



Contents lists available at ScienceDirect

# Currents in Pharmacy Teaching and Learning

journal homepage: [www.elsevier.com/locate/cptl](http://www.elsevier.com/locate/cptl)



Research Paper

## Exploring an integrated curriculum in pharmacy: Students' perspectives on the experienced curriculum and pedagogies supporting integrative learning



Andrew Mawdsley<sup>a,\*</sup>, Sarah Willis<sup>b</sup>

<sup>a</sup> Division of Pharmacy and Optometry, School of Health Science, Faculty of Biology, Medicine and Health, Room 1.135, Stopford Building, The University of Manchester, Oxford Road, M13 9PL, UK

<sup>b</sup> Division of Pharmacy and Optometry, School of Health Science, Faculty of Biology, Medicine and Health, Room 1.29, Stopford Building, The University of Manchester, Oxford Road, M13 9PL, UK

### ARTICLE INFO

#### Keywords:

Integrated curriculum  
Integrated assessment  
Pharmacy curricula  
Pharmacy education

### ABSTRACT

**Introduction:** Pharmacy educators are designing integrated curricula to implement teaching that supports integrative learning. How students experience an integrated curriculum, and the extent a curriculum supports the development of integrative learners, has not been well explored. This study investigates students' experiences and meanings of an integrated Master of Pharmacy (MPharm) curriculum.

**Methods:** Focus groups were conducted with students from the MPharm program at a single study site. The research explored the following questions: what pedagogic strategies do students recognize as examples of integration and how does an integrated curriculum shape learning?

**Results:** Fifty-one participants took part over eight focus groups. Meta-themes identified mirrored the research questions. Findings suggest that integrative learning is experienced when teaching is purposively designed to be horizontally integrated between disciplines, when integration is made explicit, and when content is applied to pharmacy practice. Integrated assessments were considered to be cognitively difficult.

**Conclusion:** Learners perceive horizontal integration as useful for promoting context and understanding how to apply science to practice. However, findings suggest the need for assessments to be better aligned with teaching to support the development of higher-order thinking skills.

### Introduction

An integrated curriculum is one designed to provide learners with opportunities to create connections between knowledge, and to respond to problems by combining knowledge and skills from different disciplines to facilitate higher-order integrative learning.<sup>1,2</sup> However, while an espoused curriculum may have been designed to be integrated by its planners, recent research suggests that educators experience difficulty enacting pedagogic strategies that have the potential to produce the intended outcomes for learners consistently within a curriculum,<sup>3</sup> and that a lack of deep or mutual understanding of integration between planners' espoused curriculum and educators' enactment of a curriculum results in students experiencing a curriculum that fails to deliver its pedagogic potential.<sup>3–5</sup>

Such a disconnect between espoused curriculum intentions and the curriculum enacted by educators suggests a possible difference

\* Corresponding author.

E-mail addresses: [andrew.mawdsley@manchester.ac.uk](mailto:andrew.mawdsley@manchester.ac.uk) (A. Mawdsley), [sarah.willis@manchester.ac.uk](mailto:sarah.willis@manchester.ac.uk) (S. Willis).

<https://doi.org/10.1016/j.cptl.2019.02.006>

between the ways in which integration is conceptualized by curriculum designers and how it is operationalized by those involved in delivery. As a result, students may experience multiple, ambiguous and even contradictory conceptualizations of integration within a curriculum, with conceptualized as a framework for curriculum design, a method for teaching content, and as a method of synthesis of knowledge in the minds of learners.<sup>6</sup> For example, integration within a curriculum may be conceptualized as occurring at different levels, ranging from isolation of disciplines to synthesis of knowledge at a trans-disciplinary level. Integration may also be conceptualized in structural terms, where components within a curriculum are arranged horizontally and/or vertically,<sup>7</sup> with horizontal integration involving the delivery of teaching across different subjects at the same level<sup>9</sup> and vertical integration involving progressive teaching across successive levels.<sup>4,8</sup> Both dimensions can further be combined in an integrated spiral curriculum,<sup>9</sup> where topics are revisited with increasing complexity at different levels of a curriculum.<sup>2</sup> Finally, integration may be conceptualized as a set of metacognitive processes taking place within a learner, as knowledge from different sources is connected and interrelated and transferred to new, complex situations where it is applied in practice.<sup>10</sup>

Although integration is required internationally<sup>11–13</sup> for pharmacy curricula accreditation, evidence of curricula producing substantive improvements in outcomes or benefits to patients from receiving care delivered by graduates from clinically integrated curricula is limited.<sup>14</sup> Studies from medical education have found that integration improves students' retention of core scientific concepts<sup>15</sup> and ability to apply these concepts to real-life clinical environments,<sup>16</sup> yet a narrative review of the literature found that studies tended to report on course/component level evaluation of attitudes to, or satisfaction with, teaching methods or techniques, rather than curriculum/program level findings where change is measured against comparators or control groups.<sup>2,5,6,15–17</sup>

An important question to address remains whether students learn better from a discipline-based curriculum or an integrated curriculum and why this might be the case.<sup>10</sup> But difficulty in identifying appropriate methodologies for investigating the 'cognitive act'<sup>6</sup> of integrative learning within a learner persists and is challenged by the existence of other factors that could contribute to students' learning. These include students' supplementary independent studies and clinical work experiences outside of the formal curriculum. Nevertheless, understanding how integration takes place can be uncovered indirectly via investigation of students' views on how the experienced curriculum has facilitated the development of their core pharmacy understanding and problem solving capabilities,<sup>18</sup> as well as in their views of the contribution of an integrated pharmacy curriculum to their perceived level of preparedness for pharmacy practice.<sup>19</sup> Such approaches provide insight into teaching, learning and assessment that can be useful for identifying barriers to curriculum integration and for designing a curriculum where students' expectations for their learning are aligned with and relevant to pharmacy practice. Moreover, through exploring students' perceptions of curriculum integration it may also be possible to identify the ways that integration supports learning cognitively and provides an important research question that this study sets out to address.

## Methods

### Study design

A qualitative approach, using focus groups as the method for data collection, was adopted. Students across all four years of an undergraduate Master of Pharmacy program were eligible to take part in the study; each focus group consisted of students from the same year cohort. During the focus groups, participants discussed their experiences of integration in the undergraduate curriculum and how the curriculum had promoted integrative learning to explore the following research questions:

1. What pedagogic strategies do students recognize as examples of integration in their program? This question addresses the experienced curriculum, and allowed the research to uncover differences between students' experiences and the espoused, intended, designed, and planned curriculum.
2. How does an integrated curriculum shape learning? This question considers the extent to which the experienced curriculum promotes and facilitates integrative learning.

Data collected during the focus groups were analysed thematically. Similarities, differences and descriptions related to the development of integrative learning were compared between and across students from different years. As the study was considered part of normal academic activity it did not require university ethical approval; nevertheless, the authors were mindful of ethical issues and risks and ensured that the study was conducted to the highest ethical standards.

### Setting

At the site where the study was conducted, the undergraduate pharmacy curriculum has been designed around a core of work placements and professional practice learning (called "Integrated Professional Practice", IPP – see Fig. 1). IPP learning takes place in one of the main sectors of pharmacy practice (community and hospital pharmacy), with additional placements in industry and primary care. Each placement has a set of intended learning outcomes, explicitly aligned with learning in other strands of the curriculum, and involves facilitated bedside teaching, patient interaction, and enquiry-based learning through the use of a placement workbook with tasks and activities. Assessment in the IPP strand is consolidated patient case reports and reflective accounts [written reports, Fig. 1]. Five satellite strands, or units of learning, are organised around this IPP core (see Fig. 1)<sup>1</sup>: the medicine strand (where learning related to pharmaceutical sciences occurs, such as pharmacokinetics, medicinal chemistry, pharmaceuticals, biochemistry)<sup>2</sup>; the patient strand (where learning related to clinical pharmacy occurs, such as pharmacology, physiology, therapeutics)<sup>3</sup>; the

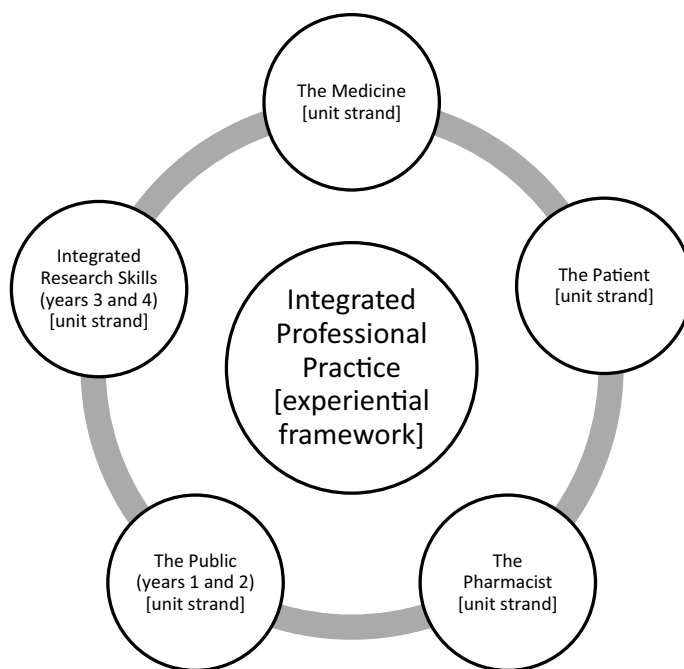


Fig. 1. Curriculum design.

pharmacist strand (which incorporates pharmacy practice learning about law, dispensing, communication, policy and governance, professional teaching)<sup>4</sup>; the public strand (public health pharmacy related to microbiology, infection); and<sup>4</sup> the integrated research skills strand (where research methods, and the final year dissertation occur to support scholarship learning). Strands are integrated horizontally within each year of the MPharm program, and vertically between the four years, with the exception of the public strand that is integrated in years one and two but then replaced with integrated learning about research in years three and four (Fig. 2).

Multiple methods for assessing strand intended learning outcomes (ILOs) are used to determine the extent of student learning and vary according to year of study. In years one and two, assessment methods include summative practical exams and coursework, a consolidated examination consisting of multiple-choice questions (MCQ) testing ILOs from each strand where section A of the exam contains MCQs related to the medicine strand, section B the patient strand, and so on, with each strand equally weighted, and an integrated examination consisting of case-based integrated questions that draw on ILOs from across each strand of the academic year. For example, a question in the integrated exam may assess the use of nitrates in angina that requires a student to demonstrate integrative learning of pharmaceuticals and packaging design, pharmacology, clinical application in disease management and cardiovascular public health. Assessment methods for years three and four include practical exams and coursework, with integrated and consolidated assessment of multiple curriculum strands replaced with single strand examinations (see Table 1).

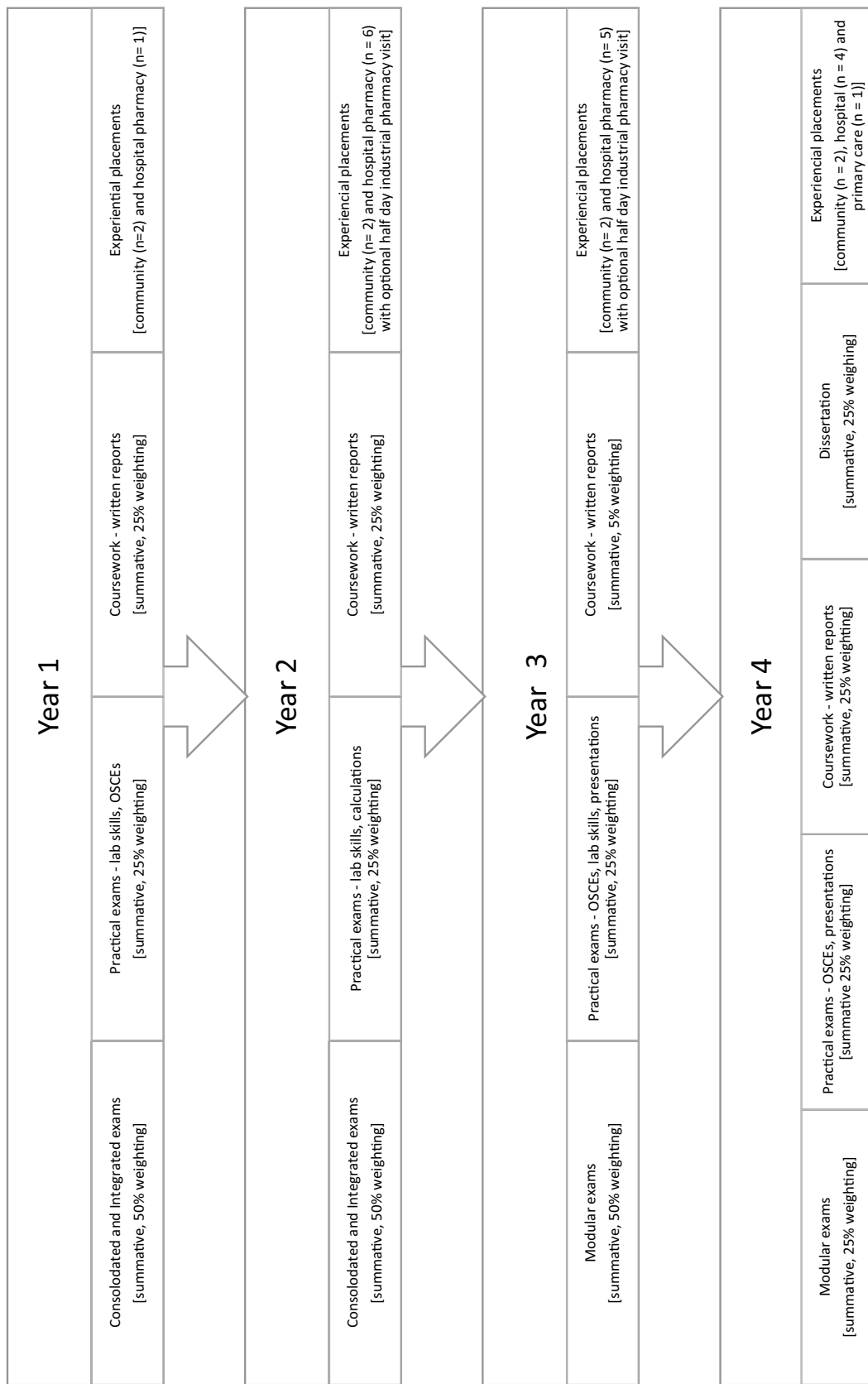
#### Recruitment

All students registered in the MPharm program ( $n = 600$ ) were invited to take part in the study via an email sent to their entire cohort. A participant information sheet providing further details of the purpose of the study and what participation involved was attached to the invitation. Students responding to the email were then given the opportunity to consider whether they would like to take part; those who did were asked to complete a consent form prior to participating in a focus group.

#### Data collection

At the start of each focus group, discussion was instigated through two orientation tasks that participants completed. To help complete these tasks, the focus group facilitator provided a definition of integration as “integration is when connections are made across different modules or subject areas of the pharmacy course” and then asked participants to write down examples of integration based on their experiences of the curriculum on sticky notes; the group then discussed these examples. Following this, in the second task, participants grouped the sticky notes on flip chart paper into different teaching and learning methods, or pedagogic strategies, that they recognised as promoting integration and discussed how the sticky notes were examples of integration. Probes were used during each task to elaborate on examples given of integration in their program to generate data in particular related to the experienced curriculum.

Having generated examples of integration during these initial orientation tasks, discussion of how these experiences of integration supported students' learning took place. This allowed participants to explore in more depth both the experienced curriculum and how



OSCE= objective structured clinical examination.

Fig. 2. Assessment.

OSCE = objective structured clinical examination.

**Table 1**  
Assessment strategy.

|   | Year 1 | Year 2 | Year 3 | Year 4 |
|---|--------|--------|--------|--------|
| Coursework                                  | ✓      | ✓      | ✓      | ✓      |
| Practical exams – OSCEs, skills assessments | ✓      | ✓      | ✓      | ✓      |
| Integrated exams – all strands              | ✓      | ✓      |        |        |
| Consolidated exams – all strands            | ✓      | ✓      |        |        |
| Single strand exams                         |        |        | ✓      | ✓      |

OSCE = objective structured clinical examination.

integration shaped their learning, the two research questions posed by this study.<sup>20,21</sup>

The focus groups were facilitated by a trained undergraduate pharmacy student and supported by another student taking notes related to non-verbal communication. While using a facilitator and note taker who shared characteristics with the groups (i.e. they were all undergraduate pharmacy students) contributed ‘social glue’ to the focus groups and allowed for a shared understanding of the research questions being investigated to develop, helping to produce common ground and adding depth to the discussions, it is possible that this introduced some bias and a lack of probing should assumptions have been made about the topic under investigation.<sup>22,23</sup> Focus groups were audio recorded with participants’ consent, and recordings transcribed verbatim.

### Data analysis

Data were analyzed using thematic analysis, an iterative approach that involves several recursive steps.<sup>24</sup> To increase internal validity, the authors ( $n = 2$ ) independently coded the transcripts. They first read the transcripts to familiarize themselves with the data prior to coding. Following this, the data from each focus group were mapped and interpreted, with initial codes identified as occurring patterns and potential interesting points and aspects found in the data; these initial codes were in part also derived from the focus group tasks and questions. Initial coding was conducted for each focus group, and then at a cohort level (between year-specific focus groups), so that the different cohorts could be analysed as distinct datasets. Coding across cohorts subsequently allowed for comparison across the complete set of data collected. The coded data were then analysed and grouped to develop emergent themes that were further analysed in a second round of coding. Using a refinement process, themes were merged, separated or rejected, to determine the final main themes, with the authors meeting to agree on the themes identified. Finally, these themes were evaluated in terms of the accuracy in capturing the data collected.

Data analysis was guided by the two research questions investigated by this study; however, while categorizing data as pedagogic strategies within the curriculum experienced as integration or as how pedagogic strategies shape learning, we were mindful to remain faithful to the views expressed by participants and the complexity of their experiences of integration.

## Results

Two focus groups were conducted with students from each year of the four-year undergraduate (MPharm) program. Across eight focus groups, 51 participants (7.5%) took part (see Table 2), with discussions lasting between 60 and 90 min.

The analyses presented in this paper are based on coding of data related to themes shown in Table 3. Findings are supported by illustrative quotes, with participants identified using an individual code number (Year 1, Focus Group 1, Participant 1 is identified as Y1G1P1 and so forth).

### Experienced curriculum – pedagogic strategies recognised as examples of integration

Within all focus groups, students were able to provide examples of their experiences of integration in the program. These examples suggest that for participants, meaningful integration was associated with instances of horizontal integration, and that practice placements in particular were experienced as valuable cognitive opportunities that allowed knowledge to be applied to pharmacy practice.

Learners found that linking taught material with activities, such as placement visits, consolidated their learning and that this aided application of knowledge. Where content was not perceived as having a direct and immediate link to another part of the curriculum, or to practice, integration was viewed as less important for learning.

**Table 2**  
Focus group details.

|               | Year 1 | Year 2 | Year 3 | Year 4 |
|---------------|--------|--------|--------|--------|
| Focus Group 1 | 6      | 5      | 5      | 7      |
| Focus Group 2 | 7      | 8      | 6      | 7      |
| Total         | 13     | 13     | 11     | 14     |

**Table 3**

Themes.

| Research question   | Themes  |
|---|---|
| 1. What pedagogic strategies do students recognize as examples of integration in their programme? (Experienced curriculum). | Temporal co-ordination<br>Trans-disciplinary learning<br>Practice placements<br>Interprofessional education (IPE) |
| 2. How does an integrated curriculum effect learning? (Integrative learning).   | Repetition<br>Spiraling complexity<br>Assessment<br>Retention and recall  |

- “The hospital placements were a good way of integrating what we learn in lectures and applying it into practice...combining communication skills with clinical knowledge and talking to the patient face to face was a good way of integrating.” (Y4G1P5)
- “There was an [industry] visit day which I went on, which was really good because, although we got to see part of the drug development process, you need basic clinical knowledge to start with. A lot of the synthetic chemists were there, that's all they kind of had, they didn't have much experience or much knowledge of the patient, which is where The Pharmacist knowledge came in because, through The Pharmacist unit (strand) and communication skills, we got to see that it's brilliant if you've got a powder but it's useless unless you can turn it into something useful, which is acceptable what's the point?” (Y2G2P3)

For participants, patient contact and clinical experience were valued, although participants felt the curriculum lacked sufficient opportunities for this compared to other healthcare disciplines.

- P1: “We have separate modules that we constantly learn in and then the placements; it forces you to bring it together because you have to apply it to an individual.”
- P3: “It's quite nice to be able to do it yourself, isn't it? Like to be able to bring it together yourself and to see the drugs and remember. I feel like it's quite difficult just to learn drugs when they're just being fired at you in a lecture, but when you're on placement, then you're looking at their drug kardex [prescription and administration chart] and you're looking and seeing the doses, how they're going up and down, it really makes it easier to remember all you lecture content.” (Y2G1)
- “Because you don't really put everything together like when you're sat in a Public (strand) lecture, you think, “Oh, we're learning about this,” and then when you go to Patient (strand), you learn about, like, something around the same topic, but then you don't put the two together until...you're on placement you can actually put everything together.” (Y2G2P2)

The role of placements in supporting learning about practice while integrating different knowledge was raised consistently during the focus group discussions, with participants drawing on both positive and negative experiences of how clinical placements worked to do this. In the second year, placements are designed to explicitly integrate with lectures<sup>25</sup> (i.e. they are temporally coordinated with lectures) so that the curriculum itself is structured to promote integrative learning. However, in subsequent years of the MPharm curriculum, students viewed this structure as missing and as a result described the curriculum as “badly organised”, suggesting students struggle with trans-disciplinary integration when the scaffolding is removed, and find it difficult to independently integrate new knowledge into their learning scheme when the curriculum is not structured to temporally coordinate content.

- P3: “In second year, it was more specific around actual conditions, so we covered something like COPD or asthma in patients and then afterwards we'd have a placement to see a patient with COPD. But now in third year, it's not that integrated...Let's say we were learning Crohn's, that same week we would have a placement where we would go see patients with that. We'd be doing pre-work to do with them questions.”
- P5: “Say we studied COPD that week, they are sending us to the wards with people with COPD.”
- P3: “It [placements] helped us consolidate it [learning] better.”
- P5: “It helped because we got to witness it and learn it and apply it if you get what I mean?”
- P4: “I still know all the heart stuff like this [clicks fingers].” (Y3G1)

Because students experienced placements as a mechanism for integrating knowledge, they wanted more of these opportunities to be available in the course:

- P1: “It made the lecture material easier to understand when we went on the ward with the patients.”
- P2: “We applied our knowledge from the Patient (strand) in the clinical tutorial (placement).”
- P7: “Yes, but we need more application in practice.” (Y2G1)
- P5: “We learn so much more when we interact with patients...I don't think that we are getting enough.”
- P4: “I think the key word is we need more exposure to patients.” (Y4G1)

As well as integrating different pharmacy knowledges and learning about how they apply in and through practice, the

undergraduate program is structured to integrate learning about other healthcare professionals (i.e. interprofessional education). Participants' described how learning with students from related disciplines enhanced their learning about practice:

- P10: "We had the [hospital] placement with the medics so that was a good way of integrating our knowledge from the clinical pharmacist point of view, and the medics' knowledge about the disease and diagnosis, and combining diagnosis and treatment. I think that was a good integration."
- P4: "Yes, because we also had the medicine reconciliation, so we would speak to patients on the placements and we had to ask the nurse first, "Can I speak to your patient?" So, we were dealing with different healthcare professionals as well as patients." (Y4G1)

Participants identified revisiting content within the same academic year as well as across years of the curriculum as a method for integrating and spiraling knowledge. They described repetition of key concepts as important for consolidating learning and advancing their level of understanding of knowledge and its application:

- P1: "Yeah repetition is always the best thing, man."
- P4: "Repetition is important."
- P2: "Yeah repetition is what keeps it to stick in your mind." (Y3G1)

While recognizing the value of repetition when it involved revisiting complex concepts, repetition was not generally experienced as a mechanism for integrating learning, especially if it was perceived as poorly timetabled or organised:

- "They're all like spread out across the semester as well, it's not just like you're doing the antibiotic week where you can really focus on it all. So, you're sort of learning a bit there, then there's a little bit more there and it's also quite messy to revise for as well. I struggled to do it, just because there's so many bits and bobs everywhere of things that are sort of related and bits which aren't." (Y3G2P3)
- "The stuff that we learn from the TBLs [team-based learning workshops], they are not going to come up until the second and third year. So, what's the point of doing it if we are not going to be tested on in the first year? We can be taught about it later." (Y1G2S2)

Students also described vertical integration, where complex concepts are revisited in subsequent years, as promoting integrative learning:

- "[It] makes you think of it in different ways, so it's not just that one lecture, that was last year, and you're meant to remember it all from there. A lot of things do keep coming up again and again in slightly different ways and maybe talking about different drugs in different topic areas, which eventually the message gets across, doesn't it?" (Y2G1P1)
- "They introduce something in first year where we learnt the basics about it. Then second year, third year, they obviously have to give you the basics again just to refresh your memory and then they add more detail." (Y3G2P6)
- P11: "...We learn in like first year then, we keep applying them and improving them through the four years."
- P10: "...So that's something we had learnt in first year and sort of went back to it again...So it's something that kept coming back to us every year." (Y4G2)
- "It's not so much as that we do something again, it's that if a lecturer starts talking about drugs crossing membranes, it only makes sense because of understanding about equilibrium and drugs dissociating and going into solution. So, if you don't know that, then nothing will make sense now, but I can't remember the detail of all that anyway." (Y2G1P2)

Participants evaluated the relevance of content according to the way it was assessed, its potential impact on their academic grade, and potential application to practice. While there was overall support for content taught throughout the four years, those taking part from the later years of the program were critical of the relevance of the content taught earlier in the course (i.e. years one and two):

- P2: "I think in year one and two there was stuff that we were covering that they feel we need to cover so they thought that, oh, we will cover them earlier on but if we forget them it's fine. But I don't see the whole point of if I am going to forget them they are not really relevant, why do I learn them in the first place?" (Y4G1)

Partly, this was a problem because participants could not see the links between content across the different years of the curriculum, and as a consequence the relevance was lost. One participant commented that, "I think the idea of integration is interesting, but it is also important how to execute it. So, if it is not executed properly then you don't really get the benefits of integration, of an integrated course". (Y4G2P10). One possible solution to this was to organise teaching in terms of shared themes and connections in a curriculum focused "on one body system throughout the four modules" (Y3GG2P2).

Each focus group discussed the assessment methods used in the MPharm program. Participants clearly differentiated between assessment used in years one and two – integrated and consolidated exams – and the single strand assessment used in years three and four. However, participants did not distinguish between the modes of assessment (consolidated or integrated), and referred to them interchangeably as the integrated and consolidated exam. Furthermore, participants from years three and four grouped year one and two assessments together, and then year three and four assessments together, suggesting a division in the MPharm program structured by the assessment strategy, and indicating that vertical integration is constrained within these two discrete parts.

*Integrative learning – how the cognitive act of learning is influenced by the curriculum*

Participants' descriptions of how the curriculum promoted integrated learning suggest that they experienced a 'correlated'<sup>25</sup> curriculum where subjects or disciplines are mainly taught separately, with some additional integrated sessions, such as those offering opportunities to apply knowledge to practice and learn about pharmacists' roles. Thus, integrative learning was described primarily in relation to teaching that was directly applied to pharmacy practice, and to teaching where educators were explicit about how content linked to other disciplines, suggesting that integrative learning requires scaffolding if it is to take place inside the mind of the learner.

- “They [the lecturer] kind of in a way make you integrate all [the strands]. You know in a lecture, like for example the Patient (strand), they will bring something up; then in another, for example the Medicine (strand), they would bring up something similar, so you kind of have to mentally put them together. They bring up the same concepts in two different units, so you have to think about it in both ways.” (Y1G2S4)
- “You learn from The Pharmacist [strand], [and] you also draw upon the knowledge from Patient [strand] to Medicine [strand] to explain, like, inhalation techniques and the effects of it, say like, asthma as the example, to a patient has just been given this for the first time.” (Y2G1P2)
- “The Patient [strand] lectures that we do, our lecturer always lets us know where it is linked with another unit, whether it is with the Pharmacist [strand], or the Medicine [strand], or the Public [strand].” (Y1G1P11)

Examples of integrative learning referenced how the assessment methods used in years one and two (consolidated and integrated exams) supported horizontal integration. However, because learners relied on learning mechanisms such as rote memorization, such assessment did not facilitate spiraling knowledge beyond a single semester or academic year.

- P2: “Obviously, it's good because it helps you put everything together, but it's hard to learn everything from semester two and semester one again, like in semester two there's stuff you know, but then you have to relearn everything from semester one, especially if you have a memory like me, I learn short-term for the exam and I forget about everything after the exam, which is probably bad. But it's harder to prepare for, but I do think it's a good exam to have because it puts everything together.”
- P3: “Yeah it can be quite difficult because it's not just a question about something you've learnt, you can't just...memorise a lecture...You have to of understood everything to be able to put all your knowledge together.” (Y2G1)

Each focus group discussed assessment methods in relation to integrative learning. Participants from years one and two had generally favorable opinions of assessment and could see the intentions of this type of exam, albeit recognizing that it was stressful.

- “It is very stressful, the integrated exam. We need to find connections between different modules to answer those questions.” (Y1G1P1)
- “We find that it just brings the whole course together. It is stressful, we feel you are kind of on your own to put it together.” (Y1G2P5)

However, participants in years three and four, in hindsight, were on the whole negative about the integrated exams, and felt that integrated exams hindered their learning because they promote short-term memorisation of facts and surface level learning rather than stimulating higher cognitive skills. Moreover, participants from years three and four differentiated year one and two assessment from later years, effectively splitting the four-year MPharm into two distinct parts based on the assessment strategy.

- “I think there was a fundamental problem with integrated exams in that, especially the one that we did at the end of second year, because that was making us learn the whole years' content for one exam. And this is a number that I'm making up but there is probably like 200 lectures or something in the whole year. So, there is no way anybody can remember 200 worth of content in an exam so what that promotes is surface-level learning [cross talk in agreement].” (Y3G1P5)
- P12: “It wasn't really integrated either as in like a case study would be more integrated, so you can integrate Medicine [strand] and Patient [strand] but really ... you integrate the medicine information and base your knowledge on that...”
- P13: “... the overall exam was just random questions from each module all in one exam.” (Y4G2)
- P13: “...but examining it in that way is not a good because at the end of the day when we are doing our like individual revision and learning, it's not learning, it's just panic and memorising one hundred lectures for an exam. So that hinders your learning.” (Y4G2)

Many of the participants from years three and four expressed a preference for modular exams: “Basically, they need to stop integrated and just give us normal exams for topics. Let me say that louder, they need to stop integrated and just give us normal exams (shouting).” (Y3G1P4).

Learners felt that modular assessments were better than integrated assessments because they could focus on studying one subject only as they had done prior to entering higher education, which suggests a disconnect between curriculum assessment intentions and learners' habitual study strategies.



- P5: “And I think in third year when we went to separate modules I think it was improved so it kind of showed that separate modules were better.”
- P2: “Yes because we’ve seen it in third year alone it was better.”
- P3: “Yes we could focus on the next subject rather than just moving among the lectures.”
- P2: “I think I was able to focus more on the things I need to actually learn.” (Y4G2)
- P4: “Yes I think it is all tangled in our heads.”
- P5: “I’ve covered it, but I don’t know it, if that makes sense? If it was separate modules I would’ve learnt it better and I would be in a better position now.” (Y4G1)

Here, learners are describing how integrated exams feel harder, because the learning strategy requires mastery of the subject knowledge in an applied way. Modular exams seem easier because revision can be focussed and compartmentalised.

## Discussion

This study sought to establish how an espoused integrated curriculum is experienced by learners, and the extent to which curriculum designers’ intentions to encourage students to participate in active learning by integrating knowledge for themselves (i.e. encourages students to become integrative thinkers) had been successful.<sup>26</sup> Through participants’ accounts of integration we have shown that the curriculum was experienced at the level of correlation,<sup>25</sup> where integration is a method for connecting knowledge between disciplines, and that examples of integration often drew on learning in the context of patient contact, facilitated by a clinical placement. Here it would appear that learners’ interaction with and experiences of integration allow integrative learning to take place in particular when links between individual disciplines and clinical practice are made, suggesting some transdisciplinary, integrative thinking is occurring, and that this is scaffolded by educators signposting links between disciplines.

That those taking part in this study valued educators who made integration explicit through signposting suggests a preference among learners to be less active in integrating knowledge between disciplines themselves. A possible outcome of this is that it allows learners to use these signposts to continue to compartmentalize disciplines. Thus, while participants voiced support for an integrated curriculum, in practice the wider intended learning outcomes of the curriculum (i.e. cohesive interaction of knowledge within and between teaching disciplines and across years) are unlikely to have been experienced as intended by the curriculum planners. This compartmentalization may further help in understanding the reasons why participants experienced learning for integrated assessment as challenging in years one and two, where memorizing content related to separate disciplines rather than actively integrating different knowledges was described as stressful and impossible. Given an integrated curriculum is considered successful when the assessment method requires students to respond as integrative thinkers<sup>30</sup> it would appear that participants in this study still had some way to go if they were to develop these meta-cognitive skills rather than rely on learning strategies acquired during schooling.

An alternative explanation of why students had such negative views of integrated assessments is that they are integrated at a different level or in a different way to that experienced by learning during teaching. In other words, it is possible that there is a difference between how learners understand integrated teaching for learning and how they understand it in relation to assessment. This raises questions regarding learners’ conceptualization of integration as an assessment mode, and conflicts with findings from a study exploring educators’ understandings of integration, where assessment was not a feature of their understanding of integration.<sup>3</sup>

Findings also suggest that assessment and teaching methods are largely characterized in terms of positive or negative learning experiences, with placements valued as relevant and useful integration. Assessment was largely perceived as not aligned to teaching methods, and as not promoting integrative mastery, and as a consequence, students were not benefitting from constructive alignment.<sup>27</sup> A reason for this could be that the integrated exams are not providing assessment for learning opportunities, in contrast to the integration experienced in teaching for learning, and so a dissonance between how learners understand integration for learning and how they understand it for assessment has arisen. Most students had strong negative views of the integrated examinations, and often suggested that integrated assessments hindered their learning and exam performance.

In addition, participants placed high importance on temporal coordination in enabling horizontal integration and were critical of timetabling when it was viewed as constraining or preventing this scaffolding of integrative learning between disciplines. *While curriculum planning for this is challenging to execute*, based on the findings from this study it encourages students to become active learners and integrate the content themselves and leads to better retention of knowledge, improved understanding of the content from different disciplines and its application in practice, and is something that medical and pharmacy schools in the UK have previously advocated.<sup>2</sup>

Participants also appreciated the use of repetition during vertical integration and expressed its value in helping consolidate and build upon previous learning. They identified repetition of content with increased complexity, both within the same academic year and across years, but only recognised this spiraling within the curriculum as beneficial for their learning in the latter years of their degree and viewed much of the content of years one and two as irrelevant to pharmacy practice, suggesting some naivety in understanding how the curriculum had been designed to scaffold higher order learning. With evidence from the literature that through repetition, a spiral curriculum can stimulate and empower students to approach content with an advanced level of application<sup>29</sup> this method of content repetition by revisiting topics and themes with increased detail each time made need further implementation to be effective.

Additional effort in aligning a curriculum so that it is experienced as it has been espoused by its designers is of course challenging, and requires different knowledges and disciplines to be drawn together.<sup>28</sup> It involves bringing large conceptual frameworks and themes from different disciplines together that may not share the same approach or assumptions,<sup>8</sup> and relies on having educators

involved in curriculum delivery to have the skills to enact integration in their teaching practice, who may lack the experience to do so.<sup>3</sup>

Despite reporting some important and novel findings related to how students experience an integrated curriculum and of the ways that a curriculum supports the development of students as integrative learners and thinkers, this research study has some limitations. These include the fact that the study involved a relatively small number of participants from a single site, and that these participants were recruited by self-selection, introducing some possible self-selection bias. As a consequence, the views expressed during data collection may not be representative of the population from which they were drawn. It is also important to note that this study explored only students' views of integration, and that integration is a complex concept to investigate.

## Conclusion

The aim of this research study was to explore pharmacy students' experiences and meanings of an integrated MPharm curriculum. Through analysis of rich accounts of the experienced curriculum a key conclusion is that while the integrated curriculum being investigated for this study was successful in facilitating student learning it still had some way to go if it was to develop students as integrative thinkers. A further important finding is that participants associated integration with assessment and perceived that integration during teaching was positive while assessment of integration was not of their ability to integrate disciplines but of their ability to memorise all the disciplines separately. Further work with educators is needed to design and implement assessment of integrative thinking skills and with students to develop these skills.

## Conflict of interest

None.

## Disclosures

None.

## Acknowledgements

The authors would like to acknowledge the contribution to data collection made by MPharm students Harveena Sanghera, Chung Yan Wu, Tamara Hassan and Artemis Karayianni.

## References

- Poirier TI, Fan J, Nieto MJ. Survey of pharmacy schools' approaches and attitudes toward curricular integration. *Am J Pharm Educ.* 2016;80(6) <https://doi.org/10.5688/ajpe80696>.
- Husband AK, Todd A, Fulton J. Integrating science and practice in pharmacy curricula. *Am J Pharm Educ.* 2014;78(3) <https://doi.org/10.5688/ajpe78363>.
- Mawdsley A, Willis S. Exploring an integrated curriculum in pharmacy: educators' perspectives. *Curr Pharm Teach Learn.* 2017;10(3):373–381.
- Pearson ML, Hubball HT. Curricular integration in pharmacy education. *Am J Pharm Educ.* 2012;76(10) <https://doi.org/10.5688/ajpe7610204>.
- Hammer DP, Paulsen SM. An innovative clerkship in pharmacy education. *Am J Pharm Educ.* 2001;65(3):284–293.
- Kulasegaram KM, Martimianakis MA, Mylopoulos M, Whitehead CR, Woods NN. Cognition before curriculum: rethinking the integration of basic science and clinical learning. *Acad Med.* 2013;88(10):1578–1585.
- Harden R, Sowden S, Dunn W. Educational strategies in curriculum development: the SPICES model. *Med Educ.* 1984;18(4):284–297.
- Dahle LO, Brynhildsen J, Fallsberg MB, Rundquist I, Hammar M. Pros and cons of vertical integration between clinical medicine and basic science within a problem-based undergraduate medical curriculum: examples and experiences from Linköping, Sweden. *Med Teach.* 2002;24(3):280–285.
- Harden RM. What is a spiral curriculum? *Med Teach.* 1999;21(2):141–143.
- Schmidt HG, Machiels-Bongaerts M, Hermans H, Ten Cate TJ, Venekamp R, Boshuizen HPA. The development of diagnostic competence: comparison of a problem-based, an integrated, and a conventional medical curriculum. *Acad Med.* 1996;71(6):658–664.
- General Pharmaceutical Council. *Future pharmacists. Standards for the initial education and training of pharmacists.* London 2011; 2011.
- Canadian Council for Accreditation of Pharmacy programs. *Accreditation standards for first professional degree in pharmacy programs.* Toronto 2014; 2014.
- Accreditation standards and key elements for the professional program in pharmacy leading to the doctor of pharmacy degree ("Standards 2016"). Accreditation Council for Pharmacy Education. <https://www.acpe-accredit.org/pdf/Standards2016FINAL.pdf>; February 2015 Accessed: 13 April 2019.
- Ratka A. Integration as a paramount educational strategy in academic pharmacy. *Am J Pharm Educ.* 2012;76(2) <https://doi.org/10.5688/ajpe76219>.
- Rosse C. Integrated versus discipline-oriented instruction in medical education. *J Med Educ.* 1974;49(10):995–998.
- Lam TP, Irwin M, Chow LWC, Chan P. Early introduction of clinical skills teaching in a medical curriculum - factors affecting students' learning. *Med Educ.* 2002;36(3):233–240.
- Malik AS, Malik RH. Twelve tips for developing an integrated curriculum. *Med Teach.* 2011;33(2):99–104.
- Islam MA, Schweiger TA. Students' perception of an integrated approach of teaching entire sequence of medicinal chemistry, pharmacology, and pharmacotherapeutics courses in PharmD curriculum. *J Pharm Pract.* 2015;28(2):220–226.
- Parmar H. Does curriculum reform influence perceived preparedness for practice of graduates of Manchester Pharmacy School? A comparison of two cohorts. Available at: [https://www.research.manchester.ac.uk/portal/files/54582850/FULL\\_TEXT.PDF](https://www.research.manchester.ac.uk/portal/files/54582850/FULL_TEXT.PDF); 2016 Accessed: 13 April 2019.
- Creswell J. *Qualitative inquiry and research design: choosing among five traditions.* First. London: Sage Publications; 1998.
- Balmer DF, Hall E, Fink M, Richards BF. How do medical students navigate the interplay of explicit curricula, implicit curricula, and extracurricula to learn curricular objectives? *Acad Med.* 2013;88(8):1135–1141.
- Morgan DL. Focus groups. *Annu Rev Sociol.* 1996;22(1):129–152.
- Kitzinger J. The methodology of focus groups: the importance of interaction between research participants. *Sociol Health Illn.* 1994;16(1):103–121.
- Tavakol M, Sandars J. Quantitative and qualitative methods in medical education research: AMEE guide no 90: part II. *Med Teach.* 2014;44(9):746–756.
- Harden RM. The integration ladder: a tool for curriculum planning and evaluation. *Med Educ.* 2000;34(7):551–557.
- Karimi R, Meyer D, Fujisaki B, Stein S. Implementation of an integrated longitudinal curricular activity for graduating pharmacy students. *Am J Pharm Educ.*

- 2014;78(6) <https://doi.org/10.5688/ajpe786124>.
27. Biggs J. Enhancing teaching through constructive alignment. *High Educ.* 1996;32(3):347–364.
  28. Mason TC. Integrated curricula: potential and problems. *J Teach Educ.* 1996;47(4):263–270.
  29. Coelho CS, Moles DR. Student perceptions of a spiral curriculum. *Eur J Dent Educ.* 2016;20(3):161–166.
  30. McAleer S. Choosing assessment instruments. In: Dent J, Harden R, eds. *A Practical Guide for Medical Teachers*. Edinburgh: Churchill Livingstone; 2001:303–313.