patients”. This may be one reason for the relative lack of ‘bad’ options in the IF with UGs: educators do not want to scare the students even if it reflects the reality of the job.

Similarly, Steven expressed conflicting ideas about responsibility specifically, but also seemed to approach it as if he were an UG and not the PG:

> *“Maybe that specific scenario would be a little bit too… I don't know, maybe it might put some people off or freak them out…it's a fine balance, isn't it? Because you don't want to discourage them too much, but you also need people to understand the role that they have and the importance of doing it well.”*

What was interesting is that these comments, like many similar ones, seem to acquiesce to the importance of their roles and the weight of the decisions they are making even if that seems frightening, possibly indicating that the benefits of seeing the outcomes outweighs the risks to the sense of self whilst playing.

This perhaps returns to self-referencing and remindings, indicating that participants’ “selves” were a very strong part of the impact of the IF itself. Perhaps this reflects that the stakes here are higher, and could truly be life or death. It is not possible, however, to draw a solid conclusion from just one study or story, suggesting an interesting and valuable avenue for further research.

Whilst Green and Jenkins argue that "the impact of [irrevocable consequences or events, such as the death of an important character] would likely be diminished if the character’s death could be prevented by making a different narrative choice" (2014, p.493), this study suggests the opposite. The preventable nature of the patient's death, coupled with the participants' real-world experience performing similar tasks,

appears crucial to the IF's profound impact. This impact may indeed reflect that of other modes of entertainment in some ways. For example, because of their experience the reader may be able to see where the story is headed, akin to watching a character in a horror movie head into the deep-dark woods. With experience of previous movies it is obvious to us what will happen but if this was your first such movie (such as inexperienced UGs) you might not be able to predict the outcome and do not experience the same anticipatory response. It would be an interesting avenue for further interdisciplinary research.

Additionally, the participants were also instructed to take multiple paths and to deliberately explore as a method of learning from failure which may have helped to ease the psychological burden of making such failures. Similarly to Kiles et al., (2021) study this instruction “decreased the pressure on students to select the “correct” answer and allowed them to explore clinical options in a low-stakes environment” (p.6). It allowed participants to explore failure without being made to *feel* like failures.

Similarly, PGs experience may also let them predict how a pathway will end in the way that a UG might not be able to. This tension as they watch their poor decision unfold may contribute to their learning. This could be an area for potential future interdisciplinary research.

7.1.5.3 Possible Selves

Possible selves refers to the different identities or roles that players may adopt in the IF. They may choose to take the path that remains true to themselves, or explore other, more riskier decisions.

Generally, participants seemed to demonstrate hesitancy in playing the IF in a way other than the ‘right’ way. Steven even reported feeling as if someone would be monitoring his actions and only settled into making mistakes “once I was happy that Queens wasn't going to steal my certificate away”, eventually finding the exercise enjoyable and insightful as he explored many different selves (and occasionally as others).

For many, the IF was a way to try out things they would not be able to do in real-life to see what the consequences of choosing the different options would be. P21, for example, reported seizing the opportunity to try things out to “see that if I make mistakes then the consequences can be severe” whilst also ensuring they stated “I don't want to cause harm”.

In fact, only one participant (Aisha) openly discussed how, on her first playthrough, she chose to play as a different self, selecting the answers she knew were wrong which proved to be interesting and useful:

> *“the first time I did it was on purpose. Like choosing the things I will* not *do in real life…So I ended up having a very bad outcome. And then I had to go back again: “Oh no: now I have to be like work”.*

Multiple other participants reported that they used the IF to see how various aspects of their decision-making processes, clinical knowledge and skills have changed during their careers. They reported playing as their previous, less-qualified selves and seeing and comparing with the decisions they would make now, with all the knowledge they have gained in the intervening period through both practice and studies. This could present an avenue for potential future research, not limited to pharmacy professionals.

Despite explicit instruction, participants exhibited a high degree of fear in making different or poor decisions. This speaks not only to the risk aversion of pharmacists and the fear of career disruption (Ferguson, 2015; Hamm, 2019) but also to the profession and teaching that students appear afraid to explore error even when they are told they can. Although it is obviously important to avoid error in practice it may show that the culture in UG pharmacy education may be damaging students ability to learn well beyond graduation. Likewise, their experiences as pharmacists may be negatively impacting their experiences as students and their ability to learn how to correct and take action on their errors. Indeed, Smith et al. (2024) advocate for error as part of learning to encourage pharmacists to become more comfortable with error as a part of patient care. Multiple authors suggest that UGs should be taught in ways

that the become more comfortable with ambiguity and error to build confidence (Charrois & Sewell, 2023; Mertens et al., 2024).

As per the framework (Green & Jenkins, 2014) “interventions that evoke possible selves have been shown to improve health behaviours” (p.487) so it is therefore possible that students may experience similar educational experiences through being able to play as other characters and “experience the consequences of each choice” (p.487).

However, it is needs to also be stated that this study involved a small cohort, and the first exploration of error in this way, to my knowledge. These are participants who have not only been working in practice where error is of course avoided at all costs, but also students who have been through years of academic learning as high achievers. It may be that playing with mistakes actually just takes some getting used to.

Therefore it could be helpful for both students and pharmacists to build in more ways in which they can learn from their mistakes and make it more normal, recognising that these things do actually happen.

7.1.6 Outcomes

Outcomes refers to the resultant effects from making decisions in the IF and may include changes in attitudes, beliefs, or behaviours.

7.1.6.1 Appreciation

Appreciation can be likened to processes of reflection.

Participants indicated that IF proved to be a valuable tool for reflection on both their decisions within the game and on similar decisions they make in practice (Chapter 6.2.5.1). Reflection occurred both during and after play as indicated by Q9[38], which may indicate participants experienced deeper processes of reflection. As P17

[38] Q9: I found myself thinking about the story even after I had finished playing it. 92.6% agree.

responded: “It is not that you want to think about your choices. It is that you have to think; what if I made the same choices in real life?”. Similarly, some expressed a more introspective perspective on how the IF provided opportunities for “understanding why you make the decisions you make” (P24).

This reflection was identified as being a useful way to learn from errors and identify knowledge gaps as both students and as pharmacists, pinpointing areas to revise or develop. For example, Oonagh commented on how it prompted her to revisit other potentially high-risk drugs “like the heparins and the DOACs[39]” and refresh her knowledge.

Furthermore, IF provided time to “slowly consider different options and look into the various topics” (P5) echoing Mertens et al. (2024b) who noted that where “undergraduates sought efficiency in decision-making, postgraduates valued [their decision-making] model’s role in decelerating the process, facilitating thorough and effective decision-making” (p.6). This highlights the difference in how UGs and PGs engage with the same tool and could have implications for IF use and merits further research.

Whilst everyone reported they reflected (Q10)[40] a few noted that being forced to reassess their own practice through self-reflection rather than formal feedback was more beneficial. This may present a slightly contradictory view expressed in Chapter 5.3.2.2 that participants wanted formal, academic feedback. However, as individuals vary in their feedback preferences, no single mechanism will satisfy all.

Although there was a mixed response to ‘enjoying’ making bad clinical decisions in a safe environment (Q5) all participants indicated that it was a valuable experience (Q7), neatly demonstrated by Maria: “I hate failure. I absolutely hate it, but I think you learn a lot from failure though. And if you make an error, I think you learn a lot from it".

[39] DOACs: Direct Oral Anticoagulants. Used to prevent blood clots. Commonly but inaccurately referred to as ‘blood thinners’.
[40] Q10: As I played “Lady and Gent” I reflected on elements of my own professional practice. 100% agree.

P17 highlighted that the experience of the IF "gives you motivation through the feelings you experience during the process and it rekindles the will to apply what you know to everyday practice". Similarly, Steven commented on how he experienced emotions as if a 'real' error had occurred, albeit to someone else:

> *"it's not until something bad happens that you sort of think, "oh God: that could have been me." And so I suppose this is a good way to do that: you still do get that. "Oh, God" feeling but actually you feel a little bit more settled because it's not a real patient and, y'know, it's OK to make mistakes and it's a better place to make mistakes"*

Green and Jenkins (2014) themselves state that "existing interactive narratives appear to have provided opportunities for enjoyment rather than reflection" (p.493). This research suggests that both are attainable and valuable as learning tools. The application of their model in this study may go beyond what they had initially intended in health-education in the general population, and not as a learning tool within healthcare education itself.

Responses from participants demonstrated reflection and considered their experiences as both students and pharmacists and how learning could be applied and improved for both throughout the data. The IF also appears to produce deeper reflection similar to that which occurs after a real-life incident whilst providing a degree of psychological safety (Klasen & Lingard, 2019). This could be extremely beneficial as incidents often stay with pharmacists throughout their careers, including those that happen to others (Ferguson, 2015; Smith et al., 2024). Relatedly, Benedict et al. (2013) reported that their simulation appeared to have no longitudinal impact on learning at UG level. 92.6% of participants in this study, however, reported thinking about the IF even after they had finished playing (Q9). When considering the long-term emotional impact of errors (Ferguson, 2015) this may indicate improved longitudinal learning not demonstrated in UGs, effective precisely because the participants are working in practice.

This also reflects the results from Q7 where all participants agreed that being able to choose different pathways showed there can be more than one right answer but that (particularly in practice) that there are very definitely wrong answers. The “very negative outcome where patient died was quite morbid and serious, hence I did ponder over the game after finishing it” (P22). This is not only applicable in their studies but in reality, where patients don’t always fit the gold standard guidance or make choices that necessitate more nuanced care, and sometimes events lie outside all healthcare professionals’ control.

In addition, it has produced very different reflections from professionals and is a useful reminder that we cannot always predict how people will see or learn, and that our students are not a homogenous group.

Green and Jenkins also assert that, in 2014, there had been no studies targeting appreciation, which appears to hold true at the time of this study. However, extensive research exists on reflection within pharmacy practice at both UG and PG levels (see Chapter 2.4), offering insights that this IF could both contribute to and draw from.

7.1.6.2 Attitudinal/ Behavioural Change

This refers to the degree in which the IF provokes a real-life change in attitude or behaviour.

Regardless of employment sector most participants commented that IF could help them build confidence in decision-making, consider more therapeutic and non-clinical outcomes for patient care, and change pharmacy practices and processes. This was possible as the IF “showed multiple options you could pick, some of which I would not have even had in my normal order of consultation so being able to add these in would be great” (P20).

Participants reported gaining confidence as “the experience you gain though the process…makes you more capable and confided [sic] to apply your knowledge in everyday practice” (P17). Experimenting and practicing their skills safely and privately and seeing positive outcomes gave them the confidence to apply these to

their real-life cases. The IF environment was also deemed extremely beneficial by numerous participants as it provides “a hands-on learning experience which could allow professionals to apply theoretical knowledge in practical, simulated environment that is a safe space” (P3).

A number of more experienced participants stated that they would be unlikely to change their practice in response to this specific scenario. They acknowledge that IF had the potential to be a persuasive tool for change in less familiar areas and as a way to push people out of their comfort zones for personal and professional development. This confers potential benefits beyond knowledge acquisition. Indeed, P10 - with 10-15 years of experience - stated the IF did make them "consider how I could improve the way our current work is” (P10), possibly demonstrating the ability of the IF to go beyond the purely clinical.

Generally, participants volunteered many examples from their own workplaces in which they demonstrated both attitudinal and behavioural changes, often citing specific examples such as increased antimicrobial stewardship (P17), changes in workload and task prioritisation (P9), or multiple, in the case of P6:

> *“antibiotics, drug interactions, renal disease and thromboprophylaxis in one case, simulating a real-life case and helping me to consider all factors in making clinical decisions in a single patient case”*

The results seem to bolster Green and Jenkins’ idea that “the process of making a decision within a fictional world, where the stakes are lower, might help individuals think through the consequences of various courses of action” (2014, p.493). Indeed, multiple participants reported having already enacted changes including new ways of working or processes changes. A lot reported urgently checking on patients who had been prescribed the same medication (gentamicin) as the IF patient.

It is uncertain whether this would have had the same impact had these participants not been PGs who are already working in these areas. Kiles et al. (2021) also demonstrated an increase in UG confidence in critical thinking and decision-making skills, and Smith and Waite (2017) stated that their virtual patient simulation helped

“students develop therapeutic decision-making skills in a risk-free environment” (p.897). It is uncertain how this would compare to the applications in PG clinical practice. However, I believe that the real-world changes that were brought about through academic learning by participants in this study may show the beneficial use of IF in this area.

7.2 Summary

This chapter presented and discussed the findings from this research relating to participants engagement with IF as both pharmacists and students, in context of the existing literature.

Overall, participants reported increased confidence in their knowledge and skills, improved by making poor choices in a realistic, judgement-free IF environment. Whilst Green and Jenkins (2014) hypothesised that negative emotions associated with questionable actions (poor clinical decisions in this case) would lessen the impact of the IF it instead appears to have been enhanced. This difference may stem from the contrast between entertainment focused IF and professional simulations. In "Lady and Gent," the patient death may have resonated more deeply as it is directly relevant to participants' real-world responsibilities, where failure has significant consequences.

Due to their real-world experiences participants also expressed a desire to exert both more and less agency over their decisions by including more options but decreasing the user control. Timed decision-making, dealing with others’ clinical decisions, and workload prioritisation (e.g. on-call) were some suggestions that would make the IF more ‘real’. Participants also requested more academically and professionally challenging and complex scenarios to reflect the ambiguity and multimorbidity in patient care, as well as handling conflict or negotiation. IF was also considered a potentially useful way to try out different processes and ways of working before initiating change, for gaining experience, and upskilling in specialist clinical areas such as critical care.

Participants found the IF time-consuming, especially alongside other commitments yet paradoxically desired more challenging IFs, demonstrating tensions between

what they desire as students and the time they are willing to commit to learning. Non-UK participants in particular requested IFs that are individualised according to their own guidance, however this would impact academic workload significantly. Incorporating IF development into assessments may therefore be a potential solution, working in groups to also develop community as suggested in Chapter 5.

When adopting dual identities, self-reflection also altered somewhat, with participants making decisions as their past selves, comparing it to their current self, and reflecting on their progress. They also reported reflecting on their knowledge and confidence beyond the topics within “Lady and Gent”, seeking ways to improve beyond the bounds of this story. Furthermore, they also suggested that IF engage students in challenging subjects by reframing them within a patient case to bridge learning and practice.

In their 2021 simulation-based study Kiles et al. stated that “students often struggle to transition from understanding and interpreting information to applying these skills in experiential settings” (p.2). The participants in this study, however, are applying these skills regularly as what they are in is not an “experiential setting” but the real-life application. It therefore seems that this difference along with their overlapping identities provided the most impactful engagement with IF.

Chapter 8: Conclusions, limitations and recommendations for further research

This final chapter draws together and concludes this thesis by first providing an overall summary (8.1) and the key findings from each RQ (8.2). I offer perspectives on my use of Green and Jenkins' (2014) conceptual model of interactivity effects and how it might be used by other researchers (8.3). I then address the study limitations (8.4), outline the contributions this thesis makes to knowledge and suggest further areas for research (8.5). I end with some final reflective points on my doctoral experiences (8.6).

8.1 Research Summary

This study explored PG DL students' interaction with IF as a pedagogical tool both academically and professionally. It examined how the interplay of student and professional roles influenced its use and how participants learned from their errors during the process. This follows on from several studies demonstrating that UGs found IF to be a useful and enjoyable way to apply decision-making and learn from their mistakes (e.g. Morningstar-Kywi & Kim, 2021; Osae et al., 2022). I believed that IF could provide similar opportunities for practicing pharmacists studying for PG qualifications, helping them to learn from errors, improving their clinical decision-making abilities and, ultimately, patient care. As errors can cause great stress for pharmacists (Ferguson, 2015; Mantzourani et al., 2019) the potential for IF to turn this fear into learning opportunities could be beneficial. Indeed, errors and mistakes are often part of patient care therefore it is also important that – as with other HCPs – pharmacists learn to deal with them (Smith et al, 2024).

Throughout this research I applied Green and Jenkins' (2014) conceptual model of interactivity effects, employing all headings to investigate how IF can be useful for both participants' studies and real-life clinical practice.

Taking a mixed methods approach, and from a pragmatic standpoint, I distributed anonymous online questionnaires that evaluated an IF called "Lady and Gent", which I also created. Questionnaires were complemented with semi-structured interviews with graduating students to gain deeper insights.

8.2 Answering the Research Questions

This research aimed to answer two main research questions, each of which is presented below.

Overall, the results were positive and provide a good basis for future avenues of research, discussed in 8.5. Participants' responses were detailed, insightful, and demonstrated the potential value of IF to them as both students and pharmacists. Echoing the results of similar UG studies using IF most participants in this study "agreed that these types of patient cases were enjoyable, helped them apply the material better, gave them an opportunity to learn from their mistakes, increased their engagement, improved their confidence, and were valuable to their understanding of course material" (Wettergreen et al., 2024, p.492). Additionally, participants also commented on the benefits of the safe environment IF provided, ensuring that patients did not come to any actual harm.

However, one factor current literature has not considered is the strong influence of professional PG experience that this cohort of participants has, which appears to profoundly impact the results. Notably, many of the responses offered were possible only as a direct consequence of participants' work in-practice, and it is highly unlikely that UGs could offer similar insights. For example, P4 responded "I think that the safe environment and ability to makes mistakes gives perspective to my clinical practice": a comment only someone actively working within that environment could make.

The value of IF to PG pharmacy DL students appears to be manifold, and their dual identities as both students and pharmacists impacted on how they engaged with IF, as demonstrated in Chapters 5 – 7.

8.2.1 RQ1. How Do PG Pharmacy DL Students Engage with IF As a Pedagogical Tool?

a) What do they consider to be the benefits or advantages in its use?
b) What do they consider to be the drawbacks or disadvantages in its use?

c) What changes would students recommend to increase its value to their studies?

Firstly, this research demonstrates that IF appears to deliver an impactful, valuable and enjoyable learning experience, providing opportunities for students to practically apply their academic knowledge to situations that are reflective of real-life. Knowledge retention may also be improved, and students reflected on and identified knowledge gaps to revisit, similar to the existing literature with UG students (Benedict & Schonder, 2011; Morningstar-Kywi & Kim, 2021). Additionally, almost all participants reported it to be a valuable mechanism for the exploration of different clinical outcomes and the development of decision-making and critical thinking skills, similarly to UG research (Bernaitis et al., 2018). Participants also reported that IF was beneficial in exposing them to unfamiliar areas of practice and clinical situations. Students practicing in countries not yet routinely providing clinical pharmacy services reported that IF could provide a way to apply and practice these skills safely, before implementing them in practice. To date, these applications do not seem to have been explored or reported in the literature.

This study shows that students learning benefitted from the use of IF, positively impacting on knowledge retention and enjoyment, and that it was a safe and effective way to both make mistakes and apply knowledge gained from their studies. This finding echoes the existing UG IF literature within pharmacy (Wettergreen et al, 2024), in other healthcare disciplines (Cragun et al, 2023; Donovan et al, 2021) and beyond (Holm, 2020; Perez-Miles & Jenkins, 2017). Markedly, participants demonstrated processes of deeper reflection, potentially indicating that IF could be useful for longitudinal knowledge retention. As making deliberate errors in learning has also demonstrated improved knowledge retention (Wong & Lim, 2022), it could be that these combined processes have a profound effect on learning.

One overarching trend was that participants reported that the IF was time consuming to complete, however 100% also responded that they would appreciate the opportunity to play other IF games. Responses requesting more intellectually challenging scenarios as well as formal feedback (or a ‘correct’ answer), such as that provided by Bernaitis et al (2018), were common. This creates an interesting tension

between the student and the academic as, whilst participants suggest more (and more complex) IF they also report it was “too wordy and lengthy” (P22). This reflects the findings of Redinger et al. (2022) and Smith et al. (2014) who reported students replayed their scenarios fewer times than expected when they were made readily available after the allotted in-person teaching sessions. Similarly, students on my own courses have requested more in-person teaching yet fail to attend when it is provided.

As one participant also commented, presenting too many choices or overly complex scenarios could lead to cognitive overload, overwhelming players who then struggle to make effective decisions (Scutt et al, 2022). Striking the right balance between an engaging narrative and appropriately detailed educational content is therefore crucial. Overemphasis on one aspect could detract from others, and the suggested ambiguous scenarios or patients with multimorbidities would only increase this complexity further. Indeed, when offered to UGs in classroom settings these cases are usually presented over a number of timetabled hours (Wettergreen et al, 2024) whereas PG DL students must study on a self-directed basis, in their own time, and around other responsibilities. IF was also suggested as a useful way to develop community and facilitate group work in complex case discussions with DL courses, reflecting the way it had been used in the literature (e.g. Donovan et al., 2021; Rozmus et al., 2015).

Participants were also concerned with accessibility and translatability, and that scenarios should allow students to use their own clinical guidance, regardless of location. Reservations were similarly expressed about the applicability of IF to scenarios that were purely academic in nature, such as conducting research. Concerns were raised about the negative outcome for the patient on one branch of the IF, with participants suggesting it could be difficult to face, and expressing discomfort in making poor decisions. However, despite potential discomfort, participants also recognised the benefits of making these decisions and errors in a safe environment.

Notably – contrary to the hypothesis of Green and Jenkins (2014) – the emotional impact of poor decision-making enhanced rather than diminished engagement,

resulting in meaningful reflection and improved learning outcomes. Participants demonstrated strong responses to the pathway that resulted in the poorest outcome through processes of identification[41] (e.g. P12: “I related to the poor pharmacist being investigated”), responsibility[42] (P17: “I felt like it was my case and I had to take care [of] my patient, to make no harm”) and transportation[43] (Steven: “it's like being able to be there before you're actually there*”*). Whilst not widely explored in the pharmacy IF literature, Steinemann et al. (2017) reported more prosocial behaviour in their study with increased empathy and sympathy for the characters adopted by the players, similarly to that expressed in this research.

A key finding from this research, which appears to significantly influence how participants learn, is the combination of their student and pharmacist identities. Though RQ1 tackles participants’ engagement with the IF as students, they appeared to find it difficult to separate their clinical practice from their studies. Additionally, they suggested ways in which they could challenge themselves more intellectually and academically through the safe learning space to gain feedback and insight. This included pushing themselves outside of their comfort zones (e.g. uncomfortable prescribing decisions), the use of more complex clinical cases (e.g. critical care), and in developing skills they considered poorly taught, understood or practiced before becoming registered pharmacists (e.g. ethical dilemmas). From my own perspective as both an academic and a clinical pharmacist it was encouraging to observe the desire for such learning opportunities.

Finally, participants suggested including the incorporation of additional technology (artificial intelligence and video, for example) and timed decision-making. These suggestions seemed to stem from reflection on real-world difficulties identified by the participants, and often replicated their own specific development needs. For example, a participant commented that character interactions in the IF were not as challenging as they experienced in real life, suggesting ways to narratively introduce push-back to learn how to appropriately deal with conflict. Another focused on their

[41] The extent to which the player identities with their IF character.
[42] The level of personal responsibility the player feels for their choices and the consequences within the IF.
[43] The degree to which the reader feels they are part of the action: being ‘lost in the story’.

identified learning need of developing ethical decision-making skills and practicing these through IF instead.

8.2.2 RQ2. In What Ways Do PG Pharmacy DL Students Feel Their Experiences Through IF Could Be Useful for Their Clinical Practice?

a) In what ways do they feel their decision-making abilities are affected?
b) In what ways do students reflect on their usual practice whilst using the IF?
c) How do they feel this reflection can affect their clinical practice?

Many of the benefits of IF appear to lie within practice, as participants applied lessons from the gameplay to their own work environments, often providing responses befitting their positions as both students and professionals.

One key aspect which has been overlooked in healthcare research with IF is that of the practicing student. Where simulation-based studies generally involve UG students (Kiles et al., 2021; Smith & Waite, 2017) applying newly acquired knowledge to novel situations, pharmacy PG DL students are already working in this role, and so are acutely aware of potential outcomes should they make errors.

IF also appears to provide a mechanism for reflection on their usual practice, especially through the negative narrative outcomes. This encouraged learning from mistakes, self-reflection, and even provided opportunities for real-world peer discussion. 92.6% of participants also pondered over the story outcomes even after completion, demonstrating deep reflective processes. This reflection appears to have been beneficial in developing their clinical decision-making skills and increasing their confidence, similarly to existing literature. Mantzourani et al. (2019), for example, discuss how pharmacists who reflect on errors or near misses often show improvement in their critical thinking skills. Ferguson (2015) also notes that “fatal and harmful errors can stay with health professionals for the rest of their lives” (p.5). As IF mimics these scenarios, participants reported feeling they had ‘experienced’ these errors as if they were their own and may remain with them as such, building the experience into their personal knowledge bank for future reference.

Furthermore, the importance of what Green and Jenkins (2014) describe as “self-referencing and remindings” (instances where players are reminded of personal experiences or situations) through the IF cannot be underestimated. This concept appears to have been essential in allowing participants to readily picture and experience the consequences of making feasible decisions, invoking similar feelings to those that might be experienced should the same outcomes happen in practice. Again, throughout both questionnaires and interviews, participants offered examples from their own practice, including patients prescribed the same medication as that within the IF, subsequently prompting real-life clinical reviews. This is a consequence of playing the IF that is not demonstrated in the current literature, as UGs would not be in the position to be checking on their own patients, or to be responsible for their care. However, it has important implications for further IF investigation and development.

Despite many participants feeling the story was not complex enough, it still prompted reflection in all 27 questionnaire participants and five interviewees, with diverse comments demonstrating considerations beyond patient care to workflow and personal boundary setting. Some reported planning changes based on the IF, though reflection alone did not guarantee demonstrable action. For example, P16’s more abstract “I will think about drug monitoring far more” contrasts with P27 who adjusted their practice to include additional screening of the blood results system. This allowed P27 to proactively identify patients prescribed gentamicin or vancomycin and review the prescriptions more urgently. As both gentamicin and vancomycin can be toxic in overdose (or ineffective in underdose, contributing to antibiotic resistance) any errors will be identified more quickly, improving patient care. Gentamicin is also the antibiotic prescribed in “Lady and Gent”: the IF created for this research.

Whilst the literature on pharmacists’ reflection on their own errors is relatively sparse, reflection has been demonstrated to prompt changes in practices and processes, particularly where the process can be pinpointed as the root of the error (Guchelaar et al., 2005). It could be beneficial to both students and their colleagues if mistakes are initially experienced through IF, pre-emptively prompting change in actual practice. Additionally, IF seems to have prompted reflection on future changes in

practice, especially for those participants who are not yet performing the clinical role described within the game. Many also reported it would be a useful way to train on new areas, experience different sectors of pharmacy, and to see how real-life changes could work before being enacted.

One significant pattern in the findings was how participants saw the IF as valuable not just for gaining disease-specific clinical knowledge, but for broader non-clinical applications. Unlike in the literature where UG students were tested on their decision-making skills within patient cases (Benedict et al., 2013; Morningstar-Kywi & Kim, 2021), PGs also stated that IF could be beneficial in providing a safe space to develop the skills traditionally and primarily learned in practice, post-registration. Similarly to RQ1 they suggested communication skills and conflict resolution. However more nuanced skills such as on-call training[44], upskilling to more complex areas (such as critical care) and learning to make autonomous decisions and handle ambiguity (Branan et al., 2024) were also suggested. Associated skills such as prioritising, handling patient complaints, or addressing others' inappropriate decisions could be practiced, developed, and enhanced through IF, providing a safe space for learning. Additionally, IF could also be used to experience other sectors of practice (e.g. hospital, for community pharmacists) and develop an understanding of how pharmacy fits into the wider healthcare team. Whilst these ideas are not specifically explored within IF in healthcare (to my knowledge), Kowald and Burns (2019) used chatbots as interactors to help students learn to prioritise. Holm (2020) stimulated discussion and detail-oriented reading skills with Jonathan Swift's "The Lady's Dressing Room", and Brooke-Lester (2018) demonstrated the beneficial use of IF to expand students' views and develop empathy. This demonstrates the wide variety of potential uses for IF, limited only by imagination.

Whilst participants recognised the benefit in being able to make errors, not all participants found it an enjoyable process, perhaps as it evokes those same feelings that are core to many pharmacists' fears (Ferguson, 2015). Nevertheless, even those that found it uncomfortable acknowledged that it was a useful way to learn.

[44] As a reminder, "on-call" refers to the provision of services outside regular pharmacy department hours. This may include providing services such as pharmaceutical advice to staff and sourcing emergency medications unavailable on hospital wards, amongst others.

This may reflect the nature of pharmacy education, where errors are (often rightfully) feared but also where students do not have many opportunities to learn from their mistakes, especially in the PG period.

A tabular summary of all the findings is included in Appendix Seven.

8.3 Perspectives on the Use Of Green and Jenkins' (2014) Model of Interactivity Effects in This Study

This study used Green and Jenkins' 2014 conceptual model of interactivity effects to explore the most influential learning mechanisms within a PG pharmacy DL context. This research aimed to add to the literature on the model (rather than test or modify it), and so I offer a brief discussion of my experiences with the framework for future researchers.

This model provides a guide for research on interactive narratives, highlighting elements such as player engagement (e.g., realism: how realistic the narrative is, including the decisions players have to make), the role of the self (e.g., responsibility: the level of personal responsibility the player feels for their character's actions), and outcomes (e.g., enjoyment: the degree to which the player enjoys the story). A full description of the model is in Chapter 3.4.

While other studies have focused on specific headings like transportation (see Table 3.1), none appear to have specifically explored the effects of appreciation[45] through IF or its impact on knowledge acquisition. Applying the complete framework in this study was extremely useful but generated a large amount of data, particularly as this is a mixed-methods design incorporating both quantitative and qualitative elements. Whilst I could have focused on specific headings, using the full framework provided a holistic view of the IF and contributed to the literature. I also believe that the results of this research would have been entirely different had I not applied the framework, finding it extremely valuable in both designing the IF itself and providing structural scaffolding for this thesis. As a pharmacist, it helped me edge my way into the social

[45] Appreciation can be likened to processes of reflection and involves meaningful engagement with concepts or experiences that lead to personal or professional growth.

sciences with a little more ease as well as ensuring I could capture meaningful data and insight.

Firstly, I have applied this framework beyond the bounds of its original intended use for “entertainment-education efforts, particularly those promoting health-related attitudes and behaviors” (Green & Jenkins, 2014, p.481), therefore I did not expect full alignment with my research.

Secondly, most of the existing literature applying this model concentrates only on one element (e.g. transportation by Ahn, 2012). In applying the complete model, I have considered the contribution of each heading, though this wide-lens view may not provide the same depth of insight as a specific focus. However, it presented me with an opportunity to consider which was most impactful for this specific group of PG DL pharmacists and pinpoint areas for future research (see 8.5 below). I have also included a tabular representation of where the findings address the research questions, organised by framework headings (Table 8.1) that demonstrates the gaps this research did not fully address, but may also guide other researchers to potential areas for further exploration.

Table 8.1 A Representation Of How The Findings Address The Research Questions, Organised By Framework Headings

Heading	Subheading	RQ1	RQ1a	RQ1b	RQ1c	RQ2	RQ2a	RQ2b	RQ2c
User control									
Narrative structure									
Moderator individual differences	Need for cognition								
	Need for control								
	Transportability								
	Comfort with technology								
Engagement variables	Transportation								
	Identification								
	Realism								
Role of the Self	Responsibility								
	Possible selves								
	Participatory responses								
	Self-referencing and remindings								
Outcomes	Enjoyment								
	Appreciation								
	Attitudinal/behavioural change								
Non-Framework variables									

Appreciation, for example, seems to have played an important role as all participants reported they reflected on their usual processes as they played, and also on the decisions that they made through the IF. As P17 responded,

> *"It is not that you want to think about your choices. It is that you have to think; what if I made the same choices in real life? In a real life situation you don't have always the possibility to change/correct your bad choices."*

Finally, Green and Jenkins (2014) discuss elements that I believe could be more formally included in the diagrammatic description of the framework itself: self-referencing and remindings[46], in particular. Though this study demonstrated that each aspect of the model has impacted on outcomes (Table 8.1) there appear to be non-framework components that also contribute to the overall impact. These could prove useful for formal educational purposes beyond the assessment of healthcare outcomes that the framework was originally intended to address. As mentioned in the limitations section below (8.4) future researchers could explore fewer headings concurrently, or group similar headings together (User control – the degree to which the player is able to exert control within the IF - and Need for Control – the extent to which the player *likes* to exert control - for example). The results of this study also emphasise the importance of "self-referencing and remindings", and I would recommend that other researchers adopt this concept more formally into their studies.

For those who are writing and developing their own IFs, I believe that the conceptual model provided a useful guide and structure. Without the application of this model this study may have proven more difficult to complete, less structured and possibly less insightful. By applying the headings, I was able to also give my students a voice on how they learn as well as how they *want* to learn.

8.4 Limitations

[46] Instances where players are reminded of previous personal experiences or situations whilst playing the IF.

As with all research there are inevitable limitations and weaknesses in both design and scope.

Results, though positive, cannot be generalised as this study was conducted with a relatively small cohort within a single PG pharmacy DL course in the UK, though it may provide insights to others in this field. This lack of generalisability is also one of the disadvantages of using mixed methods (Lewis & Quinnell, 2024; Mercer, 2007). Student response rates to questionnaires has also been historically and consistently low in QUB's pharmacy DL courses. Participants were also frontline staff during the COVID-19 pandemic, some having graduated early to bolster the workforce in 2020. Due to ethics constraints this study also took place at the end of the academic year, after students had submitted their final assessments, and many were graduating. They may, therefore, have been unwilling to dedicate time to something that might not benefit them directly. This also presented some time constraints within which I had to conduct all the research required. It is possible that research conducted during term-time may improve response rates.

Students who self-selected for interview were also unlikely to have been those who had bad experiences or disliked the IF (Burton & Bartlett, 2005). One student, who previously expressed discontent with the course itself, volunteered for interview but ultimately did not take part despite reassurance that I welcomed all opinions. This potentially skewed the results to the positive, overall. In the future, using an independent interviewer as a facilitator, increasing the sample size, and incorporating more qualitative questions in an anonymous survey may help capture a broader range of perspectives.

Finally, whilst I found Green and Jenkins' conceptual framework useful, responses became difficult to code when they crossed over multiple similar headings (e.g. transportability[47] and transportation[48]), and some responses did

[47] The ability of the IF to make the reader feel like they *could be* a part of the action.
[48] The degree to which the reader feels they *are* part of the action

not necessarily fit any heading at all, necessitating the inclusion of 'non-framework variables' in Chapter 5. Responses were also coded according to my subjective reading and, whilst I tried to ensure minimal bias, it is inevitable that some will remain and could influence the findings, discussions and conclusions (Seidman, 2013).

8.5 Contributions to Knowledge and Further Work

As outlined in Chapter 2.9 I identified various gaps in the literature which I believe this research has taken steps to address.

One of the benefits of approaching this study as a pragmatist with a mixed methods design, is that I could not only answer the RQs but identify avenues for future research (Biesta & Burbules, 2003). Pharmacy, as a health science, tends to lean into quantitative approaches rather than qualitative (Austin & Sutton, 2018), often answering questions that focus on "if" participants are learning rather than "how". In this study, the "if" is answered positively, and I believe that this research has given my students a voice (Greene, 2008; Venkatesh et al., 2023), adding weight to the "how". Participants found the IF impactful and "being able to play the game multiple times lets the player see what the best path to take should have been" (P7). Through reflection and self-referencing they related their learning to their daily work. They related to the characters and felt responsible for the patient. All leading to, in the words of P13 "being able to see how good or bad decisions would directly affect our patients…to follow and see real life scenarios which prepares you to the real world practice and challenges". This may help others in similar positions deliver appropriate and engaging learning assessments and materials.

To my knowledge this is the first study utilising IF with PG pharmacists. The results indicate that it could be an impactful way to utilise their professional experience to enhance academic development (and vice versa). IF could provide numerous avenues for teaching and learning, self-directed study, assessment, and even the development of community in DL courses. Interestingly, many of the participants' responses could only be delivered by those who are already doing the job, emphasising the role that experience

plays in academic learning for this group of students. However, it would be beneficial to explore a direct comparison of UG and PG responses to the same scenario. This study also highlighted not only the relative lack of literature in academic PG pharmacist education but also the dearth of research involving those simultaneously donning professional and student identities. This appears to provide powerful learning opportunities within higher education contexts. As per Rozmus et al (2015) “the difference between knowing the answers to questions on a test and assimilating the meaning of those answers into one’s professional and personal identity is crucial” (p.816).

Relatedly, I believe it is also the first to address learning from failure with PG pharmacists, opening avenues for further research in this area. As Maria stated in her interview: “I hate failure. I absolutely hate it, but I think you learn a lot from failure... And if you make an error, I think you learn a lot from it". Perhaps this research can also encourage other pharmacy academics to step towards learning from failure for both themselves and their students (Nohria & McBane, 2022).

Finally, participant responses hint that IF could have the potential to improve longitudinal knowledge retention by providing a ‘lived’ experience which could be useful for many professions (not just pharmacy or even healthcare) which could be explored further. There are also avenues for research into IF as an assessment tool, in multiple sectors of healthcare, for interprofessional and interdisciplinary research, the development of clinical pharmacy services in areas where it is not yet provided, or even as a way to acknowledge that chance can turn good decisions into bad outcomes, with no fault to assign.

8.6 Final Points

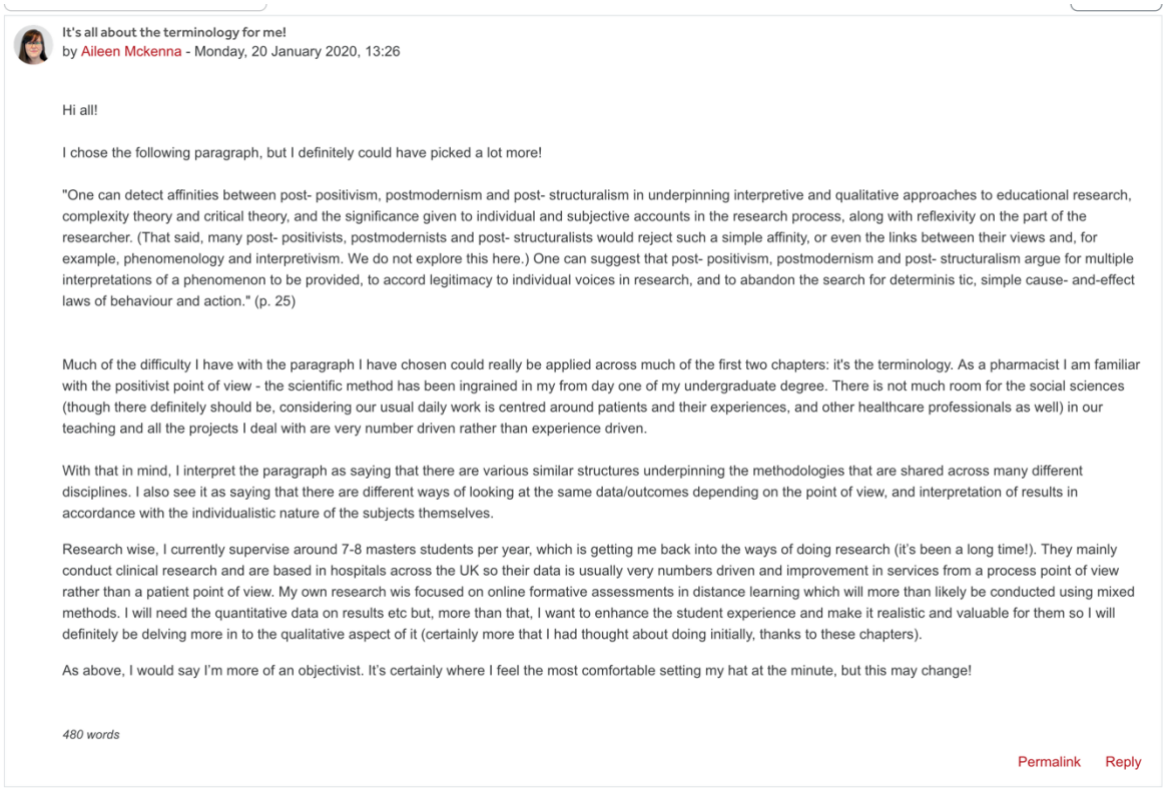
Finally, I approached this research with the mindset that I, too, was exploring just one potential path of an IF that would lead to one endpoint: the publication of this thesis. However, I recognise that there were many other pathways on which I could have travelled, and many more that have been signposted as I processed, analysed and discussed the data, focusing on the idea that this

thesis is not my life's work, but the *key* to my life's work. I hope that in conducting this research with PG pharmacists it may encourage others to embrace both the humanities and learning from failure within pharmacy education.

On a more personal level, throughout this thesis I have evaluated and re-evaluated not only my own way of doing things but that of the pharmacy profession. I pushed through my discomfort in deciding to write this thesis in the first person knowing that it may be eschewed by some members of the profession. However, I thought it beneficial to provide not only my own perspective, but to humanise the process of learning for myself and for my own students. It is worth remembering that, as pharmacists and educators, people are at the core of what we do: patient centred care and the student experience are paramount. Yet we reduce these interactions to numbers and statistics: pharmaceutical interventions quoted as money saved rather than lives improved, and exam marks rather than personal development.

Just prior to submission of this thesis I revisited the first post I ever made on the Lancaster University module forum as a newly enrolled PhD student. Many of the points I made I found myself reiterating here, five years later. I still struggle with the terminology, though I'm much better at it now and it doesn't feel like such an alien language. I still believe that in order to be patient centred we need to adopt more social sciences work within pharmacy teaching, and I think

there is still a long way to go on that.



It's all about the terminology for me!
by Aileen Mckenna - Monday, 20 January 2020, 13:26

Hi all!

I chose the following paragraph, but I definitely could have picked a lot more!

"One can detect affinities between post- positivism, postmodernism and post- structuralism in underpinning interpretive and qualitative approaches to educational research, complexity theory and critical theory, and the significance given to individual and subjective accounts in the research process, along with reflexivity on the part of the researcher. (That said, many post- positivists, postmodernists and post- structuralists would reject such a simple affinity, or even the links between their views and, for example, phenomenology and interpretivism. We do not explore this here.) One can suggest that post- positivism, postmodernism and post- structuralism argue for multiple interpretations of a phenomenon to be provided, to accord legitimacy to individual voices in research, and to abandon the search for determinis tic, simple cause- and-effect laws of behaviour and action." (p. 25)

Much of the difficulty I have with the paragraph I have chosen could really be applied across much of the first two chapters: it's the terminology. As a pharmacist I am familiar with the positivist point of view - the scientific method has been ingrained in my from day one of my undergraduate degree. There is not much room for the social sciences (though there definitely should be, considering our usual daily work is centred around patients and their experiences, and other healthcare professionals as well) in our teaching and all the projects I deal with are very number driven rather than experience driven.

With that in mind, I interpret the paragraph as saying that there are various similar structures underpinning the methodologies that are shared across many different disciplines. I also see it as saying that there are different ways of looking at the same data/outcomes depending on the point of view, and interpretation of results in accordance with the individualistic nature of the subjects themselves.

Research wise, I currently supervise around 7-8 masters students per year, which is getting me back into the ways of doing research (it's been a long time!). They mainly conduct clinical research and are based in hospitals across the UK so their data is usually very numbers driven and improvement in services from a process point of view rather than a patient point of view. My own research wis focused on online formative assessments in distance learning which will more than likely be conducted using mixed methods. I will need the quantitative data on results etc but, more than that, I want to enhance the student experience and make it realistic and valuable for them so I will definitely be delving more in to the qualitative aspect of it (certainly more that I had thought about doing initially, thanks to these chapters).

As above, I would say I'm more of an objectivist. It's certainly where I feel the most comfortable setting my hat at the minute, but this may change!

480 words

Permalink Reply

Figure 8-1: My first post on the Lancaster University Moodle forum at the start of my PhD.

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Appendix One – Demographic Data

Nine students initially volunteered to take part in an interview, of which four subsequently did not respond to invitations. Invitations were sent out via Canvas between June 6th and July 2024 a total of six times, as well as via email. A final total of five students were interviewed between 14th and 21st July 2024, as summarised in table [interview participant demographics]

Five interview participants:

Participant's initials	Gender	Location	Area of practice	Other information
Penny	Female	England	Hospital	Specialises in mental health. Qualified for 5 years. Also has experience in community pharmacy.
Aisha	Female	Qatar	Hospital	Also has experience in community pharmacy and pharmacy education
Steven	Male	Scotland	Hospital	Specialist antimicrobial pharmacist and independent prescriber (practising)
Maria	Female	Wales	Hospital	Newly qualified independent prescriber (not yet practicing)
Oonagh	Female	Republic of Ireland	Hospital	Also has experience in community pharmacy

Responses to question: Age range

Age	Total Number
21-25	3
26-30	9
31-35	10
36-40	3
41-45	2
45-50	0
51-55	0
55-60	0
60+	0
Total	**27**

Responses to question: **What gender are you?**

Gender	Number	Percentage (%)
Female	21	77.8
Male	6	22.2
Non-binary	0	0
Transgender	0	0
Prefer not to say	0	0
Total	**27**	**100.0**

Responses to question: What age are you?
Also crosstabbed with gender

Age	Total Number	Male	Female
21-25	3	2	1
26-30	9	7	2
31-35	10	8	2
36-40	3	2	1
41-45	2	2	0
45-50	0	0	0
51-55	0	0	0
55-60	0	0	0
60+	0	0	0
Total	**27**	**6**	**21**

In order to check how representative the sample within the questionnaire and interview data is to the interview and reported data from the university I used the university's administrative system (QSIS) to access the demographics for the 2023-24 registered students across all applicable modules. There are 250 students enrolled on the course.

After Brexit Northern Irish universities found themselves in a position where they continue to charge GB fees (which differ to NI fees) to students from Ireland and the EU due to regulations with the devolved government. As such, any students from the EU are counted within the GB section in demographic data.

Age ranges are not readily available for the QSIS system

	Official University Demographic data		Questionnaire data		Interview data	
	Totals	**Percentage (%)**	**Totals**	**Percentage (%)**	**Totals**	**Percentage (%)**
Enrolled Students	250	100	27	100	5	100
GENDER						
Females Enrolled	191	76.4	21	77.8	4	80
Males Enrolled	59	23.6	6	22.2	1	20
TOTALS	250	100	27	100	5	100
LOCATION						
UK Students* (England, Scotland, Wales and Northern Ireland)	219	87.6	15	55.6	3	60
EU Students*	0	0	7	26.9	1	20
International Students	31	12.4	5	29.7	1	20
TOTAL	250	100	27	100	5	100

*NB Due to fee structures within Northern Irish Universities post-Brexit students who are resident in Ireland and the wider EU are charged at the same rate as GB students and so are included in this total number by the admissions system. This number is therefore not reflective of the actual residential countries of EU students

To further check the representation of the data for the students I used student self-introduction posts in the Pharmacy DL Hub from the 2023-24 academic year (all students were asked to briefly introduce themselves to the other students as an ice breaker) to check representation. Although students weren't required to do complete this, 69 students took part and the data is as follows.

From all these various samples we can see that the numbers fall within approximately 5% of each other, and that the demographic data of males and females who are enrolled is approximately the same as those who have completed the questionnaire.

Location	Self reported introduction post data		Self reported Questionnaire data		Interview Data	
	Totals	Percentage (%)	Totals	Percentage (%)	Totals	Percentage (%)
International	15	21.74	5	18.52	1	20
UK	40	57.97	15	55.55	3	60
Ireland & EU	14	20.29	7	25.93	1	20
Totals	69	100	27	100	5	100

I currently work in

Location	Academia	Community	Consultancy or private business	Hospital	Primary Care	Public Health	Regulatory	Research & Development	Other	Prefer to say	Total
UK (GB & NI)	0	1	0	12	0	1	0	0	1	0	**15**
Africa	0	0	0	1	0	0	0	0	0	0	**1**
Asia	0	0	0	3	0	1	0	0	0	0	**4**
Australia	0	0	0	0	0	0	0	0	0	0	**0**
Europe	0	2	0	4	0	1	0	0	0	0	**7**
North/Central America	0	0	0	0	0	0	0	0	0	0	**0**
South America	0	0	0	0	0	0	0	0	0	0	**0**
Prefer not to say	0	0	0	0	0	0	0	0	0	0	**0**
TOTAL	**0**	**3**	**0**	**20**	**0**	**3**	**0**	**0**	**0**	**0**	**27**

Whilst the numbers of students who completed the questionnaire and the interviews is small, it is fairly representative of the composition of the course in general. So whilst it would be unwise to make generalisations across the whole course using this data we can be assured that we have at least got representation in alignment with enrolment.

Also got the students to say which sector they are from in their introductory which approximately lines up with that

Responses to Question: Where do you live?

Location	Frequency	Percentage (%)
UK (GB & NI)	15	55.6
Africa	1	3.7
Asia	4	14.8
Australia	0	0
Europe	7	25.9
North/Central America	0	0
South America	0	0
Prefer not to say	0	0
Total	**27**	**100**

Table showing location vs place of work crosstab

Gender vs place of work cross tab

				I currently work in…							
Gender	Academia	Community	Consultancy or private business	Hospital	Primary care	Public Health	Regul-atory	R&D	Other	Prefer not to say	**TOTAL**
Female	0	1	0	16	0	3	0	0	1	0	**21**
Male	0	2	0	4	0	0	0	0	0	0	**6**
Total	**0**	**3**	**0**	**20**	**0**	**3**	**0**	**0**	**1**	**0**	**27**

Responses to question: How many years experience do you have as a pharmacist?

Years	Frequency
0-2	3
3-5	5
6-7	8
8-10	6
10-15	4
16-20	1
20+	0
Total	27

Response to question: I currently work in

Sector	Frequency	Percentage (%)
Academia	0	0
Community	3	11.1
Consultancy or private business	0	0
Hospital	20	74.1

Primary care	0	0
Public Health	3	11.1
Regulatory	0	0
Research and Development	0	0
Other	1	3.7
Prefer not to say	0	0
Total	**27**	**100**

Responses to question: I have also worked in

Sector	Frequency	Percentage (%) of cases
Academia	3	11.1
Community	19	70.4
Consultancy or private business	0	0
Hospital	2	7.4
Primary care	3	11.1
Public Health	1	3.7
Regulatory	0	0
Research and Development	1	3.7
Prefer not to say	0	0
I have only worked in one sector	5	18.5
I have worked in a sector that is not listed	1	3.7
Total	**35**	**100**

Crosstab of Current sector and sectors also worked in

	I have also worked in											**Total**
I currently work in	Academia	Community	Consultancy or private business	Hospital	Primary care	Public Health	Regulatory	Research and Development	Prefer not to say	I have only worked in one sector	I have worked in a sector that is not listed	
Academia	-	0	0	0	0	0	0	0	0	0	0	**0**
Community	0	-	0	1	0	0	0	0	0	2	0	**3**
Consultancy or private business	0	0	-	0	0	0	0	0	0	0	0	**0**
Hospital	3	17	0	-	1	1	0	1	0	2	1	**26**
Primary care	0	0	0	0	-	0	0	0	0	0	0	**0**
Public Health	0	1	0	1	1	-	0	0	0	1	0	**4**
Regulatory	0	0	0	0	0	0	-	0	0	0	0	**0**
Research and Development	0	0	0	0	0	0	0	-	0	0	0	**0**
Other	0	1	0	0	1	0	0	0	0	0	0	**2**

Prefer not to say	0	0	0	0	0	0	0	0	-	0	0	**0**
Total	**3**	**19**	**0**	**2**	**3**	**1**	**0**	**1**	**0**	**5**	**1**	**35**

In order to gain further insight into why students' motivations for completing a DL course they were also asked the state the main reason for enrolling on a PG pharmacy course in an open-answer question within the questionnaire. The answers were categorised according to type of response as in the table below (examples included). As some students cited multiple reasons they enrolled this resulted in a number greater than the total sum of questionnaire respondents. Understanding students motivations may also help to understand their responses to the IF and to the open questions in particular, as well as putting these into context.

Reason	**Number of responses**	**Example**
Skills development	15	"To sharpen my pharmaceutical knowledge as well as academic skills"
Personal interest	13	"I wanted to expand my potential"
Career progression	13	"postgraduate MSc required for career progression"
Job requirement	5	"It forms part of the post-registration training for a newly registered pharmacist working in the hospital sector"
Changing jobs/sector	2	"A change in role from community pharmacist to hospital pharmacist"

Responses to question: Have you ever had experience with interactive fiction before you completed "Lady and Gent"?

Response	**Frequency**	**Percentage (%)**
Yes	14	51.9
No	13	48.1
Total	**27**	**100**

Do you intend on returning to the story again (for any reason including enjoyment, curiosity, to explore the links and resources and more)?

Response	**Frequency**	**Percentage (%)**
Yes	12	44.4
No	11	40.7
Not sure	4	14.8
Total	27	100

Please indicate how many times you have played "Lady and Gent" so far

Number of times	Frequency	Percentage (%)
2	12	44.4
3	6	22.2
4	6	22.2
5+	3	11.1
Total	**27**	**100.0**

Appendix Two – Questionnaire and Interview questions

Demographic data:

Please indicate how many times you have played "Lady and Gent" story so far:
1 | 2 | 3 | 4 | 5+
[NB If students select 1 they will receive a comment that says they must return to play through the IF at least once more before completing the questionnaire]
Age (years):
Location:
UK/Africa/Asia/Australia/Europe/North/Central America/South America/Prefer not to say
Gender:
Female / Male / Non-binary / Transgender /Other / Prefer not to say
Years of Experience in Pharmacy:
What is the main reason you have enrolled on a postgraduate pharmacy course?
Required for my job role / Career progression / Personal interest or development / Moving sectors / Continuing professional development / To network with other professionals / Prefer not to say
I currently work in:
Community / Hospital / Primary care / Regulatory / Academia / Public Health / Research and development / Consultancy or private business / Prefer not to say
I also have additional post-registration experience in the following pharmacy sectors: *Community / Hospital / Primary care / Regulatory / Academia / Public Health / Research and development / Consultancy or private business / None*

RQ1: Perceptions of Interactive Fiction in Learning

I. Have you ever had experience with interactive fiction before you completed "Lady and Gent"?
(other examples include choose-your-own-adventure stories/novels by authors such as R.A. Montgomery, Edward Packard and Ian Livingstone, television shows such as "*Black Mirror: Bandersnatch*" or "*We Lost Our Human*", and as narrative points in video games such as "*The Last of Us*" and "*Red Dead Redemption 2*"?)
Yes | No

II. Do you intend on returning to the story again (for any reason including enjoyment, curiosity, to explore the links and resources and more)?

Please indicate how much you agree with the following statements:

1. Overall, how valuable do you think learning through interactive fiction (IF) could be for your postgraduate pharmacy distance learning experience?
Extremely valuable / Very valuable / Moderately valuable / Slightly valuable /Not at all valuable
    a. Please explain the reasons for your rating above.
    (Free text answer)

2. It was not immediately obvious that I was receiving feedback though the story narrative
Strongly agree / Agree / Neither agree nor disagree / Disagree /Strongly disagree

3. Playing the "Lady and Gent" made learning more enjoyable
Strongly agree / Agree / Neither agree nor disagree / Disagree /Strongly

disagree

4. I would appreciate the opportunity to play interactive fiction games as part of my studies
   Strongly agree / Agree / Neither agree nor disagree / Disagree / Strongly disagree

5. I feel like I learned more from making poor decisions in the game than by making good decisions
   Strongly agree / Agree / Neither agree nor disagree / Disagree / Strongly disagree

6. I enjoyed being able to make bad clinical decisions in a safe environment
   Strongly agree / Agree / Neither agree nor disagree / Disagree / Strongly disagree

7. It was beneficial to see the consequences of my decisions in the story, even if they were not what I would do in real life.
   Strongly agree / Agree / Neither agree nor disagree / Disagree / Strongly disagree
8. Being able to learn from my mistakes in “Lady and Gent” was a valuable learning experience
   Strongly agree / Agree / Neither agree nor disagree / Disagree / Strongly disagree

9. Being able to choose different pathways helped me to understand that there can be more than one right answer
   Strongly agree / Agree / Neither agree nor disagree / Disagree / Strongly disagree

10. What do you see as the main benefits or advantages of using interactive fiction in your pharmacy distance learning program?
    (Free text answer)

11. What do you see as the main drawbacks or challenges of using interactive fiction in your pharmacy distance learning program?
    (Free text answer)

12. In what specific ways would you suggest improving the use of interactive fiction to enhance its value in your studies?
    (Free text answer)

13. Are there any other comments you would like to add at this time about “Lady and Gent”?
    (Free text answer)

RQ2: Usefulness of Interactive Fiction in Professional Practice

This section will focus on how your experiences of playing “Lady and Gent” could be useful to your professional practice.

Please indicate how much you agree with the following statements:

14. I found myself thinking about the story even after I had finished playing it
    Strongly agree / Agree / Neither agree nor disagree / Disagree / Strongly disagree

a. Please explain the reasons for your rating above
(Free text answer)

15. As I played “Lady and Gent” I reflected on elements of my own professional practice
Strongly agree / Agree / Neither agree nor disagree / Disagree / Strongly disagree
    a. Please explain the reasons for your rating above

16. Overall, I think my experiences in “Lady and Gent” were beneficial to my professional practice
Strongly agree / Agree / Neither agree nor disagree / Disagree / Strongly disagree
    a. Please explain the reasons for your rating above
    (Free text answer)

17. Overall, I think my experiences in “Lady and Gent” could positively influence my decision making abilities in my daily practice
Strongly agree / Agree / Neither agree nor disagree / Disagree / Strongly disagree
    a. Please explain the reasons for your rating above
    (Free text answer)

18. I have changed or will change some of practice as a result of playing the interactive fiction
Strongly agree / Agree / Neither agree nor disagree / Disagree / Strongly disagree
    a. Please explain the reasons for your rating above

19. I related to my character in the story
Strongly agree / Agree / Neither agree nor disagree / Disagree / Strongly disagree

20. I felt responsible for the actions of my character in the story
Strongly agree / Agree / Neither agree nor disagree / Disagree / Strongly disagree

21. What do you see as the main benefits or advantages of using interactive fiction to your professional practice?
(Free text answer)

22. What do you see as the main drawbacks or challenges of using interactive fiction in relation to you professional practice?
(Free text answer)

23. In what specific ways would you suggest improving the use of interactive fiction to enhance its value to you as a pharmacy professional?
(Free text answer)

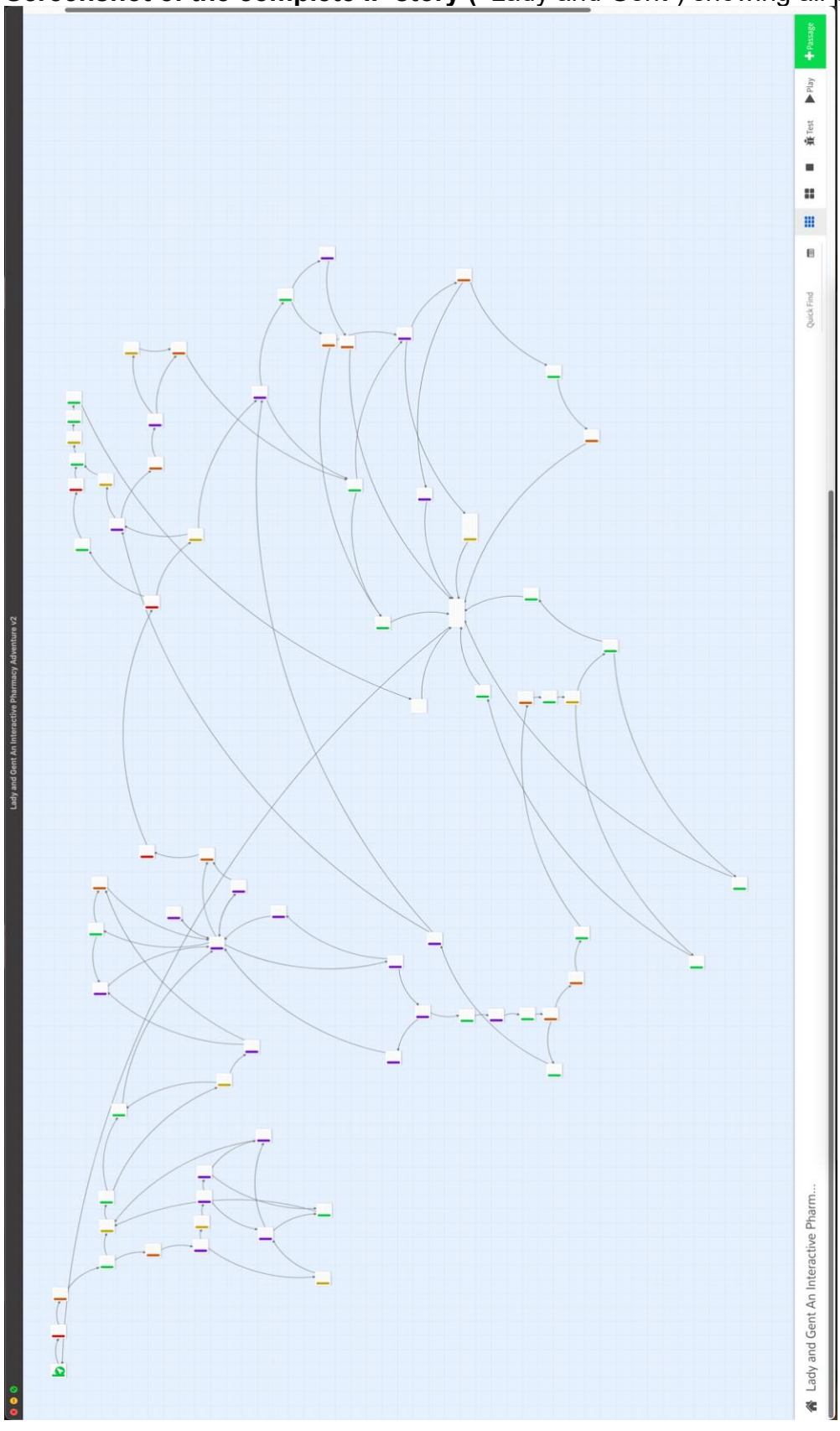
Semi-structured interview overarching questions

Thank you for completing the interactive fiction game and for agreeing to do this interview. You will be asked the following questions throughout your interview, and you are likely to be asked more follow-up questions based on your answers.

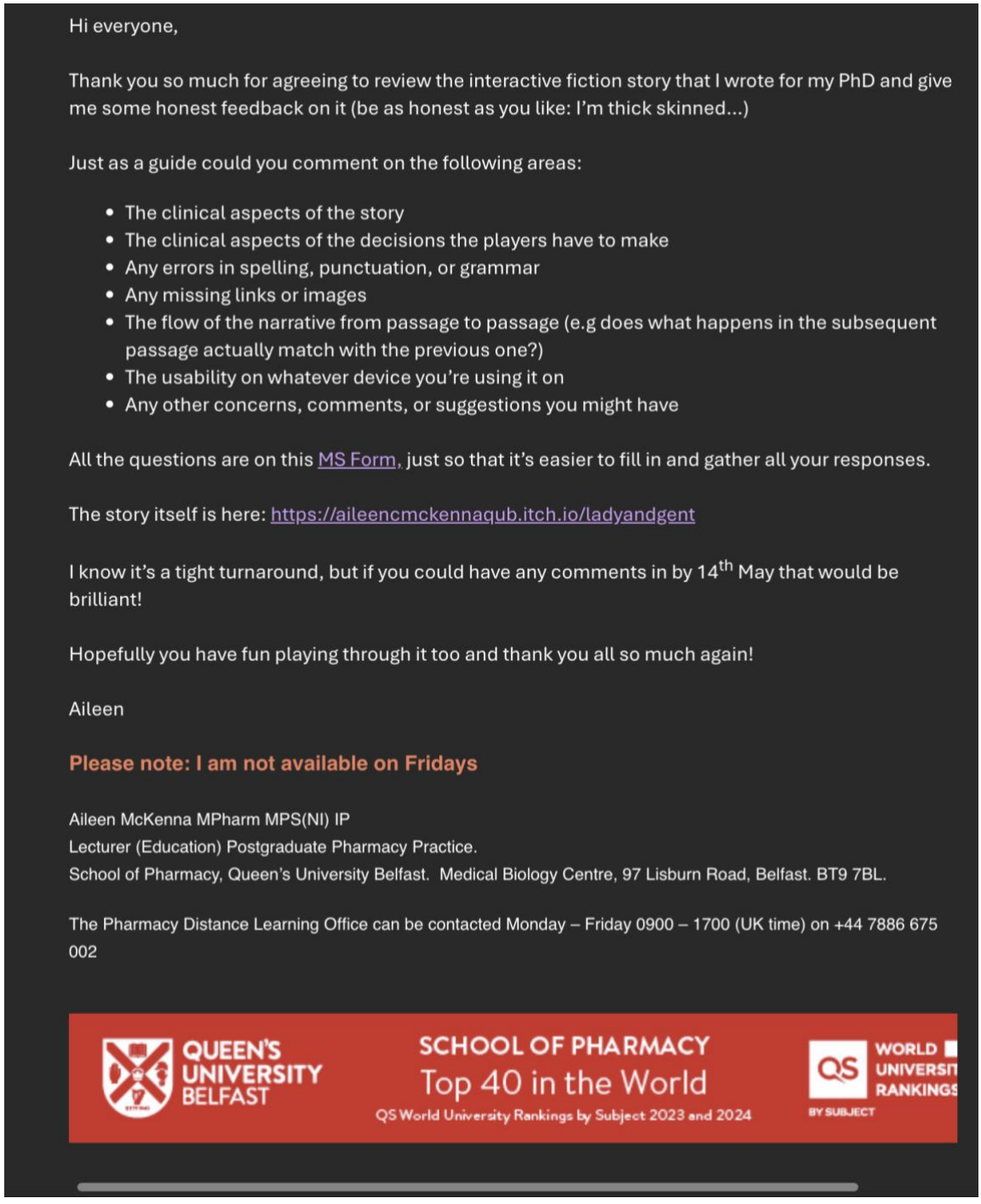
1. What was your general impression of the story?
2. Do you feel like it was/could be an effective way to learn?
3. What advantages/disadvantages could it offer you as a student?
4. What advantages/disadvantages could it offer you as a practicing pharmacist?
5. How did the game affect you?

Appendix Three – Interactive Fiction Design and Story

Screenshot of the complete IF story (“Lady and Gent”) showing all pathways



Independent Story review
Sent out via Microsoft Forms. Comments were not anonymous and reviewers were informed of this. All were happy to give feedback.
Email sent out:



Hi everyone,

Thank you so much for agreeing to review the interactive fiction story that I wrote for my PhD and give me some honest feedback on it (be as honest as you like: I'm thick skinned...)

Just as a guide could you comment on the following areas:

- The clinical aspects of the story
- The clinical aspects of the decisions the players have to make
- Any errors in spelling, punctuation, or grammar
- Any missing links or images
- The flow of the narrative from passage to passage (e.g does what happens in the subsequent passage actually match with the previous one?)
- The usability on whatever device you're using it on
- Any other concerns, comments, or suggestions you might have

All the questions are on this MS Form, just so that it's easier to fill in and gather all your responses.

The story itself is here: https://aileencmckennaqub.itch.io/ladyandgent

I know it's a tight turnaround, but if you could have any comments in by 14th May that would be brilliant!

Hopefully you have fun playing through it too and thank you all so much again!

Aileen

Please note: I am not available on Fridays

Aileen McKenna MPharm MPS(NI) IP
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The Pharmacy Distance Learning Office can be contacted Monday – Friday 0900 – 1700 (UK time) on +44 7886 675 002

QUEEN'S UNIVERSITY BELFAST
SCHOOL OF PHARMACY
Top 40 in the World
QS World University Rankings by Subject 2023 and 2024
QS WORLD UNIVERSITY RANKINGS BY SUBJECT

FORMS INSTRUCTIONS:
Thank you so much for agreeing to review the interactive fiction story that I wrote for my PhD and give me some open and honest feedback on it! If there are any issues that you spot in a particular passage it would be really helpful if you can copy in exactly what it says to the appropriate section, just to help me find it amongst all the pages.

Just in case you need it, the link to the story is here too: https://aileencmckennaqub.itch.io/ladyandgent

Thank you so much again!

Aileen

Reviewer	Comment	Action
The clinical aspects of the story		
CS	The notes for Adeline state she is T1DM but she is on treatment for T2DM. Not sure if this was a intentional or not. This had me confused as if T1DM I probably would have wanted to see a blood glucose and ketones as parts of initial obs.	Corrected. Image reuploaded and link updated in Twine
	Regarding gentamicin dosing and weight, we are just given actual weight of 70.2kg. Correct me if I am wrong as my experience with gentamicin is limited but would you not also want to know Adeline's height in order to check her ideal body weight and make sure her actual body weight is not more than 20% over this (i.e. obese). In that case, adjusted body weight would be needed for dosing. This is something I went to check but I couldn't find a height or any mention to say she is not obese, etc	Ok to use 70.2kg (pt not noted to be overweight in notes)
	Down the ototoxicity line of the story, Adeline receives her 2nd gent dose at 8pm. Should this not be 8am the following morning as you have already decided earlier that dosing interval should be 36 hours based on renal function? (received first dose 8pm as far as I understand)	Corrected
	Should an inflammatory marker be part of your blood results, e.g. CRP? Would this not normally be checked when giving gent to monitor if this is improving along with WBC? I think improvement in CRP is normally seen before WBC	Corrected/added. Image reuploaded and link updated in Twine
MM	The OTC ibuprofen is probably not great for this patient with diabetes/HTN/on an ACE so at the end wonder if there could be an option only to restart ramipril. Also very very very minor but Evorel brand is twice weekly.	Evorel changed in SCR but left as is otherwise to reflect the potential errors in documentation that can occur (and

		lend more of a sense of reality)
SH	All made sense to me. More familiar with enox compared to tinzaparin but all OK.	Not required.
2. The clinical aspects of the decisions the players have to make		
CS	The 2nd day for Adeline, when you are asked again whether to continue at the overdose or reduce the dose, should there not be something built in around checking the gent level? Regardless of what dose you are giving next would you not want to check the level to ensure it is appropriate to give any subsequent dose. Should there be an option to review the level then change the dose?	Ideally, yes. For the purposes of this story (and brevity for the students!) I chose not to as it could make it overly long at this point and students are more likely to stop playing (esp with similar story lines). Had been considered in development and decided against.
	For the decision regarding who to take the medication history from, i.e. Adeline or wait for Piotr. There's a few other things I would factor in there. I don't think you need to necessarily change the wording, this just made me stop and think a little bit more about what I would do in practice. I would probably wait for Piotr, speak with Adeline, check that she's happy that I include Piotr in the history also if he looks after her meds. I would also want to gauge from speaking with Adeline how confused she is	Again, ideally yes but a little difficult to work in to the story line, and takes the focus away from the gentamicin level. Again, considered in development and decided against.
	Re restarting the ramipril and ibuprofen that were held, I would want this choice separated out as I would only want to restart the ramipril for this person ideally. I would also want to see things like her U&E and BP trends during admission to gauge if / what dose to recommence ramipril and then to arrange follow up U&E and BP with GP	As above. Considered and decided against in terms of playability and time.
	Does it state anywhere if you as the pharmacist are an IP? May affect some of your choices, e.g. restarting the held meds or speaking to the junior doctor depending on this and the areas you specialise / prescribe in.	For all students (international and home) therefore decided against being an IP as not available in all countries.
MM	No issues	None required

SH	The decision trees worked and the decisions options were logical.	None required
The flow of the narrative from one passage to the next (e.g. does what happens next make sense in the context of the previous passage)		
CS	No issues identified	None required
MM	Yes	None required
SH	The flow made sense to me.	None required
Any spelling, punctuation, or grammar errors		
CS	-Very minor, but the Cockcroft and Gault equation in the gent guidance needs units (micromol/L). You have included units for age and weight.	Corrected - image to be replaced on imgur
MM	Because her gentamicin *does* was too high and the dosing interval was too short,	Corrected
	combined with the *nephrtoxic* rampiril and regular ibuprofen she started suffering from side effects very rapidly	Corrected
	Once you've decided to proceed with Adeline's medication history as it stands (at least for the time being, but you make a note to return to it to *bbe* doubly sure later on)	Corrected
SH	I spotted a few - have copied the text into a word doc and will ping it on. [See rows below]	See below
	(From email: Loved this one Aileen. Comments complete and just a few wee typos fixed that I spotted (attached). At times the text was tricky to read against certain backgrounds but that could be my shoddy eyesight! Have a good weekend.)	
	Since everything seemed to be ok with Adeline's blood results so far(except for that slightly low haemoglobin, but that's nothing to be too worried about right now) you make sure that there's a note on the chart to check the patient's trough gentamicin level before administering the next dose.	Both corrected
	Just to be doubly sure, you ask the junior doctor on the ward to make sure it gets done before administration and let Rakhee know as well. You find it slightly amusing that they both seem to take their handover pages out of their pockets, click their pens, and write it all down almost in sync.	Corrected

	When you laugh Jin, the doctor, asks you what's so funny and you wave it off saying "nothing, don't worry about it!"	
	"Hello, I'm the pharmacist working on the ward today" you tell him, "and I was going to just check Mrs Tessutti's medication history with her but I see she's asleep so I'll come back"	Corrected
	It's 0830 and Rakhee is back in today and looking after Adeline again. She waves and tells you she's just about to…. (missing text)	Corrected
	You go in to say good morning to her and she's sitting up in bed looking a little pale but happily eating her breakfast of tea, toast and jam with some fruit. You wave good morning saying "I'm not interrupting you: just here to pick up your medication chart!" and leave her in peace to eat.	Corrected
Any missing links or images		
CS	ECR / Summary care record – when I click this it crashed the story with a warning stating "imgur.com refused to connect". Opened okay when I right click and open. Crashed the whole story but restores to same point on refreshing the browser.	External site issue. Seems to have only happened once!
	On the screen after changing the gentamicin dose based on Adeline's weight, you are asked to decide if everything is ok or if there is something that needs looking into. However, there isn't a link to the bloods on this screen to check everything is okay.	Image included on the screen. Have added a link below to allow opening in a new window.
MM	No	
SH	No. All worked for me. The image enlarger (imgur) was a but clunky on my laptop but I haven't used it before which might explain that.	Not sure what this means but as images are working ok and are viewable has been left as is for now. Will reassess with students.
Any usability issues on your device of choice		
CS	-Used on laptop, no issues, everything was clear and well presented. It was really helpful having the ability to open resources in a larger window.	None required
	Took me a long time to realise you can flick back, e.g. to see the notes, bloods, etc. at a later time. It is maybe just my lack of attention that I missed this but this could possible be made clearer. It would be	Images open in a new window to allow this. Will highlight in the

	handy if there was a tab to quickly access the resources like bloods, gent guidelines, etc. at a later date but this is more of a luxury, being able to flick back is good.	instructions at the start so players are aware.
MM	Good	None required
SH	Some of the pages came up with a black background and grey text - v hard to read. Could the text be white?	Possibly the end? Text is set to black on a white background so not sure what this refers to.
Any other concerns, comments, or suggestions you might have		
CS	-Is there a 'todays date is...' anywhere to put in context where you are in the patient's journey and save you having to get very specific with your dates when rolling this out	Due to the crossing storylines not really possible. Considered and tried to work it out but made it all very convoluted.
	Overall I think this is brilliant, really clearly present, so engaging, fun (for a nerd like me) and I think is really beneficial for learning. I can think of so many different scenarios this kind of interactive story could be applied to.	None required
MM	It is really great!!	None required
SH	The patient dying was sad but a reality I suppose if the issues are missed.	None required

n.b. Additional spelling errors detected in a 'proofing copy' exported from Twine and subsequently corrected using the find and replace function.

Notes from Informal chat with CS:

Loved the story, especially the details (e.g at one point the doctor sighs and grabs the Kardex from your hands). Wouldn't be taught that way but the detail makes it more real and is actually reflective of how people behave in real life. Could see that some people would have an issue with how things were phrased but this was actually more real to how things would happen rather than the ideal so felt more real. Although the decisions were sometimes a bit more obvious even the responses to those would make you pause and think. E.g. when you're taking the drug history I knew what I would do but even being presented with the option made me stop and think about the other options and whether or not that is something that I SHOULD

Lady and Gent" Interactive Fiction

The IF can be accessed directly at:
https://aileencmckennaqub.itch.io/ladyandgent

Lady and Gent: An Interactive Pharmacy Adventure

Interactive Fiction

Play in browser

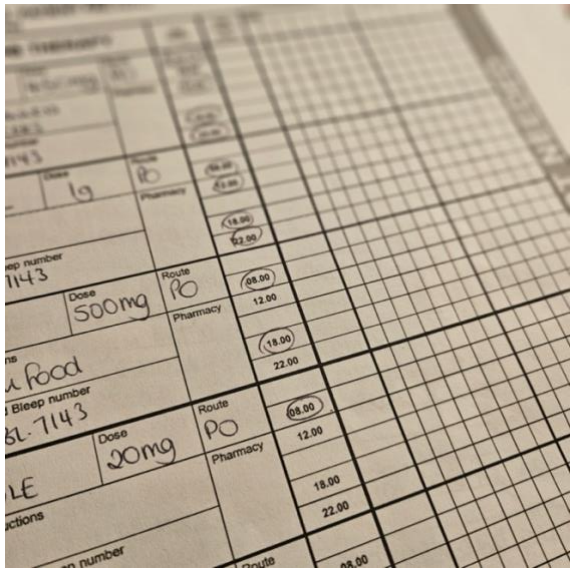
INSTRUCTIONS:

Please note that the information used to develop this work of fiction reflects the current clinical standards and guidance in at least one UK hospital as of May 1st 2024. Material contained in this scenario is based on UK guidance only, and participants should continue to refer to their own local guidance where appropriate.

The story, all names, characters, and incidents portrayed in this production are fictitious. No identification with actual persons (living or deceased), places, buildings, and products is intended or should be inferred.

When you click to expand images they will open in a new browser window so that you may keep them to refer to as you go along. Should you close the window at any point the story will reopen on the last page you were on.

Handwritten Medication Chart Background



AI generated Ward backgrounds

Lady and Gent An Interactive Pharmacy Adventure v2 – Proofing Copy

Monday morning

It's Monday morning.

You've just arrived at work and walked into the hospital pharmacy department with the remains of the coffee you'd picked up just before you got on the bus. It's not really stopping you yawning from that early start though...

You put away your coat and your bag, sit down for two minutes and finish the last couple of sips whilst listening to everyone's tales from the weekend.

After the morning departmental meeting (and organising the most important time of the day with your work friends: lunch time, obviously) you pick up your things and [[head off to the ward]]

---

head off to the ward

Your ward is at the opposite end of the very large Central University teaching hospital where you've worked for about two years now. It always takes a while to get there from the pharmacy department and sometimes you bump into other members of pharmacy staff coming back from the early shift on their ward: occasionally some who are trying to sneak in late without being noticed...

This morning it was neither, though you had to stop briefly to direct a lost patient to the cardiology department before you could get on your way again.

As you're walking to the ward you start thinking about your day, and
wondering about what staff will be in today. There are some people you always like to see on shift and some that you always dread...

What will the patients be like? How many new patients will you have to see? Will they be complicated... or nice and easy for a dreary Monday morning?

You wonder if the nice but confused woman in Room 2 has finally gone home (she really reminds you of one of the ladies who lives on your street so you //really// hope she has), or if the man in his forties who was always off the ward getting "a breath of fresh air" (everyone knew he was actually outside secretly smoking) would have been transferred to the surgical ward as they were planning.

[[Who would be waiting for you?]]

Who would be waiting for you?

You swipe your pass, hear the (text-style:"shudder")[*beep!*] and open the doors. Right there to greet you is the friendly face of the ward clerk Carol who asks you about your weekend whilst handing you a list of the new patients that she always has ready for you. The consultant (oh no, it's Dr Manning...) and his junior doctor Jin, the nurse in charge (Rakhee today! At least it'll be a funny morning), the physiotherapist and the dietitian are on the ward round and it looks like they're close to finishing it already so there's not much point in joining in: better to wait until they're done and you can ask about the plan for each patient!

In the meantime you review your list of patients.

<img src="https://imgur.com/rUwESdb.png" width="678" height="453" /img>

It looks like there are a few new names, so you might as well start at the top of the ward with [[Mrs Adeline Tessutti]]

Mrs Adeline Tessutti

But where will you start?

Should you [[read her notes to see why she's come in]], or [[go and speak to her to get her medication history]] first?

read her notes to see why she's come in

You manage to quickly grab hold of Mrs Tessutti's notes and have a read over them. Despite the fact that your hospital mostly uses electronic patient records these days you sometimes still see paper admission notes when the system goes down or the Emergency Department is particularly busy. This is one of those times where you find yourself with paper notes, trying to figure out what on earth the doctor's handwriting actually says.

<img src="https://imgur.com/ZBf7wjl.png" width="678" height"453" /img>
(Click here to open a larger copy in a new window)

You manage to decipher that she was admitted to the Emergency Department over the weekend with symptoms of a urinary tract infection and was [[started on gentamicin]]

go and speak to her to get her medication history

Mrs Tessutti's husband Piotr is sitting at her bedside concentrating on completing the crossword in today's newspaper whilst his wife sleeps. He looks

up at you with a look of concentration on his face but softens when you introduce yourself.

"Hello, I'm the pharmacist working on the ward today" you tell him, "and I was going to just check Mrs Tessutti's medication history with her but I see she's asleep so I'll come back"

"It's ok" he tells you, "I actually look after all the medication for both of us and I thought it would be useful to bring it in too".

He pulls out both a bag of her usual medication and a list with it all on it and hands it to you.

<img src="https://i.imgur.com/mAOOmdn.jpg" height="660" width="476" /a>
(Click here to open a larger copy in a new window)

"Oh that's brilliant!" you tell him and then ask if it's ok to take it with you for a few minutes to check it all over.

"Not a problem!" he says with a smile. "It'll be nice for her to sleep for a while too. It was a long night... And call her Adeline! As she always says: Mrs Tessutti was my mother!"

You promise him you'll bring the medication back soon and take it to somewhere where you can [[sit down and go through it easily]]

started on gentamicin

It looks like the consultant in charge prescribed a stat dose and then gentamicin 400mg every 24 hours for Adeline. She received a dose at about 8pm last night, so her next dose is due this evening.

<img src="https://i.imgur.com/wwRvnyV.jpg" height="660" width="476" /img>
(Click here to open a larger copy in a new window)

You can't see a weight documented for her on the medication chart but you look at her and think "yeah, that dose seems ok for [[what I think she weighs]]... or maybe I should [[ask one of the nurses to weigh her]], just in cas

dose is too high

For once daily administration of gentamicin, according to the guidelines, you know that the dose should be 5mg/kg.

<img src="https://imgur.com/np6x9HE.png" width="428" height="577" /img>

This means that the dose for Adeline, based on her body weight, 400mg seems a little over what it should be.

However, what you have to decide now is if you [[continue]] according to the consultant's recommendations, or do you [[change dose according to weight]]?

---

change dose according to weight

No, you should change this according to the patient's weight: even small errors could cause some serious problems and side effects, especially over the whole course of treatment.

The closest dose that will be easily administered is 350mg and so you make a note to ask the junior doctor to change it.

Before you do though, you should check the patient's blood results to decide whether [[everything is ok]] or if there is [[something that needs looking into]] a little more.

continue

You decide to continue with the consultant's recommendation and keep the gentamicin at 400mg once daily but keep an eye on any side effects the patient might be suffering from. The next dose is due at around 8 o'clock tonight so you check the patient's blood results first to make sure that [[everything is ok]] or if there's [[something that needs looking into]] a little more

<img src="https://imgur.com/yGb64ST.png" width="600" height="600" /img>
 (Click here to open a larger copy in a new window)

interactions

From talking to her husband you establish that Adeline is taking some more medication that she buys over-the-counter as well. She takes ibuprofen 400mg for knee and back pain which she sometimes gets after working in her garden during the day, and Kalms (valerian root extract) every night to help her sleep. Piotr says she also buys ibuprofen gel occasionally as well.

Both the ramipril and the ibuprofen could interact with the gentamicin so you need to decide which course of action to take for now: either [[hold both]] or to [[continue with the prescriptions and just monitor for side effects]]?

sit down and go through it easily

You get a list of all the medication the patient has with her and go back to confirm some things.

When you get there it looks like Mrs Tessutti has woken up but her husband has gone somewhere so you have to make a decision on whether you [[get the drug history from Mrs Tessutti herself]] or [[wait for Piotr to come back]]

---

get the drug history from Mrs Tessutti herself

Since Mrs Tessutti is awake it makes sense to talk to her about it.

"Hello, Mrs Tessutti I'm the pharmacist on the ward today. I was just talking to your husband about your medication and he gave me a list of what you're taking and the bag of medication that he brought in too. Is it ok if I ask you some questions about it to confirm some things?"

Mrs Tessutti pushes herself up to a seating position in bed, smiles and says "Of course, but you must call me Adeline: Mrs Tesutti was my mother- in-law!" You can see that she'll be pleasant to talk to, which is always a bonus. "I've no idea where that husband of mine went. He was here just a minute ago but I should be of some use to you I hope!"

You thank her and proceed to go through the medication list with her. She tells you of a few changes and you make a note of them, but they don't seem quite right (you're pretty sure she won't still be using the Evorel patches she insists she's applying every week, for example...).

At this point, you have to decide on whether you want to [[wait for Piotr to come back]] or to [[continue checking her chart as it is]]

wait for Piotr to come back

Since the patient was noted as being confused when she was admitted you decide that maybe what she tells you might not be completely right at the minute, or that you'd at least be doubting it a little. Whilst you wait for Piotr to come back you decide to get a list of the patient's medication from her electronic care record, which shows everything that she is prescribed from her GP.

<img src="https://imgur.com/vbsh9Au.png" width="476" height="660" /img>
(Click here to open a larger copy in a new window)

You match this up with the list that Piotr gave you and jot down any discrepancies. You are double checking other information when Rakhee, one of the nurses, comes to tell you that Piotr has returned and she knew you wanted to talk to him.

After a short discussion you manage to establish the patient's full medication history as

Indapamide 2.5mg tablets. 1 daily.
Metformin SR tablets. 1g twice daily.
Ramipril 10mg capsules. 1 daily.
Co-codamol 8/500mg tablets. 2 up to four times daily as required. Buys over the counter.
Ibuprofen 400mg tablets. 1 up to three times a day when needed. Buys over the counter.
Also using ibuprofen gel alongside tablets. Buys over the counter.

You thank both Piotr and Adeline for their time and go to your work area where you can take a seat to [[check over the chart]]alongside her reasons for admission

what I think she weighs

You consider yourself to be generally pretty good at guessing patients' weights and so you take one more peek at Adeline and figure that 80kg seems like a reasonable weight for her.

You [[continue]] with the prescribed dose.

ask one of the nurses to weigh her

You catch Rakhee's arm as she's passing my and ask her if she would mind weighing Adeline, just to make sure that the dose of gentamicin is ok, and you'll need it for a few other things too.
"Oh! I already weighed her!" Rakhee says "Did I not write it down on the chart?"

She takes her handover notes from her pocket, grabs a pen and clicks it so she can write it down.

"There you go!" she says and bounds off to her next job.

Adeline weighs 70.2kg so her gentamicin [[dose is too high]]

---

everything is ok

Since everything seemed to be ok with Adeline's blood results so far (except for that slightly low haemoglobin, but that's nothing to be too worried about right now) you make sure that there's a note on the chart to check the patient's trough gentamicin level before administering the next dose.

Just to be doubly sure, you ask the junior doctor on the ward to make sure it gets done before administration and let Rakhee know as well. You find it slightly amusing that they both seem to take their handover pages out of their pockets, click their pens, and write it all down almost in sync. When you laugh Jin, the doctor, asks you what's so funny and you wave it off saying "nothing, don't worry about it!"

Now that that's all done and you can see Adeline's awake you can [[go and speak to her to get her medication history]]

something that needs looking into

It looks like Adeline's renal function could be a little low so you get calculate her creatinine clearance and find it to be 52 ml/min.

This means that you'll actually have to increase the interval the gentamicin is administered to 36 hourly, according to your hospital guidelines

<img src="https://imgur.com/np6x9HE.png" width="428" height="577" /img>
(Click here to open a bigger version in a new window

You go off in search of the junior doctor and let him know.

He asks you a couple of questions and then agrees to the changes you've asked for, amending the prescription.

As per your usual practice, you make a note on the chart to check the pre-dose gentamicin level and then let Rakhee know that it's changed so that nothing is left to chance!

Now that's done and you can see Adeline is awake you [[go and speak to her to get her medication history]]

incorrect doses

All the doses of her regular medication seem appropriate for her pre- existing conditions, her age and her weight and you make no recommendations for changes for these.

Is there anything else to [[check over the chart]] for, or can you [[make your recommendations]] and continue?

clinical appropriateness

It seems that the medication Adeline is prescribed is clinically appropriate for now. She is known to be diabetic and has a history of hypertension. All the prescribed medication is in line with current NICE guidance so you don't need to recommend any changes to her regular medication at discharge so far, and you decide to just monitor these
throughout her admission for the time being.

For now, you continue to [[check over the chart]]

continue checking her chart as it is

Once you've decided to proceed with Adeline's medication history as it stands (at least for the time being, but you make a note to return to it to doubly sure later on) you notice that there are some potential interactions on her chart.

For now you have to decide on a course of action based on the information you have gathered: either
[[hold both]] potentially nephrotoxic medications or to [[continue with the prescriptions and just monitor for side effects]]

continue with the prescriptions and just monitor for side effects

For now, you decide that there's no reason to hold her medications and continue to [[check over the chart]]

check over the chart

You check the chart for

[[interactions]]
[[incorrect doses]]
[[clinical appropriateness]] alongside her reasons for admission
[[other issues]] and then
[[make your recommendations]] to Jin for any changes to her medication

make your recommendations

You manage to catch Jin as he's about to head to a teaching session and tell him about your recommendations for Adeline's medication. He happily takes your advice before running off, hurriedly putting his coat on as he runs out the door.

Adeline's review is now complete for today, any recommended changes have been made and you [[move on]] to see the rest of the patients.

---

move on

It's the end of the day now, and you're tired, your feet hurt and, quite frankly, you're ready to go home and put your feet up and watch some terrible TV and have something really nice to eat.

It's been long, and you've done an extra hour in the main dispensary helping to process the prescriptions to discharge as many people as possible and clear some beds for new admissions. You grab your bag and head out the door, stopping to say goodbye to the pharmacist who's closing up tonight.

[[Tomorrow is another day!]]

Tomorrow is another day!

Tuesday.

Back in to work you go, and you head to your ward again.

Would you like to [[check in with Adeline]] or [[check on other new patients first]]?

check in with Adeline

It's 0830 and Rakhee is back in today and looking after Adeline again. She waves and tells you she's given Adeline her breakfast and is off to sort out all the IVs now.

You go in to say good morning to her and she's sitting up in bed looking a little pale but happily eating her breakfast of tea, toast and jam with some fruit. You wave good morning saying "I'm not interrupting you: just here to pick up your medication chart!" and leave her in peace to eat.

Now, what had you decided to do with her gentamicin again? Was it to [[continue with the original dose]] or [[change it]]?

hold both

You manage to catch Jin as he's about to head to a teaching session and explain that both ramipril and ibuprofen are potentially nephrotoxic when administered alongside gentamicin, and could cause some long term harm if they're administered together. You ask him to just indicate that they should

be held for a few days and he happily takes your advice before running off, hurriedly putting his coat on as he runs out the door.

You also write a note on the medication chart that these will need to be reviewed before Adeline's discharged, in case she's discharged when you're not around. You don't necessarily want to stop them completely, and it'll be good to review them later.

After these annotations have been made you continue to [[check over the chart]]

check on other new patients first

The ward was so busy today!

There was
* a 66 year old man with Parkinson's disease whose administration times were all wrong that you had to sort out medication for
*a 42 year old man who'd been admitted from the local prison with two police officers who was handcuffed the whole time and you had to be accompanied to talk to him
*a 84 year old woman with dementia brought in from a nursing home
*a 58 year old man who'd been co-administered pregabalin and gabapentin and was suffering from some very unusual side effects

...and a whole host of other problems!

You remembered on your way out that day that you needed to check on Mrs Tessutti but you were already late for your chemotherapy checking session so decided to [[check on her blood results]] back in the pharmacy, just to make sure her gentamicin levels were ok at the very least.

check on her blood results

When you get to the chemotherapy checking bench it's chaos and you forget to check Adeline's bloods. It's only that night when you get home that you remember and you're annoyed at yourself. You can't check now though, so you make a note to check in first thing in the morning, as soon as you get to the pharmacy. You're annoyed at yourself but what can you do?
Sometimes things just can't get done, and everyone knows that and has experienced it at some point. You also trust the other members of the ward to do their jobs! It's not like you're the only one responsible for her care!

The next morning on your way in you [[stop by the ward]] before you even get to the pharmacy department

stop by the ward

Carol is on the desk again this morning, gives you a wave and says "I hope it's less busy today than it was yesterday: I've not seen it like that in ages!" as she gives you a handover sheet.

You tell her you're only popping in for a second just to check on Adeline before you come back up after dropping all your things off at pharmacy and seeing what your day holds.

"Oh, Mrs Tessutti isn't here anymore. I think she went off to Ward 6C over night. Hold on a second and I'll ask..."

She goes to stand up and you tell her not to worry: you'll have a look on the system.

Ward 6C is the renal unit though: [[why would she have gone there?]]

---

why would she have gone there?

You get into the pharmacy department, put your bags down and take off your coat. At the same time you log into one of the free computers there to check and see where Adeline went, and grab a seat. Two of your friends come in at the same time laughing about something funny they'd overheard in the coffee shop on the way in. As you're waiting for the system to load up you organise your lunchtime and see what wards your covering and when you're expected in the dispensary.

Finally, you get into the blood results system and see that Adeline has moved not to ward 6c but to the intensive care unit. [["Oh no! What happened?"]] you wonder to yourself, slightly apprehensively...

change it

That's right: her dose was a little high for her weight and her renal function yesterday so you'd recommended a change to both.

You're glad you did because someone has written on that Adeline's trough gentamicin level last night was 1.6mg/L! That's much too high, and if you'd continued to administer both the higher dose and more frequently she could've become extremely unwell very quickly.

<img src="https://i.imgur.com/339qoUp.png" height="222" width="621" /img>

You check the blood tests that have been sent off this morning before dosing and the level is <1.0mg/L, so within the right range for another dose.

So for now you can either [[continue her treatment]] without changes or [[recheck her bloods]]

continue with the original dose

That's right: you were continuing with the prescribed dose.

It looks like Adeline had her dose last night at 8pm but there isn't a gentamicin level recorded on beforehand.

Would you like to [[check it now]] or [[continue as prescribed]]?

check it now

You log in to the computer system and wait for what feels like forever for the blood results system to load up. Carol spots you as she's walk past, waves and then ducks into the nurses office for a second to answer the phone, which always seems to be ringing somewhere!

As she's walking past you she drops a handover sheet off and you smile and say thank you to her. She always remembers to give you a copy!

Finally you get into the system and [[check Adeline's blood results]]

---

continue as prescribed

It looks like the patient is feeling better, since she's sitting up and eating her breakfast. The nurses also say she is a little bit less confused so it seems to be helping!

You put her medication chart back and say hello to both Adeline and Piotr who has returned to her side and then continue to see the other patients.

On your way in the next morning you [[stop by the ward]] to check on Adeline very briefly.

check Adeline's blood results

Oh no...

<img src="https://i.imgur.com/fCn9z9h.png" height="222" width="621" /img>

It looks like the gentamicin level last night as 1.6mg/L which is //much// too high for it to have been administered! It was definitely administered though so that is really not good. You're actually quite worried about the consequences...

Should you [[speak to the patient]] or [[speak to the doctor]] first?

---

speak to the patient

You go to see Adeline again now that she's finished her breakfast, just to see how she's doing and assess if she's had any adverse effects.

You tentatively approach her bed...

"Morning Adeline! How are you this morning?"

"Sorry I didn't hear you! What was that?"

Is it your imagination or is she shouting a bit?

"I JUST ASKED HOW YOU WERE" you reply in slightly louder than normal voice.

"Oh I'm not too bad really, I don't feel as unwell but I have this //terrible// ringing in my ears". As if to demonstrate she puts one of her fingers into her right ear and wiggles it around, as if she had water stuck in

there. She tilts her head to the side and says "It's never been like this before!"

Uh oh... Could she have some auditory side effects?!

"I think your antibiotic dose might have been a bit high Adeline, and caused a bit of ringing in your ears. How are you feeling otherwise? Are you doing alright?"

"Oh yes, wonderful apart from this" she sticks her finger in her other ear now "constant... (text-style:"blur","shudder")[RINGING!]"

Time to record it in her notes and go [[speak to the doctor]]

"Oh no! What happened?"

The intensive care pharmacist says hello to you as he's checking the dispensary rota and ward cover lists that are pinned to the noticeboard above the computer you're sitting at.

"Have you seen Mrs Tessutti yet?" you ask.

"Who?"

"A lady who was admitted with a UTI over the weekend? She's been on gentamicin, and she's always with her husband Piotr. They're the sweetest couple!"
"Ah yes" she says and she looks annoyed "How do you know her?"

"She was admitted straight to my ward after the emergency department"

"Well then, [[let's have a chat]]"

---

let's have a chat

The intensive care pharmacist, Lisa, sits down with you in a private room and talks to you about Adeline.

Because her gentamicin too high and the dosing interval was too short, combined with the ramipril and regular ibuprofen she started suffering from side effects very rapidly.

The nurses on your ward noticed that she had been confused but attributed it to her UTI, especially as one of her presenting symptoms had been confusion. She started to get drowsier and was complaining of not being able to hear what the nurses were saying too. They, again, put this down to her confusion and the infection making her feel unwell.

She had deteriorated very rapidly, her blood results showed acute kidney failure and a gentamicin level of >2mg/L across two separate days. She had a markedly reduced urine output which, again, was attributed to her infection.

<img src="https://i.imgur.com/83ZJQ6I.png" height="222" width="621" /img>

Whilst you were not the one solely responsible for Adeline's condition, Lisa very solemnly tells you that there are a number of failures in what you've chosen to do whilst Adeline was on your ward that directly contributed to her condition now. She is stern with you, and you feel terrible for both the patient and for yourself, because you know that this was both avoidable and not in any way up to your normal standards.
Lisa tells you there will likely be an investigation and a meeting about what has happened and you may well be required to speak about it.

You can't help but think about how lovely both Piotr and Adeline are and how friendly they were to you on the ward. You apologise to Lisa and are clearly extremely upset but she just replies "well, [[it's too late now]]"

---

speak to the doctor

You approach Jin with the results that show her level is much too high.

He sighs deeply - he's the only doctor around at the minute by the looks of things - throws his head back in despair and says

"Give me the medication chart!"

He indicates that the gentamicin dose should be held for today and that the levels will need checked again tomorrow.

"I'll go and speak to her as well, but we'll need to [[continue her treatment]] for the time being.

---

recheck her bloods

You bring up Adeline's latest blood tests so that you can make sure everything is ok. The result from last night has made you a little worried that anything could happen!

(Click here to open a larger copy in a new window)

~~Maybe at this point you can [[stop monitoring so much]]? Or maybe it's better~~ that you [[keep an eye on them for a while longer]]

continue her treatment

The patient continues to improve, her temperature drops to 36.7°C and she seems less confused as the day goes on. Her husband seems relieved and they laugh and joke with each other as they chat throughout the day.

The following evening - 36 hours after her previous does - she receives one further dose of gentamicin.

The morning after - you're amazed how quickly the week has gone and it's already Thursday! - you are back on the ward and Adeline is packing up her things ready to go home. The consultant seems to have completed the ward round nice and early that morning and they've told her she can go home.

She's all dressed and ready to go so do you [[say your goodbyes]] or [[check her medication chart]] one final time?

say your goodbyes

You see no reason to keep Adeline and Piotr waiting, and the junior doctor has completed their discharge summary already. You say goodbye to them both as they walk off the ward and turn back to your work.

But wait... did the junior doctor tell her to restart her ramipril? What about the ibuprofen too?

In fact, should she have had further oral antibiotics to take home to make sure that UTI had completely cleared up?!

Ah well it's too late now, [[right?]]

check her medication chart

Even though you know she's keen to get out and home you tell her you'd like to just give her chart a quick look over to make sure she knows everything she needs to about her medication. She tells you that you should speak to Piotr if there's anything that needs altering as he's the one who looks after both of their medication.

As you look over the chart you remember that her ramipril and ibuprofen were held during her admission. Should you [[tell her to restart them]] or [[speak to the junior doctor first]]?

tell her to restart them

Since the medication was only held during the gentamicin therapy you don't think it's worth bothering the doctor about to ask whether they should be restarted or not.

Before Adeline leaves you explain that during her stay they'd been held because they interact badly with the gentamicin and could affect her kidneys. You tell her you don't want to delay her getting home, and that she should restart these but review them with her GP when she gets a chance.

She looks delighted that she won't have to stay much longer, promises she'll speak to her GP and you watch them both leave the ward arm-in-arm.

About five minutes later Jin pops out and asks you if you've seen Mrs Tessutti. You tell him she's already gone and ask why.

"Ah, never mind" he says "it's too late now, [[right?]]"

speak to the junior doctor first

You quickly speak to Jin as he's washing his hands and before he goes in to see the patient in the side room who has presented with symptoms of C. diff.

"Jin! Very quickly! Mrs Tessutti is about to walk off the ward and go home. Is she restarting her ramipril and her ibuprofen? We held them when she was on the gentamicin and I just want to be sure"

"Ah yes! Good question! Yeah, she'll need to restart the ramipril but I'd also like her to see her GP when she can because I think it can probably be reduced. Her BP was quite low when she was in and I'm not entirely convinced she needs to be on 10mg daily. Thanks for reminding me: I nearly forgot!"

Just as he's about to open the door into the room he says "Oh! I also nearly forgot that she'll need a few more days of antibiotics! I had a chat with microbiology this morning and they said to give her long-term nitrofurantoin because she gets recurrent UTIs. Should I [[prescribe that now]] or [[contact her GP and see if they'll do it]]?"

it's too late now

Throughout the course of the next few weeks you think about Adeline and periodically ask Lisa how she's doing.

One day, when you ask, Lisa takes a deep breath and says "Actually, she passed away overnight. She deteriorated really quickly in the end and they just couldn't seem to get her back".

You're truly devastated and can't believe that some of the decisions you've made could have ended up so, so badly.

You look downcast and say to Lisa with a sigh "It's amazing to think that we can have such an impact on someone's life, [[right?]]"

---

prescribe that now

"You're probably better prescribing that now" you say "because you never know how long it'll take for it to happen after she's discharged, and you don't want to risk her coming back in..."

He sighs, tells you that you're right and sits back down to write a prescription for her for discharge.

Adeline and Piotr are about to walk off the ward when you stop them and say "I'm really sorry, but the consultant wanted you to have some longer term, preventative antibiotics just to make sure your infection stays away so you can't quite leave yet"

You can tell they're both disappointed as they were excited to be getting home, but they take it well and go to sit back by the bed.

"I'll get them dispensed for you as quickly as possible!" you say and quickly go back to pharmacy and return with the dispensed nitrofurantoin.

Before they go, you quickly counsel Adeline on her new medication (as well as Piotr) and tell her that she should follow up with her GP for a few things too.

Finally they get to go home: they leave both the ward and you, to the rest of your day [[and the rest of your patients]]

contact her GP and see if they'll do it

You'd rather not have the GP prescribe it since you could do it right there and then and *know* that Adeline would be leaving with her medication at least...

...but you also know that the hospital has been under extreme pressure lately and you'll be in trouble for not letting the patient go for something like this.
Jin completes an addendum to the original discharge summary and marks it so that it's not for prescribing.

Adeline and Piotr leave the ward and give you a friendly wave as they walk past you arm-in-arm as you're on hold on the phone with her GP trying to organise to get the prescription for nitrofurantoin sorted as soon as possible.

As they go past you raise your hand and are about to tell them to hang on for a minute or two so that you can tell them the plan but that happens to be the very moment the GP receptionist picks up...

They walk off the ward, blissfully unaware that Adeline will require the prophylactic antibiotics. You ask the GP receptionist to process the discharge summary Jin has just sent, organise a prescription, contact the patient, contact her usual community pharmacy...

You sigh, frown, and think to yourself "it actually would've just been easier to go and dispense this, [[right?]]"

and the rest of your patients

The ward was so busy today!

There was:

a 66 year old man with Parkinson's disease whose administration times were all wrong that you had to sort out medication for
a 42 year old man who'd been admitted from the local prison with two police officers who was handcuffed the whole time and you had to be accompanied to talk to him
a 84 year old woman with dementia brought in from a nursing home
a 58 year old man who'd been co-administered pregabalin and gabapentin and was suffering from some very unusual side effects
...and a whole host of other problems!

You were rushed off your feet the whole day and glad to get home to eat something delicious, watch some terrible TV and relax for a bit.

After all, you have to do it all again tomorrow, [[right?]]

stop monitoring so much

Everything looks fairly stable so maybe you don't need to monitor as much any more. After all, there are a lot of other sick patients on the ward who also need your attention!

You make a note on Adeline's chart to say that the gentamicin dosing should continue to be 36-hourly and that it should be reviewed to stop after the next dose.

You then set out about seeing the rest of the new patients

There was:

a 66 year old man with Parkinson's disease whose administration times were all wrong that you had to sort out medication for
a 42 year old man who'd been admitted from the local prison with two police officers who was handcuffed the whole time and you had to be accompanied to talk to him
a 84 year old woman with dementia brought in from a nursing home
a 58 year old man who'd been co-administered pregabalin and gabapentin and was suffering from some very unusual side effects

...and a whole host of other problems!

You were rushed off your feet the whole day and glad to get home to eat something delicious, watch some terrible TV and relax for a bit.
Tomorrow is another day! Hopefully Adeline will [[get to go home tomorrow]]

keep an eye on them for a while longer

You decide that it's better not to risk it when it comes to gentamicin: it won't hurt to monitor it a little bit longer.

You move on with the rest of your patients for today and decide to check on Adeline first thing tomorrow morning.

The next day her gentamicin level is <1mg/L. It's never a bad thing to check how the actual patient is rather than just some numbers on a screen (it's so easy to forget that sometimes) so you decide to quickly pop in to see how she's doing.

When you get to her bedside she's sitting out in the chair, dressed and reading a book. She looks great! In fact, she looks so much better than you'd even imagined she could look!

"Good morning Adeline. How are you feeling today?"

Adeline looks up at you as she folds the corner over on a page to mark her place, closes her book and places her hands on her lap. She smiles and tells you "I feel wonderful! I'm looking forward to getting out of here: I can tell you that for nothing!"

"Ah, I'm so glad to hear that Adeline. That's brilliant!"

Now, do you [[say your goodbyes]] now, or [[check her medication chart]] one final time?

other issues

It looks like Adeline hasn't been prescribed thromboprophylaxis yet, and so you make a note to recommend it to Jin. Your hospital uses tinzaparin for all patients, unless they have an allergy.

But what dose should she be prescribed: [[4500 units]] or [[14,000 units]] s/c once daily?

4500 units

You ask Jin to prescribe 4,500 units s/c daily for Adeline for prophylaxis of DVT as an inpatient, and make a note that it should be discontinued at discharge.

One more time you [[check over the chart]]

14,000 units

14,000 units is the dose for prophylaxis for Adeline, since she weighs between 70 and 80kg. You bring the chart to Jin and ask him to prescribe it for you.

He looks up at you, with furrowed eyebrows and looking slightly confused.

He pauses for a couple of seconds, looks at you quizzically and says "...are you sure?"

He flips the chart over in his hands, looks a bit panicked and then takes his handover out of his pocket.

[["Yeah, it's definitely 14,000 units"]] you tell him=

or wait... [[is it?!]]

"Yeah, it's definitely 14,000 units"

Jin sort of just looks at you for a second and then says "Ok, if you're sure!" and writes the prescription for tinzaparin 14,000 units once a day.

He still doesn't look convinced, but you know it's right!

Now that you've sorted that out and can move on to [[the rest of her chart]]

is it?!

"Has she got symptoms of a DVT now? Are we treating her for that?" he says desperately

---

Your eyes open wide and you suddenly realise that 14,000 units is the treatment dose, not the prophylaxis dose. What on earth got into you?! You know this: you see it everyday!

"Oh wait no! Of course it's not 14,000 units. What was I thinking?! 4,500 units! 4,500 UNITS!"

Panic over, Jin sits back down and is very visibly relieved before he writes out a prescription for tinzaparin.

Slightly embarrassed now, and worrying a little if Jin thinks you don't know what you're doing, you [[check over the chart]]a final time. What if you've missed something else?!

the rest of her chart

Everything else seems to be fine with Adeline's chart, now that you've made sure the tinzaparin is prescribed!

You tell Rakhee that it's been sorted and ask her to keep an eye out for Adeline's gentamicin level later on too.
You finally seem to be done with Adeline for the day so it's time to move on to the rest of the patients and then [[go back to the dispensary]] to grab your things so you can go home.

go back to the dispensary

It's the end of the day now, and you're tired, your feet hurt and, quite frankly, you're ready to go home and put your feet up and watch some terrible TV and have something really nice to eat.

It's been long, and you ended up staying for an extra hour in the main dispensary helping to process the prescriptions to discharge as many people as possible and clear some beds for new admissions. You grab your bag and head out the door, stopping to say goodbye to the pharmacist who's closing up tonight.

[["I could already do with a day off"]] you think to yourself.

"I could already do with a day off"

Sadly, it's only wishful thinking and you don't have a surprise day off waiting for you...

Tuesday.

Back in to work you go, and you head to your ward again.

Would you like to [[see Adeline first]] or [[see the other new patients first]]?

see Adeline first

You decide that you should go and check on Adeline's chart first to make sure everything is ok.

When you pick it up you look at the tinzaparin dose and realise you'd very, *very* confidently told Jin the wrong dose. Your eyes widen as you look at the chart... and then close as you realise you're going to have to go and admit to him that you told him something wrong.

(text-style:"double-underline")[AND] that the patient had a dose.

You grab the chart and head towards him.

"Jiiiiiin" you say, drawing out his name "this actually *should* be 4,500 units...

He says nothing, stares at you for a second whilst clicking his pen, sighs and changes the prescription to tinzaparin 4,500 units.

[["Sorry"]] you say, kind of embarrassed.

see the other new patients first

The ward was so busy today!

There was

* a 66 year old man with Parkinson's disease whose administration times were all wrong that you had to sort out medication for
*a 42 year old man who'd been admitted from the local prison with two police officers who was handcuffed the whole time and you had to be accompanied to talk to him
*a 84 year old woman with dementia brought in from a nursing home
*a 58 year old man who'd been co-administered pregabalin and gabapentin and was suffering from some very unusual side effects

...and a whole host of other problems!

You remembered on your way out that day that you needed to check on Mrs Tessutti but you were already late for your chemotherapy checking session so decided to [[check her bloods]] back in the pharmacy, just to make sure her gentamicin levels were ok at the very least.

check her bloods

When you get to the chemotherapy checking bench it's chaos and you forget to check Adeline's bloods. It's only that night when you get home that you remember and you're annoyed at yourself. You can't check now though, so you make a note to check in first thing in the morning, as soon as you get to the pharmacy. You're annoyed at yourself but what can you do?
Sometimes things just can't get done, and everyone knows that and has experienced it at some point. You also trust the other members of the ward to do their jobs! It's not like you're the only one responsible for her care!

The next morning on your way in you [[go straight to the ward]] before you even get to the pharmacy department

go straight to the ward

Wednesday. Carol is on the desk again this morning, gives you a wave and says "I hope it's less busy today than it was yesterday: I've not seen it like that in ages!" as she gives you a handover sheet.

You tell her you're only popping in for a second just to check on Adeline before you come back up after dropping all your things off at pharmacy and seeing what your day holds.

"Oh, Mrs Tessutti isn't here anymore. I think she went off to Ward 6C over night. Hold on a second and I'll ask..."

She goes to stand up and you tell her not to worry: you'll have a look on the system.

Ward 6C is the renal unit though: [[why did she go there?]]

why did she go there?

Rakhee is in again today so you manage to grab her before she runs off to catch the consultant as he's gelling his hands and backing out of the ward.

"Give me two seconds!" she says "I really need to sort the discharge for this patient... I'll tell you all about it in a minute!". You barely hear the end of the sentence as she runs off.

You get started again on your rounds, and as you're about to go to talk to one of the new patients in the side room Rakhee comes back.

"Rakhee!" you should "What happened to Adeline?"

"[[Ahh...]]" she says. "That was awful"

Ahh...

It turns out that Adeline should've been prescribed 4,500 units of tinzaparin not 14,000.

On top of that, she'd been taking a lot of ibuprofen before she was admitted to hospital, and the bruising she'd gotten from the first tinzaparin injection was terrible.

Later that night she ended up vomiting coffee grounds along with some fresh blood. Her renal function had dropped significantly as she lost fluids too, on top of the gentamicin prescription and her platelets fell dramatically.
This is not good.

There's nothing you can do about it now though: it's already happened.

You feel pretty terrible though, and you now have to decide what to do.

Do you [[fill in an incident report]] or [[let it go for now]]?

fill in an incident report

You decide that it's best to complete an incident report about it. It was partly due to your mistakes, after all, and it's not like you can hide it or no one will know.

You complete the incident form, send it off and wait until you hear from the [[Medication Safety Officer]].

And then you just have to keep going with your day, and make sure that you take care of everyone else too.

let it go for now

A couple of weeks go by and you've quite honestly forgotten about the incident with Adeline Tessutti.

One day, just as you're arriving at pharmacy, the Medication Safety Officer Jeanette pulls you aside and asks to talk to you.

That's always a scary question when it's coming from her...

She takes you to a nice quiet area and asks you if you had recommended an incorrect dose of tinzaparin lately. It's at this point you realise you're probably in trouble. So are you going to [[get defensive]] or [[own up]]?

Medication Safety Officer

A couple of weeks go by and you've quite honestly forgotten about the incident form you did for Adeline Tessutti.

One day, just as you're arriving at pharmacy, the Medication Safety Officer Jeanette pulls you aside and asks to talk to you.

That's always a scary question from her...

She takes you to a nice quiet area and tells you that you did well to fill in the form and wants to talk through everything that happened with you.
You're candid with her about where you went wrong and the mistakes that you make. She's supportive and understanding but she's still stern with you, as you'd expect her to be.

"Well done on completing it yourself though" Jeannette says "That can't have been easy to do".

"Just to let you know though, the patient did end up in quite a bad way on the intensive care unit. They're even talking about doing a bit of an investigation about it. So it's good that you reported it and you weren't trying to hide it, but someone will talk to you about it at some point ok? If you need someone there with you let me know".

You're pretty devastated about the whole thing, to be totally honest. You can't believe you made some really silly mistakes that could've ended up costing someone their life.

Still... you can only learn and keep going forward, [[right?]]

right?

Thank you for completing this branch of the story!
Please return to [[Monday morning]] to play it through again, ensuring you make different choices

or

if you have played it multiple times you can return to Canvas to complete the questionnaire

Thank you again for taking the time to play through and to give your feedback. I hope you enjoyed playing the game no matter what ending you got each time!

Aileen

"Sorry"

Now that you've had your daily dose of embarrassment you look at the rest of the chart.

Now, what had you decided to do with her gentamicin again? Was it to [[continue with the original dose]] or [[change it]]?

get to go home tomorrow

When you get to the ward the next day Adeline is nowhere to be found.

Carol is the first person walking towards you so you ask "Has Adeline gone home already?"

Oh yeah! She was discharged last night" Carol tells you.

"She was ever so excited to get home. I think she was more annoyed about missing all her favourite TV shows than about actually having to stay in hospital!" She walks on past you to the ward reception and sits down.

You didn't get a chance to even chat to Adeline about her medication before she left and you have a *tonne* of unanswered questions

Did those side effects clear up?
How was her blood pressure before she left?
Did the occupational therapist see her too?
They wouldn't have discharged her with the tinzaparin, would they?!
Did anyone prescribe her the prophylactic antibiotics she was supposed to have for her UTI?
Did she even get a proper discharge summary?!

Lots of things are floating through your mind but she's gone now, and she was well when she left so that's fine... [[right?]]

get defensive

"Yeah well I did but the junior doctor just prescribed it so I can't see how any of this is my fault. It's not like..."

You continue rambling for a while as the Medication Safety Officer just stares at you, getting more and more annoyed. Her arms are crossed, her legs are crossed, she's staring at you as if she's waiting for you to stop speaking so she can give you a good talking to.

Eventually you run out of things to say and she starts speaking.

"WELL" she starts. "That was a lot of information, wasn't it?"

you think to yourself "Oh no.. I'm in so much trouble, [[right?]]"

own up

"Actually yeah, that was me" you say to her.
You're candid with her about where you went wrong and the mistakes that you make. She's supportive and understanding but she's still stern with you, as you'd expect her to be.

"We'll have to complete an incident form about this and there'll likely be an investigation into it. Well, to a certain extent at least" Jeannette says. "If anything like this ever happens again - *and I obviously hope it won't* - it's probably better for you to fill in an incident form for it yourself. You know the details when you're involved so it helps to get those down fairly early".

"Just to let you know though, the patient did end up in quite a bad way on the intensive care unit. They're even talking about doing a bit of an investigation about it. So it's good that you reported it and you weren't trying to hide it, but someone will talk to you about it at some point ok? If you need someone there with you let me know".

You're pretty devastated about the whole thing, to be totally honest. You can't believe you made some really silly mistakes that could've ended up costing someone their life.

Still... you can only learn and keep going forward, [[right?]]

Appendix Four –Participant information sheets and informed consent forms

Participant Information - Semi-Structured Interview

Participant information sheet

Title: Interactive Fiction and Learning from Failure in Distance Learning Postgraduate Clinical Pharmacy Education

For further information about how Lancaster University processes personal data for research purposes and your data rights please visit our webpage: www.lancaster.ac.uk/research/data-protection

I am a PhD student at Lancaster University and I would like to invite you to take part in a research study about using interactive fiction (IF) to allow postgraduate (PG) distance learning (DL) pharmacy students to learn from errors in a safe environment.

Please take time to read the following information carefully before you decide whether or not you wish to take part.

What is the study about?

This study aims to use IF (also known as a "choose-your-own-adventure" story) to present clinical scenarios to allow students to explore the consequences of their clinical decisions in a safe environment.

Why have I been invited?

I have approached you because you are a postgraduate student graduating from a distance learning clinical pharmacy course at QUB and have previously told me you would be happy to complete a semi-structured interview about the IF. I am interested in finding out how presenting patient scenarios in this way can help you learn safely and in a playful way from your mistakes without causing actual patient harm.

I would be very grateful if you would agree to take part in this study.

What will I be asked to do if I take part?

If you decide to take part, this would involve having an informal and semi-structured interview with me on Microsoft Teams at a time that is convenient to you to discuss your thoughts on the interactive fiction. This will take between approximately 30 minutes and 1 hour and will involve you answering some

questions on your experience of the IF and your day-to-day practice. You will be provided with the questions in advance and, depending on your responses, we may have a deeper conversation about some of your answers. The interview will be recorded for transcription purposes and any resultant transcription will be sent to you for confirmation or correction before the final submission.

What are the possible benefits from taking part?

Taking part in this study will allow you to gain clinical knowledge and problem-solving skills in a different and potentially more fun and interesting way. It will also help me to improve on learning experiences for you and future students and to develop mechanisms to improve feedback processes.

Do I have to take part?

No. It's completely up to you to decide whether or not you take part. As this study is being undertaken by a member of the programme team I recognise that you may feel under pressure to take part. I would like to reassure you that your participation is entirely voluntary and whether you decide to take part or not will have absolutely no impact on the relationship between you and I, or you and the university.

If you decide not to take part in this study, this will not affect your studies and the way you are assessed on your course.

What if I change my mind?

If you change your mind after initially agreeing to take part you are free to withdraw from the study. Please let me know as soon as you reach this decision. If you wish to stop part way through the interview, that is also no problem, just let me know and the interview will stop, and your data will not be used in the study.

You might decide after the interview that you are no longer happy for your information to be used. If you decide to withdraw after the study, and contact me within **two weeks** of the interview, your data will be destroyed and not used. After this point, the research analysis of the data will have commenced, and your data will remain in the study.

Refusal to take part, changing your mind or withdrawing from the study will not involve a penalty of any kind and will have no bearing on our relationship, your grades, or any institution associated with the study.

What are the possible disadvantages and risks of taking part?

It is unlikely that there will be any major disadvantages to taking part, although you may feel some discomfort whilst you are playing through the story and making your choices, and in talking through some of those decisions with me.

The scenario may also remind of you similar situations in your own or others' professional practice.

You will be required to set aside some time to have a conversation with me but this will not affect your grades in any way and will take place after your final results have been released.

Will my data be identifiable?

All information collected from you (interview responses) will be stored in a dedicated, password-protected computer folder and will only be accessible to myself. Data (whether written, audio or video) will not be stored with any names or other identifying information, and any transcripts will not be accessible to anyone other than myself. If, for any reason, you would like a copy of the information you provided after the study is completed then please email me.

All information generated by the project will be stored in the secure computer folder, in line with the requirements of the Data Protection Act and Lancaster University Research Ethics Committee requirements.

I will keep all personal information about you (e.g. your name and other information about you that can identify you) confidential, that is I will not share it with others. I will remove any personal information from the written record of your contribution and will take all reasonable steps to protect the anonymity of the participants involved in this project and protect their identities.

Any publications or presentations arising from this project will not identify you by name, with pseudonyms being used instead. When presenting transcripts and other research data in publications or presentations, I shall also strive to limit the excerpts so that you are not easily identifiable. There is however, always a very small risk that your participation in this study could be identifiable but I will take all reasonable steps to protect the anonymity of the participants involved in this project and protect their identities..

How will we use the information you have shared with us and what will happen to the results of the research study?

I will use the information you have shared with me for research purposes only. This will include my PhD thesis and other publications (journal articles, for example). I may also present the results of my study at academic and/or clinical conferences.

When writing up the findings from this study, I would like to reproduce some of the views and ideas you shared with me from your questionnaires. I will only use anonymised quotes and remove any identifiable information, so that although I will use your exact words all reasonable steps will be taken to protect your anonymity in our publications.

How my data will be stored

Your data will be stored in encrypted files (that is no-one other than me, the researcher will be able to access them) and on password-protected computers. I will store hard copies of any data securely in locked cabinets in my office. I will keep data that can identify you separately from non-personal information (e.g. your views on a specific topic). In accordance with University guidelines, I will keep the data securely for a minimum of ten years.

What if I have a question or concern?

If you have any queries or if you are unhappy with anything that happens concerning your participation in the study, please contact myself (a.mckenna@lancaster.ac.uk) or my supervisor, Dr. Richard Budd, (r.budd@lancaster.ac.uk, tel: +44 1524 510625; Educational Research, County South, Lancaster, LA1 4YL)

If you have any concerns or complaints that you wish to discuss with a person who is not directly involved in the research, you can also contact: Dr Jan McArthur (Head of Department; (j.mcarthur@lancaster.ac.uk; tel +44 1524 593572; Educational Research, County South, Lancaster, LA1 4YL)

This study has been reviewed and approved by the Faculty of Arts and Social Sciences and Lancaster Management School's Research Ethics Committee.

Thank you for considering your participation in this project.

Informed Consent form – Semi Structured Interview

Quiz instructions

Project Title: Interactive fiction and learning from failure in distance learning postgraduate clinical pharmacy education

Please ensure you have thoroughly read and understood the Participant Information Sheet before completing the consent form.
Thank you

Name of Researcher(s): Aileen McKenna

Email: mckennaa@lancaster.ac.uk or Aileen.McKenna@qub.ac.uk

Please answer each question

1 **1 pts**

I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily

- True

2 **1 pts**

I understand that my participation is voluntary and that I am free to withdraw at any time up to 2 weeks after I complete the interview without giving any reason, and that my data will be removed from the study.

- I understand

3 **1 pts**

I understand that the interview will take place on Microsoft Teams and be recorded for transcription purposes only, and that this recording will not be used within the data analysis for any other reason.

- I understand

4 **1 pts**

I understand that my name or likeness will not appear in any reports, articles or presentations and that some of the views and ideas I share during the interview may be anonymised and used in any resulting publications.

- I understand

5	1 pts
I understand that any information given by me may be used in future reports, academic articles, publications or presentations by the researcher/s, and all answers are anonymous and cannot be traced back to any individual participant in this project.	

6	1 pts
I understand that anonymised, transcribed interview data will be offered to Queen's University Belfast archive and will be made available to genuine research for re-use (secondary analysis)	

7	1 pts
I understand that data will be kept according to University guidelines for a minimum of 10 years after the end of the study.	

8
I have completed my programme of studies with the School of Pharmacy at Queen's University Belfast and understand that participation in this study will not contribute to my grade

9	1 pts
I agree to take part in the above study.	

Participant Information - Questionnaire

Participant information sheet

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Please take time to read the following information carefully before you decide whether or not you wish to take part.

What is the study about?

This study aims to use IF (also known as a “choose-your-own-adventure” story) to present clinical scenarios to allow students to explore the consequences of their clinical decisions in a safe environment.

Why have I been invited?

I have approached you because you are a postgraduate student undertaking a distance learning clinical pharmacy course at QUB. I am interested in finding out whether presenting patient scenarios in this way can help you learn safely and in a playful way from your mistakes without causing actual patient harm.

I would be very grateful if you would agree to take part in this study.

What will I be asked to do if I take part?

If you decide to take part, this would involve playing through the IF scenario a minimum of twice (although you are free to play as many times as possible), making varying choices each time before completing a questionnaire. Students who choose to take part who have also completed their studies will also asked if they would like to volunteer to undertake an interview on Microsoft Teams.

What are the possible benefits from taking part?

Taking part in this study will allow you to gain clinical knowledge and problem-solving skills in a different and potentially more fun and interesting way. It will also help me to improve on learning experiences for you and future students.

Do I have to take part?

No. It's completely up to you to decide whether or not you take part. As this study is being undertaken by a member of the programme team I recognise that you may feel under pressure to take part. I would like to reassure you that your participation is entirely voluntary and whether you decide to take part or not will have absolutely no impact on the relationship between you and I, or you and the university.

If you decide not to take part in this study, this will not affect your studies and the way you are assessed on your course.

What if I change my mind?

If you change your mind, you are free to withdraw at any time up until you submit the questionnaire as it is impossible to take out data from one specific participant after it has been anonymised. As this will happen at the point where you submit the questionnaire it will therefore not be possible to identify and remove your specific dataafter this point.

What are the possible disadvantages and risks of taking part?

It is unlikely that there will be any major disadvantages to taking part, although you may feel some discomfort whilst you are playing through the story and making your choices. The scenario may also remind you of similar situations in your own or others' professional practice.You will be required to invest some of your own time: when you play through the IF and when you submit the questionnaire, and if you are invited to complete the interview. If you are likely to find this discussion uncomfortable, you would be advised not to take part.

Will my data be identifiable?

When you submit your questionnaire all data will be anonymised and so it is extremely unlikely that you will be identifiable. Only I, the researcher conducting this study will have access to the ideas you share with me within the questionnaires.

How will we use the information you have shared with us and what will happen to the results of the research study?

I will use the information you have shared with me for research purposes only. This will include my PhD thesis and other publications (journal articles, for example). I may also present the results of my study at academic and/or clinical conferences.

When writing up the findings from this study, I would like to reproduce some of the views and ideas you shared with me from your questionnaires. I will only use anonymised quotes, so that although I will use your exact words all reasonable steps will be taken to protect your anonymity in our publications.

How my data will be stored

Your data will be stored in encrypted files (that is no-one other than me, the researcher will be able to access them) and on password-protected computers. I will store hard copies of any data securely in locked cabinets in my office. I will keep data that can identify you separately from non-personal information (e.g. your views on a specific topic). In accordance with University guidelines, I will keep the data securely for a minimum of ten years.

What if I have a question or concern?

If you have any queries or if you are unhappy with anything that happens concerning your participation in the study, please contact myself (a.mckenna@lancaster.ac.uk) or my supervisor, Dr. Richard Budd, (r.budd@lancaster.ac.uk, tel: +44 1524 510625; Educational Research, County South, Lancaster, LA1 4YL)

If you have any concerns or complaints that you wish to discuss with a person who is not directly involved in the research, you can also contact: Dr Jan McArthur (Head of Department; (j.mcarthur@lancaster.ac.uk; tel +44 1524 593572; Educational Research, County South, Lancaster, LA1 4YL)

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Thank you for considering your participation in this project.

Informed Consent form - Questionnaire

Quiz instructions

Project Title: Interactive fiction and learning from failure in distance learning postgraduate clinical pharmacy education

Please ensure you have thoroughly read and understood the Participant Information Sheet before completing the consent form.
Thank you

Name of Researcher(s): Aileen McKenna

Email: mckennaa@lancaster.ac.uk or Aileen.McKenna@qub.ac.uk

Please answer each question

1. 1 pts

I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily

- True

2. 1 pts

I understand that my participation is voluntary and that I am free to withdraw at any time during my participation in this study and within 4 weeks after I took part in the study, without giving any reason. If I complete and submit a questionnaire I understand that it will not be possible to withdraw this data as it will have been anonymised.

- I understand

3. 1 pts

I understand that any information given by me may be used in future reports, academic articles, publications or presentations by the researcher/s, and all answers are anonymous and cannot be traced back to any individual participant in this project.

- I understand

4, 1 pts

Anonymised data will be offered to Queen's University Belfast archive and will be made available to genuine research for re-use (secondary analysis)

- I understand

5. 1 pts

I understand that my name will not appear in any reports, articles or presentation.

- I understand

6. 1 pts

I understand that data will be kept according to University guidelines for a minimum of 10 years after the end of the study.

- ○ I understand

7. 1 pts

I understand that participation in this study does not contribute to my grade within my programme of study at Queen's University, Belfast

- ○ I understand

8. 1 pts

I agree to take part in the above study.

- ○ I agree

9.

I have completed my studies with QUB School of Pharmacy and am graduating or will have graduated from the programme in July 2024 with either a postgraduate certificate, a postgraduate diploma, or a postgraduate MSc and would be happy to be contacted and invited to participate in a semi-structured interview.

Please note that you are free to withdraw your agreement before the interviews take place, and you will be provided with a separate participation leaflet, consent form, and advance copy of the questions you will be asked.

- I would be happy to take part in an interview
- I do not wish to take part
- I am continuing my studies and cannot take part

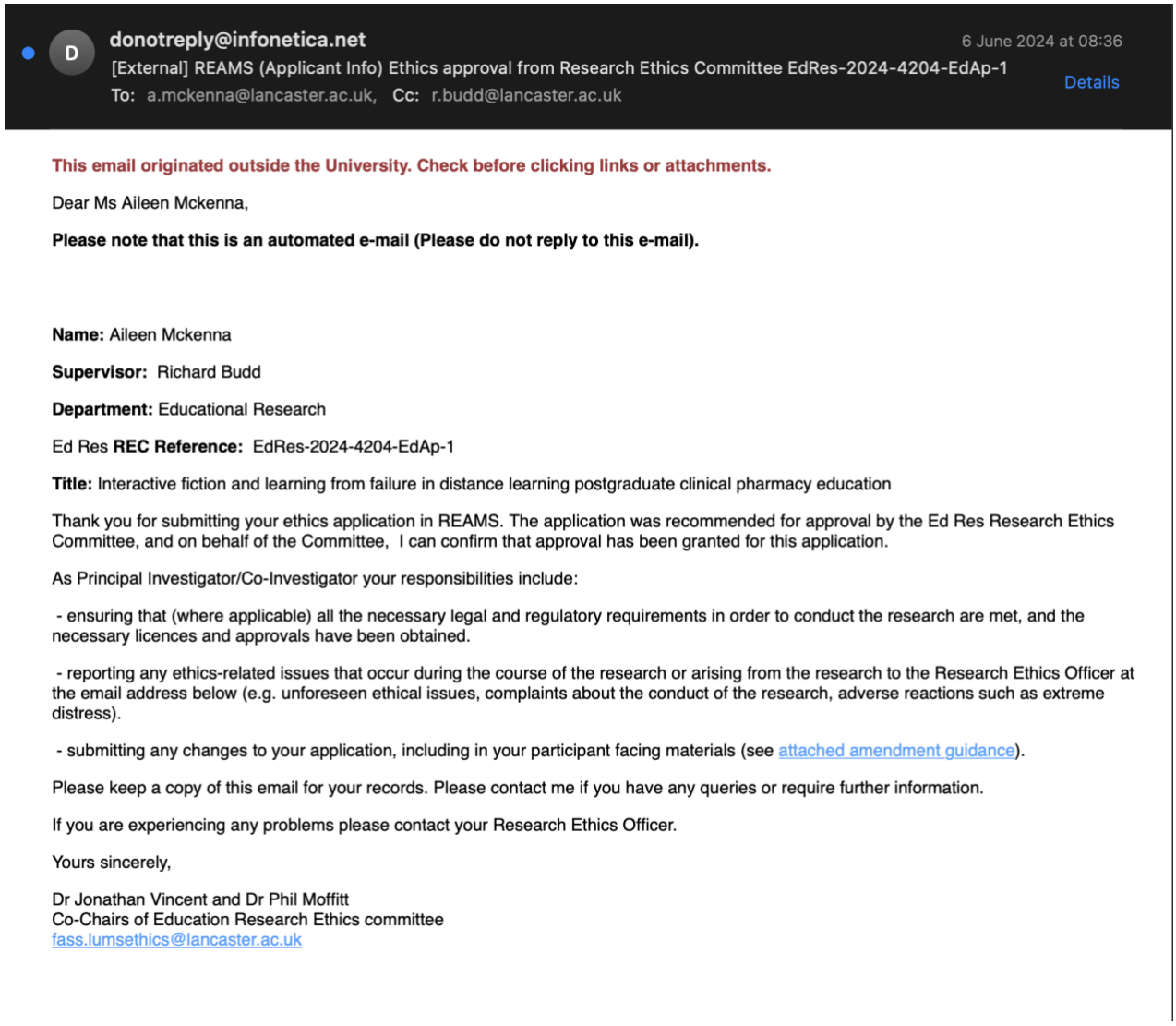
10

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Aileen McKenna

Read the instructions and access the interactive fiction game at the quiz here: https://canvas.qub.ac.uk/courses/32/quizzes/76902
Your access code is: 134340

Appendix Five - Ethics Approval



donotreply@infonetica.net 6 June 2024 at 08:36

[External] REAMS (Applicant Info) Ethics approval from Research Ethics Committee EdRes-2024-4204-EdAp-1

To: a.mckenna@lancaster.ac.uk, Cc: r.budd@lancaster.ac.uk Details

This email originated outside the University. Check before clicking links or attachments.

Dear Ms Aileen Mckenna,

Please note that this is an automated e-mail (Please do not reply to this e-mail).

Name: Aileen Mckenna

Supervisor: Richard Budd

Department: Educational Research

Ed Res **REC Reference:** EdRes-2024-4204-EdAp-1

Title: Interactive fiction and learning from failure in distance learning postgraduate clinical pharmacy education

Thank you for submitting your ethics application in REAMS. The application was recommended for approval by the Ed Res Research Ethics Committee, and on behalf of the Committee, I can confirm that approval has been granted for this application.

As Principal Investigator/Co-Investigator your responsibilities include:

- ensuring that (where applicable) all the necessary legal and regulatory requirements in order to conduct the research are met, and the necessary licences and approvals have been obtained.

- reporting any ethics-related issues that occur during the course of the research or arising from the research to the Research Ethics Officer at the email address below (e.g. unforeseen ethical issues, complaints about the conduct of the research, adverse reactions such as extreme distress).

- submitting any changes to your application, including in your participant facing materials (see attached amendment guidance).

Please keep a copy of this email for your records. Please contact me if you have any queries or require further information.

If you are experiencing any problems please contact your Research Ethics Officer.

Yours sincerely,

Dr Jonathan Vincent and Dr Phil Moffitt
Co-Chairs of Education Research Ethics committee
fass.lumsethics@lancaster.ac.uk

Ethics Application

[N.B. Appendices within this application refer to appendices submitted for the ethics application only. In order to maintain the original wording of the application form, corresponding appendices within this thesis are included in square brackets after the original reference. For example, “participant information sheet (Appendix 1) [Thesis Appendix 4] and consent form (Appendix 2) [Thesis Appendix 4]”.]

In addition to completing this section you must submit all supporting materials such as participant information sheet(s), consent form(s), interview questions, questionnaires, etc. See the checklist at the end of this form for guidance.

1. Summary of research in lay terms, including aims (maximum length 150 words)

This study involves the use of an interactive fiction (IF) (choose-your-own-adventure) style story to investigate learning through failure in distance learning

postgraduate pharmacy students, and to establish its effectiveness as a learning tool for this group of students.

In the IF participants take on the role of the protagonist and are presented with a story of a fake patient. They must make decisions at numerous stages to progress the story itself ana their choices decide the patient's fate, resulting in positive or negative outcomes. Students will play the story multiple times making different choices each time to explore the effects of their decisions and learn about clinical patient management whichever pathway they choose. The study aims to establish whether learning through IF can benefit the students learning in their postgraduate studies as well as its transferability to their daily pharmacy practice.

2. Anticipated project dates (month and year only)

Start date: May 2024 End date: August 2024

3. Please describe briefly the intended human participants (including number, age, gender, and any other relevant characteristics):

Up to approx. 247 postgraduate clinical pharmacists enrolled on DL PG clinical pharmacy course at Queen's University, Belfast (students are located worldwide) although the expected participation rate is much lower.

All students must be registered pharmacists and working in practice therefore minimum participant age is 22 and there is - theoretically - no maximum (although it is unusual to have students over the age of 60). Students are mixed gender (although a greater proportion of students are female as there is a greater proportion of registered pharmacists who are female) and of multiple ethnicities and social backgrounds.

4.Are members of the public involved in a research capacity, for example as data collector (e.g. participatory research) and if so, do you anticipate any ethical issues resulting from this?

No

5. How will participants be recruited and from where?

Participants will be recruited from the three pharmacy distance learning courses run by Queen's University, Belfast via the university's VLE, Canvas. Students will be invited to participate through an announcement - which will include a video summary of the project in an effort to engage more students - on a module shared by all Pharmacy DL students on Canvas (The Pharmacy DL Hub). Announcements in Canvas are also automatically sent to students' email addresses so they will receive an additional notification this way. All students who wish to can take part are welcome to complete the anonymous questionnaire. Students who are graduating in July 2024 will be invited to volunteer to participate in a semi-structured interview. Not all may be selected for interview due to time and resource constraints. It is anticipated that approximately 5 students will be interviewed to supplement and complement the questionnaire data.

All students completing the IF questionnaire will be provided with a participant information leaflet (Appendix 1) [Thesis Appendix 4] and consent form (Appendix 2 [Thesis Appendix 4] before being provided with an access link to the IF itself (https://aileencmckennaqub.itch.io/ladyandgent). Students who are eligible for the interview will be provided with an additional participant information leaflet (Appendix 3) [Thesis Appendix 4] and consent form (Appendix 4) [Thesis Appendix 4] to sign prior to the interviews taking place. Interview participants will also be asked to give their verbal consent immediately prior to their interviews.

6. Briefly describe your data collection methods, drawing particular attention to any potential ethical issues.

Data will be gathered from all participants using an anonymous questionnaire, and from a sub-set of students through semi-structured interviews.

All questionnaires will be anonymised to ensure student confidentiality and - as I am the programme lead - students will be reassured that their participation (or not) will not have an impact on their grades. Gathering anonymous responses also leaves the students free to give their honest opinions on the IF without fear of repercussion.

Students who volunteer for the interview must be graduating from the course in July 2024, and I will personally confirm this is correct on the university registration system before invitations are formally extended. Interviews will take place after the submission of their final piece of coursework and release of the marks so that students can be reassured that their participation will not affect their grades. As above, it is hoped that this will leave students more at ease to be open with their thoughts and opinions without fear of repercussion.

7. Consent

7a. Will you take all necessary steps to obtain the voluntary and informed consent of the prospective participant(s) or, in the case of individual(s) not capable of giving informed consent, the permission of a legally authorised representative in accordance with applicable law?
If yes, please go to question
If no, please go to question

7b. Please explain the procedure you will use for obtaining consent?
Please include sample participant information sheets (PIS) and consent forms in your application. If applicable, please explain the procedures you intend to use to gain permission on behalf of participants who are unable to give informed consent. Please include copies of any relevant documentation.

All students will be provided with a participant information sheet (Appendix 1) [Thesis Appendix 4] and consent form (Appendix 2) [Thesis Appendix 4] which must be digitally signed in Canvas prior to receiving password-protected access to the IF link itself. The questionnaire students complete is delivered separately via a link at the end of each pathway in the IF. The questionnaire itself can

therefore be completely anonymous. The consent form also asks students to indicate their eligibility and willingness to participate in a semi structured interview. As students must be logged in to Canvas with their own credentials this serves as an electronic signature for the forms and can be easily collected.

Students who are then eligible to participate in the interview will be contacted and provided with a separate participant information sheet (Appendix 3) [Thesis Appendix 4] and consent form (Appendix 4) [Thesis Appendix 4] which they must return prior to the interview starting. Interviews will be recorded and the participants will be asked again to verbally confirm their consent prior to commencement at the beginning of the recording (Appendix 5) [Thesis Appendix 2].

7c. If it will be necessary for participants to take part in the study without their knowledge and consent at the time, please explain why.(For example covert observations may be necessary in some settings; some experiments require use of deception or partial deception – not telling participants everything about the experiment).

Not applicable.

8. What discomfort (physical and psychological eg distressing, sensitive or embarrassing topics), inconvenience or danger could be caused by participation in the project beyond the risks encountered in normal life?
Please indicate plans to address these potential risks.
State the timescales within which participants may withdraw from the study, noting your reasons.

In the IF itself: students will be making decisions that they may not make for patients in real life which could become uncomfortable or cause distress. Likewise, if students do choose a route that ultimately leads to a poor outcome for the patient and it is something that they would normally do then this could also cause distress or discomfort. However, the topic of this project is around learning from failure and so unpleasant feelings or emotions are to be expected to different extents. It is also preferable to identify errors that students are making in real life even through this as it could ultimately improve patient care. Students are free to discuss their concerns with the investigator if they wish.

Interviews will be recorded on Microsoft Teams in order to both provide and check the transcription and students will be offered a range of time slots for their convenience.As these will be recorded the students' faces will obviously be visible for the duration. Discussing topics with a tutor may cause discomfort or embarrassment in itself however the students should be under no undue pressure to give positive feedback as they will be graduating from the course. They will also be reassured that their data will be stored safely on a password protected and encrypted hard drive that is accessible only to myself as the investigator. Students are informed in the information leaflet and consent form that they are welcome to withdraw from the study at any time before or during the interview and up to 2 weeks following their interview (or survey completion)

The questionnaire asks some questions which the participants may be forced to stop and consider and may require them to reflect on their own practice as both pharmacists and as students. It is not envisioned that this will cause too much discomfort beyond normal life. Information leaflets provided to students completing the anonymous questionnaires state that it will not be possible to remove their data from the study once they have submitted their responses as it will not be possible to identify respondents at that point. Students are free to withdraw from the study at any time up until submission of this questionnaire.

9. How will you protect participants' confidentiality and/or anonymity in data collection (e.g. interviews), data storage, data analysis, presentation of findings and publications?

Questionnaires completed by students will all be recorded anonymously and cannot be attributed to any individual student once submitted. The results of the questionnaires will be stored on a Canvas module to which I am the sole 'teacher' with permissions that allow this data to be viewed. Results will be exported to Microsoft Excel and these spreadsheets can then be further processed for data analysis. All data that is collected and processed from the questionnaires will be stored on a password protected and encrypted hard drive accessible to only me, as the researcher.
The semi-structured interviews with participants must be recorded on Microsoft Teams for transcription and analysis purposes. These videos are initially stored on a secure QUB server but will be downloaded and stored on the same encrypted hard drive as the questionnaires. Participants will be assured that these videos are not accessible to anyone else and are only for data analysis and transcription purposes. Transcriptions resulting from these interviews will be anonymised and participants allocated pseudonyms for the analysis. Any information that could lead to potential identification of the participants will be redacted or anonymised.

As all participants are also working in practice in patient facing roles there is also the possibility that they may inadvertently mention patients in their responses. Given the nature of the questions this risk is extremely low but students will be reminded to maintain confidentiality at all times. Similarly, if a student discloses information in either the questionnaire or interview that indicates their patients may be at risk of harm (or have previously come to harm) this will be discussed with the student and the dedicated fitness to practice team in the School of Pharmacy at QUB. Within Great Britain and Northern Ireland all pharmacists must be registered with the General Pharmaceutical Council and the Pharmaceutical Society of Northern Ireland respectively. QUB has a duty to follow the regulations for both registration bodies and so may be required to report unsafe or illegal practice. Such regulations do not exist for non-UK based students however and so if any of these students raise concerns a discussion will be had with the School of Pharmacy team, as is standard practice.

10. Do you anticipate any ethical constraints relating to power imbalances or dependent relationships, either with participants or with or within the research team?
If yes, please explain how you intend to address these?

As I am the programme lead for the DL courses in the School of Pharmacy there are potential issues with students who volunteer to be interviewed. However, the students that will be selected are those who have submitted their final assignments and are awaiting graduation before exiting the course. There should therefore be no expectation that this will influence the students' grades either positively or negatively.
As the questionnaires will be completed and submitted anonymously I do not foresee any ethical issues with the participants who only complete these.

11. What potential risks may exist for the researcher and/or research team?
Please indicate plans to address such risks (for example, noting the support available to you/the researcher; counselling considerations arising from the sensitive or distressing nature of the research/topic; details of the lone worker plan you or any researchers will follow, in particular when working abroad.

There are a few potential risks to both the research and myself as the researcher with this project.

Participant interviews will take place one-on-one in an online environment. Although there is obviously no physical risk of harm in this instance there is the potential for upset, distress, anger, hostility and more to arise during the interviews. As I have both been trained in and have experience in dealing with all kinds of interactions with patients and healthcare professionals (including breaking bad news) I believe I am in a position to deal with most situations (should they arise) in a calm and effective way. QUB also has a very effective Student Wellbeing Service (including urgent support - https://www.qub.ac.uk/directorates/sgc/wellbeing/) who provide online as well as on-campus services. Students in distress may be signposted there in the event that they require more specialised help and resources or the centre may be contacted directly by staff if students disclose concerning information.
12. Whilst there may not be any significant direct benefits to participants as a result of this research, please state here any that may result from participation in the study.

As the IF scenario is based on a real clinical case students may derive some benefit from extra learning that occurs during the playthroughs. This will not benefit students directly in their studies for this academic year but students may find that it has implications for t heir professional practice.

13. Please explain the rationale for any incentives/payments (including out-of-pocket expenses) made to participants.

Not applicable.

14. What are your plans for the storage of data (electronic, digital, paper, etc.)?
Informed consent forms for questionnaires and interviews: digitally signed informed consent will be collected using the quiz function on the specific Canvas module (The Pharmacy DL Hub) and stored temporarily. These forms

will then be exported to Microsoft Excel where they can be stored on an encrypted and password protected hard drive. As the lone 'teacher' on the DL Hub this information is not accessible to other academics or staff who may also have read-only access to the module.
Completed questionnaires: as for the consent forms, data from the questionnaires will be gathered using the quiz function in Canvas, downloaded and stored on the same encrypted and password protected hard drive.
Interview data: interviews will be recorded on Microsoft Teams on secure QUB servers and are accessible to only the participants and the researcher. Automatic transcriptions will be generated in Teams and exported as Microsoft Word files for further editing and clarification alongside the recordings, as appropriate. Once recordings are available these will be downloaded and stored on an encrypted hard drive along with the questionnaire data and informed consent forms. Interview transcriptions will also be imported to NVIVO 12 for coding and analysis once they have been anonymised. As these are further files containing potentially sensitive data these will also be stored on the encrypted and password protected hard drive.

All data will be maintained for a minimum of 10 years from project completion and be accessible only to the researchers for the duration of the project. Anonymised data will be made available to the university's archive to be made available for secondary analysis.

Please ensure that your plans comply with the General Data Protection Regulation (GDPR) and the UK Data Protection Act 2018 .
15. Please answer the following question only if you have not completed a Data Management Plan for an external funder.
15a.Do you intend to deposit your (anonymised) data in a data archive?
Yes ☒ No ☐

15b. If you have responded 'no' to question 15a, please explain briefly why you cannot share your data via a data archive or repository.
Not applicable

16. Will audio or video recording take place?
no ☐ audio ☐ video ☒

16a. Will portable devices (laptop, USB drive, audio- and video-recorders, etc) be encrypted (in particular where they are used for identifiable data)?
yes ☒ no ☐
16b If it is not possible to encrypt your portable devices, please comment here on the steps you will take to protect the data.
Not applicable.

16c What arrangements have been made for audio/video data storage? At what point in the research will tapes/digital recordings/files be destroyed?

Interviews will be recorded on Microsoft Teams on secure QUB servers and are

accessible to only the participants and the researcher. As the storage time on these servers is limited to approximately 3 years these recordings will be downloaded and stored on an encrypted and password protected hard drive for the stated 10 years retention time.

16d. If your study includes video recordings, what are the implications for participants' anonymity? Can anonymity be guaranteed and if so, how? If participants are identifiable on the recordings, how will you explain to them what you will do with the recordings? How will you seek consent from them?

Video recordings, as previously stated, will be downloaded from the QUB servers as soon as possible to minimise the potential for them to be accessed by anyone other than the researcher. Participants will be allocated pseudonyms which will be used in the file names as well. The downloaded files will be stored on an encrypted and password protected hard drive which is accessible only to the researcher and the recordings removed from the QUB servers as soon as possible.

Information about storage of video files and handling of data is included in the consent form (Appendix 4) [Thesis Appendix 4] and will be explained to the participants at the start of the interview using the script in Appendix 6 [Thesis Appendix 2]. Participants will also be afforded time to ask questions at this time before the interview begins in earnest and verbal consent will be obtained at this time (and recorded on the video itself).

17. What are the plans for dissemination of findings from the research? If you are a student, include here your thesis.
Please also include any impact activities and potential ethical issues these may raise.

Findings from this research will be disseminated primarily through submission of a PhD thesis to Lancaster University. Results may also be submitted to academic and professional journals and conferences for publication or presentation, and shared with Queen's University Belfast's assessment hub. After publication of the thesis the results will also be presented back to students enrolled on the DL courses through webinars, recorded presentations or written articles.

18. What particular ethical considerations, not previously noted on this application, do you think there are in the proposed study?
Are there any matters about which you wish to seek guidance from the FASS-LUMS REC?

The IF has been uploaded to a site (Itch.io) well know and used by IF authors. This site also allows the game to be published as 'unlisted' so that members of the general public search for or find it. Access is granted only through a shared private link that I can generate and distributed to players through the consent form. This minimises the risk of it being freely available to the public whilst also ensuring students are not required to sign up for any additional sites or

complete too many checks to start playing the game.

In order to ensure that no group of student benefits above others in their course assessments the scenario content is not aligned to any specific module although it may contain basic clinical information available to all qualified pharmacists.

From a clinical standpoint there are potential risks in developing scenarios that are not contained within the course materials. Each country or region has individual laws and guidance governing how pharmacy operates although the scenario has been written to minimise these. As all QUB pharmacy DL students are regularly informed that all materials are based on UK standards and guidance this should not be an issue, however it will be reiterated in the information associated with the IF on the opening page. Clinical guidance is also updated regularly and so there is a risk that this could occur during the timeframe the IF remains open. This risk is small however, as the IF will only remain available during the times stated and students will be informed that the topic is up to date as of 1st May 2024

A disclaimer will also be added to this page that states:
The story, all names, characters, and incidents portrayed in this production are fictitious. No identification with actual persons (living *or deceased), places, buildings, and products is intended or should be inferred.*

Appendix Six – Statistical Analysis

Tests of Questionnaire Validity

Cases	Valid	27	100.0
	Excluded[a]	0	.0
	Total	27	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.890	16

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
It was not immediately obvious that I was receiving feedback though the story narrative	63.56	54.333	.379	.892
It was beneficial to see the consequences of my decisions in the story, even if they were not what I would do in real life.	62.48	55.567	.650	.883
Being able to make and learn from my mistakes in “Lady and Gent” was a valuable learning experience	62.48	54.952	.735	.881
I feel like I learned more from making poor decisions in the game than by making good decisions	62.78	51.103	.647	.880
Playing “Lady and Gent” made learning feel more enjoyable	62.63	54.396	.632	.882
I would appreciate the opportunity to play other interactive fiction games as part of my studies	62.52	56.028	.583	.884

Being able to choose different pathways helped me to understand that there can be more than one right answer	62.59	56.405	.535	.886
I enjoyed being able to make bad clinical decisions in a safe environment	62.74	54.815	.401	.890
Overall, how valuable do you think learning through interactive fiction (IF) could be for your postgraduate pharmacy distance learning experience?	62.85	49.439	.806	.872
As I played Lady and Gent I reflected on elements of my own professional practice.	62.56	56.179	.562	.885
I have changed or will consider changing some of my practice as a result of playing the interactive fiction	63.56	50.718	.570	.884
I related to my character in the story and/or to the story itself	63.07	58.379	.153	.898
I felt responsible for the actions of my character in the story and the outcomes for the patient	62.63	55.088	.625	.883
I found myself thinking about the story even after I had finished playing it	62.78	53.564	.639	.881
Overall, I think my experiences through playing Lady and Gent were beneficial to my professional practice	62.78	53.179	.678	.879
Overall, I think my experiences in “Lady and Gent” could positively influence my decision making abilities in my daily practice	63.56	46.103	.705	.880

Although a relatively small percentage of the student population (10.8%) took part in the questionnaire, As the Cronbach’s alpha has shown reliability and

consistency and the distribution of students who took part in the research within both the questionnaire and the interviews is broadly consistent across.

All items >0.7 therefore a high internal validity and reliability.

The overall Cronbach's alpha is **0.890**, indicating **high internal consistency**.

The "Corrected Item-Total Correlation" values mostly range from **0.379 to 0.806**, meaning most items have a moderate to strong correlation with the overall scale.

The "Cronbach's Alpha if Item Deleted" values show that removing any item does not significantly improve reliability as values remain close to 0.89, suggesting all items contribute meaningfully.

This indicates that the questionnaire effectively measures a consistent construct, meaning responses are reliable.

Some items (e.g., "I related to my character in the story and/or to the story itself," with a correlation of **0.153**) have weaker correlations with the total scale, indicating they may not be as strongly aligned with the other questions.
The statement at the end confirms that despite a small sample size (**10.8% of the student population**), the results are considered **valid and reliable** due to the high Cronbach's alpha.

This analysis demonstrates that the questionnaire used in the study has **strong internal reliability**, making it a dependable tool for measuring participants' experiences with interactive fiction in pharmacy education.

CROSSTABULATIONS

I have changed or will consider changing some of my practice as a result of playing the interactive fiction * I currently work in Crosstabulation

Count

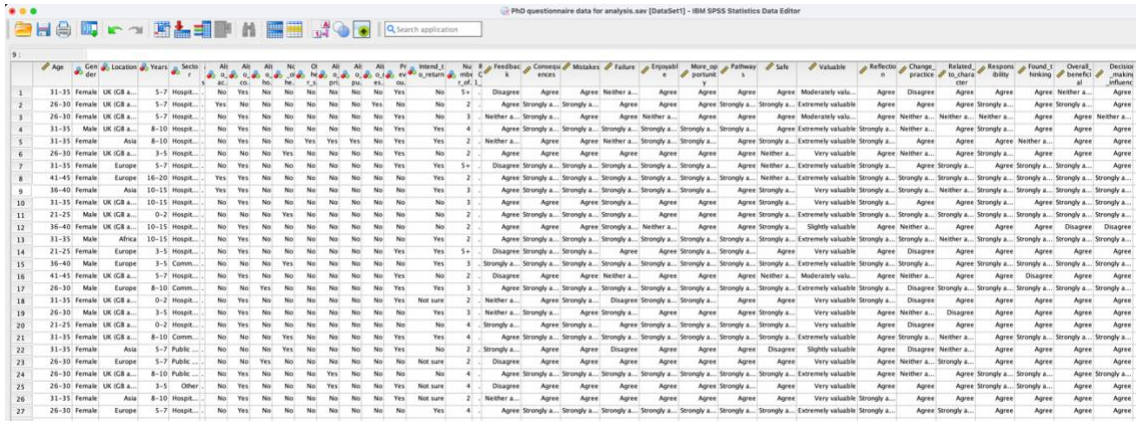
		I currently work in				
		Community pharmacy	Hospital pharmacy	Public health	Other	Total
I have changed or will consider changing some of my practice as a result of playing the interactive fiction	Disagree	1	4	1	0	6
	Neither agree nor disagree	0	6	2	0	8
	Agree	0	6	0	1	7
	Strongly agree	2	4	0	0	6
Total		3	20	3	1	27

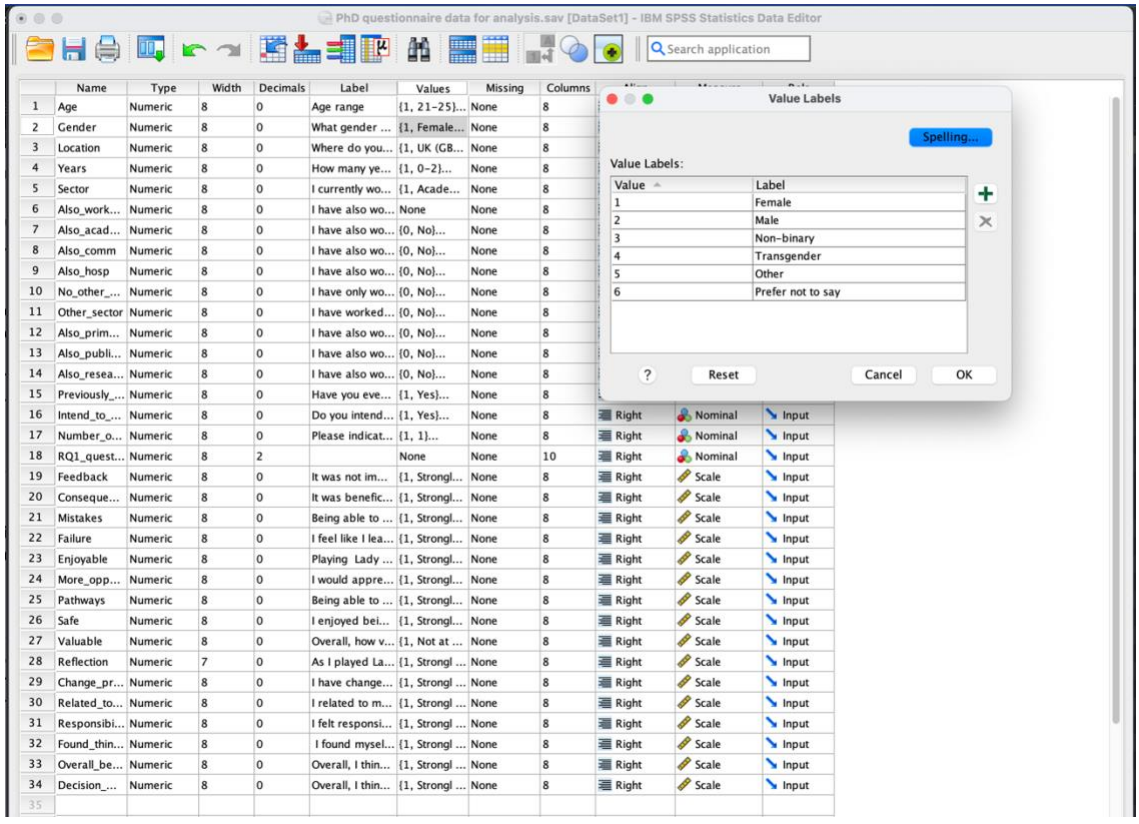
Correlations

		I currently work in	I have changed or will consider changing some of my practice as a result of playing the interactive fiction
I currently work in	Pearson Correlation	1	-.141
	Sig. (2-tailed)		.484
	N	27	27
I have changed or will consider changing some of my practice as a result of playing the interactive fiction	Pearson Correlation	-.141	1
	Sig. (2-tailed)	.484	
	N	27	27

p-value >0.05 therefore non-significance.

SPSS Tables





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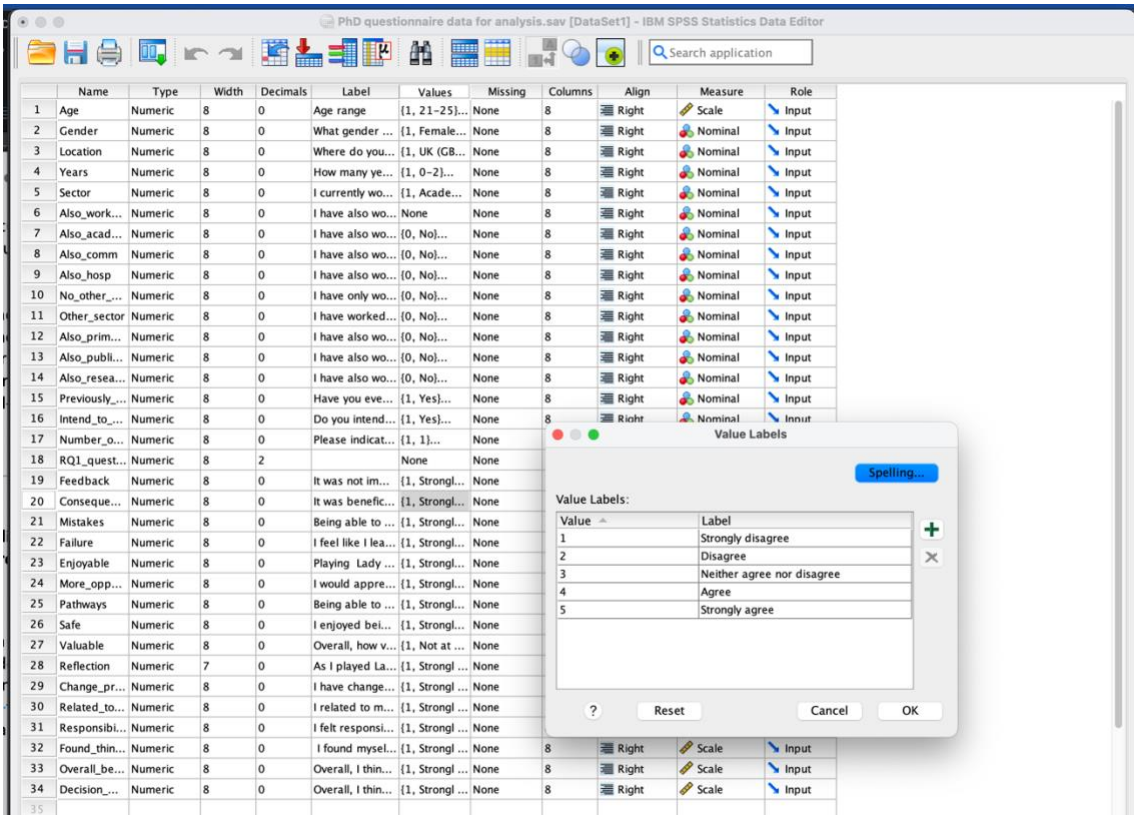
2	Gender	Numeric	8	0	What gender ...	{1, Female...	None	8			
3	Location	Numeric	8	0	Where do you...	{1, UK (GB...	None	8			
4	Years	Numeric	8	0	How many ye...	{1, 0-2}...	None	8			
5	Sector	Numeric	8	0	I currently wo...	{1, Acade...	None	8			
6	Also_work...	Numeric	8	0	I have also wo...	None	None	8			
7	Also_acad...	Numeric	8	0	I have also wo...	{0, No}...	None	8			
8	Also_comm	Numeric	8	0	I have also wo...	{0, No}...	None	8			
9	Also_hosp	Numeric	8	0	I have also wo...	{0, No}...	None	8			
10	No_other_...	Numeric	8	0	I have only wo...	{0, No}...	None	8			
11	Other_sector	Numeric	8	0	I have worked...	{0, No}...	None	8			
12	Also_prim...	Numeric	8	0	I have also wo...	{0, No}...	None	8			
13	Also_publi...	Numeric	8	0	I have also wo...	{0, No}...	None	8			
14	Also_resea...	Numeric	8	0	I have also wo...	{0, No}...	None	8			
15	Previously_...	Numeric	8	0	Have you eve...	{1, Yes}...	None	8			
16	Intend_to_...	Numeric	8	0	Do you intend...	{1, Yes}...	None	8	Right	Nominal	Input
17	Number_o...	Numeric	8	0	Please indicat...	{1, 1}...	None	8	Right	Nominal	Input
18	RQ1_quest...	Numeric	8	2		None	None	10	Right	Nominal	Input
19	Feedback	Numeric	8	0	It was not im...	{1, Strongl...	None	8	Right	Scale	Input
20	Conseque...	Numeric	8	0	It was benefic...	{1, Strongl...	None	8	Right	Scale	Input
21	Mistakes	Numeric	8	0	Being able to ...	{1, Strongl...	None	8	Right	Scale	Input
22	Failure	Numeric	8	0	I feel like I lea...	{1, Strongl...	None	8	Right	Scale	Input
23	Enjoyable	Numeric	8	0	Playing Lady ...	{1, Strongl...	None	8	Right	Scale	Input
24	More_opp...	Numeric	8	0	I would appre...	{1, Strongl...	None	8	Right	Scale	Input
25	Pathways	Numeric	8	0	Being able to ...	{1, Strongl...	None	8	Right	Scale	Input
26	Safe	Numeric	8	0	I enjoyed bei...	{1, Strongl...	None	8	Right	Scale	Input
27	Valuable	Numeric	8	0	Overall, how v...	{1, Not at ...	None	8	Right	Scale	Input
28	Reflection	Numeric	7	0	As I played La...	{1, Strongl ...	None	8	Right	Scale	Input
29	Change_pr...	Numeric	8	0	I have change...	{1, Strongl ...	None	8	Right	Scale	Input
30	Related_to...	Numeric	8	0	I related to m...	{1, Strongl ...	None	8	Right	Scale	Input
31	Responsibi...	Numeric	8	0	I felt responsi...	{1, Strongl ...	None	8	Right	Scale	Input
32	Found_thin...	Numeric	8	0	I found mysel...	{1, Strongl ...	None	8	Right	Scale	Input
33	Overall_be...	Numeric	8	0	Overall, I thin...	{1, Strongl ...	None	8	Right	Scale	Input
34	Decision_...	Numeric	8	0	Overall, I thin...	{1, Strongl ...	None	8	Right	Scale	Input
35											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Search application
Value Labels
Spelling...
Value Labels:
Value
Label
1
Strongly disagree
2
Disagree
3
Neither agree nor disagree
4
Agree
5
Strongly agree
?
Reset
Cancel
OK

Appendix Seven –Results Summary Tables

Summary of the findings for RQ1, organised according to the conceptual framework headings					
		RQ1 : Value of IF as a pedagogical tool	**RQ1a: Advantages or benefits**	**RQ1a :Disadvantages or drawbacks**	**RQ1b :Suggested Changes**
User control					
Narrative structure				1. Time 2. Limited in types of scenarios 3. Limited in applicability of scenarios 4. Lack of obvious feedback	1. Provide the correct pathway 2. Provide all pathways 3. More IF including 4. More non-clinical skills 5. Individualise
Moderator individual differences	Need for cognition	1. Applied learning	1. Application of knowledge 2. Critical thinking and decision-making skills 3. Identification of knowledge gaps	1. Not complex enough	1. Increase complexity 2. Spiral learning 3. Varying difficulty levels
	Need for control			1. Not enough control 2. Too much control	1. Scenarios in different sectors
	Transportability	1. Exposure to unfamiliar environments and scenarios 2. Contextual learning	1. Exposure to unfamiliar environments and scenarios		
	Comfort with technology	1. Include bilingual or accessible features		1. Technical issues	

		2. Requires maintenance			
Engagement variables	Transportation	1. Applicable to real life			
	Identification	1. Put in the mindset of the pharmacists therefore making decisions feels real	1. Decision-making skills		
	Realism	1. Improved knowledge retention		1. Unrealistic/Too realistic	
Role of the Self	Responsibility	1. Improved knowledge retention	1. Decision-making skills	1. Scaremongering	
	Possible selves	1. Potential to see different outcomes	1. Potential to see different outcomes 2. Practice decision-making skills 3. Reflect on own and others' decisions	1. Discomfort 2. Reluctance to embrace error making 3. Risk aversion	
	Participatory responses				
	Self-referencing and remindings				
Outcomes	Enjoyment		1. Enjoyable 2. Reinforces learning		
	Appreciation		1. Identification of knowledge gaps 2. Self-reflection 3. Improved knowledge retention		

	Attitudinal/ behavioural change	1. Improved attitude towards studies			
Non-Framework variables			1. Self guided learning		1. Use of AI, voice and video, Mentimeter® & group work 2. Use in formal assessment

Summary of the findings for RQ2 organised according to the conceptual framework headings					
		RQ2: Usefulness for practice	**RQ2a: How decision-making skills are affected**	**RQ2b: Reflection on usual practice**	**RQ2c: How reflection can affect their practice**
User control		1. Non-clinical skills development			
Narrative structure		1. Variety of scenarios		1. Patient care	1. Improved care
Moderator individual differences	Need for cognition	1. Explore increasingly complex situations	1. Challenging current knowledge 2. Reflection on skills development	1. Acts as a prompt 2. Deeper self-reflection 3. Authentic learning	1. Non-clinical skills development 2. Interpersonal relationship management 3. Practical solution testing
	Need for control	1. Authentic 'lived' experiences	1. Improved task management 2. Increased comfort with ambiguity		1. Increased comfort with ambiguity
	Transportability	1. Exploring new environments 2. Direct knowledge application	1. Skills development	1. Adaptation to environments and processes	1. Alternative approaches
	Comfort with technology				
Engagement variables	Transportation	1. Authentic experiences		1. Impact of decision-making	1. Error prevention

	Identification	1. Reducing multidisciplinary workplace boundaries	1. Reflection on decisions made		
	Realism	1. Authentic 'lived' experiences			
Role of the Self	Responsibility	1. Feel the impact of decisions	1. Authentic 'lived' experiences	1. Practices and processes 2. Authentic 'lived' experiences Scaremongering	1. Improved patient care
	Possible selves	1. Increased knowledge retention 2. Enjoyment	1. Experience increased impact 2. Exploration of different decisions and outcomes 3. Hesitation in making errors	1. On own and others' behaviours/decisions 2. Reflection on past selves	
	Participatory responses		1. Authentic 'lived' experiences	1. Scaremongering	
	Self-referencing and remindings	1. Direct impact on patient care	1. Reflected	1. Reinforced professional roles	1. Changed practices and processes
Outcomes	Enjoyment				
	Appreciation	1. Provoked reflection 2. Peer discussion	1. Skills enhanced 2. Reasoning and motivation for decision-making 3. Increased confidence 4. Encourage to step beyond comfort zone	1. Deeper reflection 2. Impact of minor decisions 3. Assessment of own skills and knowledge 4. Reinforced professional roles Decision load	1. Unaffected 2. Peer discussion 3. Reduced stress 4. Recognition of human impact 5. Enhanced decision-making 6. Workload prioritisation

				5. Enhanced decision-making 6. Workload prioritisation	
	Attitudinal/ behavioural change	1. Increased adaptability	1. Error prevention 2. Connectedness of care 3. Increased confidence	1. Reinforced professional roles 2. Enhanced patient care 3. Positive reinforcement of decision-making 4. Encourage to step beyond comfort zone	1. Task prioritisation 2. Personal boundary setting 3. Reduced stress 4. Improved patient care Focus shift from diagnosis to patient 5. Improved prescribing decisions 6. Enhanced decision-making 7. Changed practices and processes
Non-Framework variables					