

Embedding Health Advocacy as Core Professional Practice: Evaluation of an Integrated Pharmacy Curriculum Using Mixed Methods

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Abstract

In response to the evolving health landscape, healthcare professionals are increasingly expected to engage in health advocacy through health promotion at the individual, systems levels AND population. In the Academic Year 2020/2021, the National University of Singapore (NUS) Department of Pharmacy introduced a spiral integrated curriculum that combines clinical, basic, and systems sciences, with the explicit aim of strengthening students' internalisation of health advocacy and preparing them for advocacy roles in professional practice. A mixed-methods study design was employed. Quantitative data were collected using questionnaires administered at three time points to assess students' levels of health advocacy internalisation, which were subsequently categorised and analysed using the Mann–Whitney U test. Compared with prematriculation findings, no statistically significant change was observed after completion of the first year of the curriculum, whereas a significant increase was identified after two years of curricular exposure. Qualitative data were obtained through semi-structured interviews conducted at the end of each academic year to further contextualise the quantitative results. Thematic analysis revealed that students perceived limited curricular integration during the first year. In contrast, the second year's repeated reinforcement of concepts and expanded experiential learning opportunities were viewed as instrumental in enhancing students' confidence and readiness to practise health advocacy. These findings highlight the potential of a spiral integrated curriculum to effectively foster health advocacy competencies in pharmacy education and suggest its broader applicability to other educational contexts. Longitudinal follow-up studies are warranted to examine sustained outcomes and to inform ongoing curriculum refinement.

Keywords: Competency, Education, Pharmacy, Integration, Healthcare disparities, Curriculum design

Introduction

Health outcomes are not determined solely by access to medical care; rather, they are largely influenced by broader societal conditions such as housing stability [1], educational attainment, and nutritional environments [2]. Addressing health issues therefore requires a dual focus on both clinical conditions and the upstream social determinants that shape them [3].

In parallel with these shifting determinants, the scope of healthcare practice has expanded to include health advocacy as a professional responsibility [4]. Health advocacy encompasses efforts to improve health at both individual and collective levels, including championing equitable access to healthcare services and scrutinising policies and institutional structures that contribute to health inequities [5]. Reflecting its central role in comprehensive patient care, health advocacy has been formally recognised as a core competency within the internationally adopted CanMEDS framework [6]. Pharmacists, due to their accessibility and sustained patient engagement, are strategically positioned to undertake advocacy roles [7]. Despite this, the profession continues to face challenges in addressing health disparities [8], as many pharmacists do not regard

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advocacy as an integral component of their professional practice [9].

The development of pharmacists who can effectively engage in health advocacy requires educational programmes that integrate biomedical knowledge, clinical exposure [10], and advocacy-related perspectives [11]. Traditional pharmacy curricula, however, have been criticised for their fragmented structure [12], where public health content is often siloed from clinical instruction and experiential learning opportunities are introduced later in training [13]. This separation limits students' ability to synthesise learning across domains [14, 15] and reinforces the perception that health advocacy exists outside routine clinical responsibilities.

Curricular models that deliberately integrate basic, clinical, and systems sciences have been proposed as a means of embedding health advocacy within professional training [11, 16, 17]. By presenting these domains as interrelated rather than discrete, integrated curricula may enable students to progress from conceptual understanding to active engagement in advocacy across individual, population, and systems contexts [18].

Historically, the undergraduate pharmacy programme at the National University of Singapore (NUS) followed a block-based structure in which disciplines such as pharmaceuticals, medicinal chemistry, patient care, and physiological systems were taught independently. In the Academic Year 2020/2021 (AY20/21), the Department of Pharmacy implemented a redesigned spiral curriculum informed by the CanMEDS framework [6], positioning

health advocacy as a foundational competency. This reform aimed to repeatedly revisit and reinforce advocacy-related concepts across scientific and clinical learning, facilitating students' ability to recognise advocacy as intrinsically linked to pharmacy practice. Although integrated pharmacy curricula have been increasingly adopted internationally [19], empirical evaluations of their educational impact remain limited, particularly with respect to health advocacy. This study therefore examines the extent to which pharmacy students internalised the role of health advocacy following participation in the newly implemented integrated curriculum at NUS.

Materials and Methods

Curriculum integration

From AY20/21 onwards, students in the NUS Pharmacy Class of 2024 were trained under the new integrated curriculum. Instruction was organised around physiological systems as a unifying framework, with basic science, clinical application, and systems-level perspectives delivered concurrently. As depicted in **Figure 1**, health advocacy principles were incorporated across multiple modules and revisited in a spiral design, allowing students to engage with these concepts at progressively greater levels of complexity during the first two years of the programme.

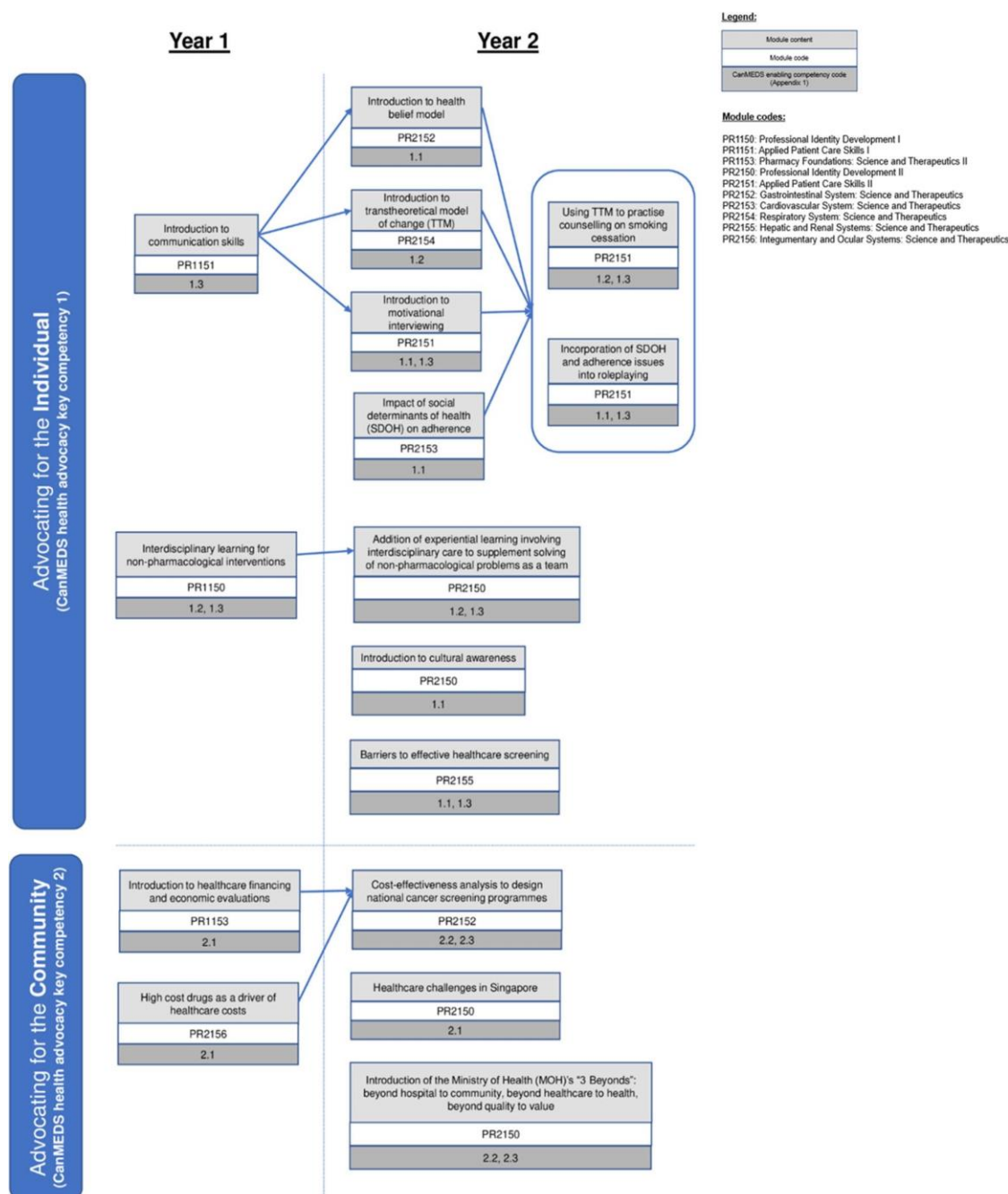


Figure 1. Mapping of health advocacy learning points within the revised Bachelor of Pharmacy programme

The revised Bachelor of Pharmacy programme was designed around the CanMEDS framework [6], positioning health advocacy as a central professional function rather than an adjunct skill. Students were trained to approach disease prevention and management by addressing modifiable social determinants of health, supporting healthy behavioural choices, and engaging in ongoing health surveillance. Advocacy activities were conceptualised across two interconnected domains:

engagement with individual patients and their families, and intervention at the community or systems level through the evaluation and improvement of institutional and clinical practices that contribute to health inequities. Rather than teaching advocacy as a standalone topic, the curriculum embedded these principles across physiological systems and scientific domains. Early exposure occurred in Year 1 through the PR2156 Integumentary and Ocular Systems module, where

treatment decisions for psoriasis were used as a platform to examine the financial burden of rising drug prices. Students explored the scientific basis of biologic therapies (basic sciences), evaluated cost-effectiveness and resource allocation (systems sciences), and considered clinical implications within patient care (clinical sciences). This scaffolded learning was extended in Year 2 through the PR2154 Respiratory Systems module, where behaviour change theory was introduced. Specifically, the Transtheoretical Model of Change (basic science) was applied to smoking cessation initiatives (systems science within health promotion) as a preventive strategy for asthma exacerbations (clinical science).

The programme adopted a spiral integrated curriculum structure [20], which supported progressive development of advocacy competencies by reintroducing concepts at higher levels of complexity, reinforcing them through repeated encounters, embedding them within authentic clinical problem-solving activities, and illustrating their applicability across multiple healthcare contexts to sustain learner engagement [21, 22].

Clinical exposure was also repositioned earlier within the curriculum to strengthen theory–practice integration. Unlike the previous curriculum, where Pre-Employment Clinical Training (PECT) was confined to Year 4, students in the revised programme commenced experiential learning in outpatient polyclinics in Year 2. These placements emphasised interdisciplinary collaboration with other healthcare professionals. Following each PECT activity, students completed structured critical reflections to examine how social

determinants influence patient outcomes and to identify opportunities for pharmacists to actively address health inequities [23]. These experiential components were delivered alongside classroom instruction to promote continuous linkage between conceptual learning and clinical application.

Data collection

This study employed a pre–post qualitative design involving the NUS Pharmacy Class of 2024 and adopted a mixed-methods methodology incorporating both questionnaire-based and interview-based data collection. Recruitment for the interview component was conducted by an independent research assistant who was not involved in curriculum development or teaching. During AY20/21 and AY21/22, students received email invitations requesting voluntary participation in the study. Informed consent was obtained prior to participation, and students were provided with detailed participant information sheets and consent documentation.

Qualitative data were gathered through voluntary open-ended questionnaires administered at three time points across AY20/21 and AY21/22 (**Figure 2**). In-depth insights were further obtained through voluntary semi-structured interviews conducted at the end of each academic year. These interviews were designed to explore key themes in greater depth [24, 25] and to contextualise and explain patterns observed in the questionnaire responses by capturing students' experiences and perceptions [26].

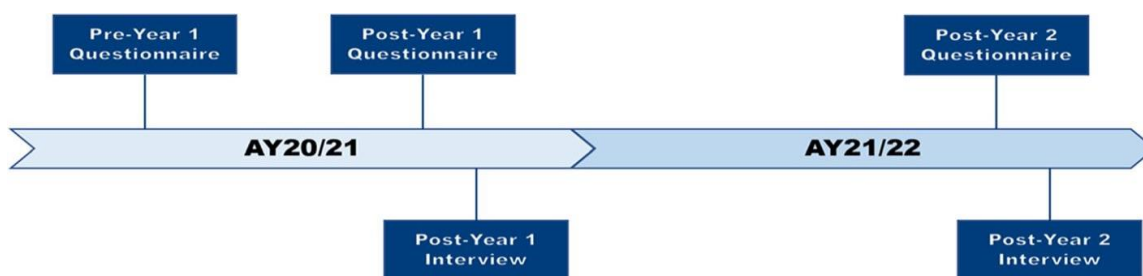


Figure 2. Overview of instruments used in the pre–post study design

Pilot testing was not undertaken for either data collection tool, as both instruments were intentionally designed to be clear, concise, and easily interpretable. To strengthen instrument quality, several rounds of internal review were conducted to refine content validity and clarity. In addition, participants were expected to possess a high

degree of familiarity with the subject matter, given their direct enrolment in the spiral integrated curriculum. As such, it was anticipated that the questions posed would be readily understood and appropriately addressed without difficulty.

Data collection during AY20/21 – Year 1

During Academic Year 2020/2021, the Pre-Year 1 questionnaire was administered prior to the commencement of Semester 1, while the Post-Year 1 questionnaire was distributed following the completion of final examinations in Semester 2. Identical questionnaires were used at both time points and comprised two prompts: one requesting students' personal interpretations of health advocacy, and another asking for an example of how pharmacists might contribute to advocacy efforts. Following the Post-Year 1 questionnaire, semi-structured interviews were conducted using 11 open-ended guiding questions.

Data collection during AY21/22 – Year 2

At the conclusion of Semester 2 in Academic Year 2021/2022, the same student cohort was invited to complete an additional questionnaire. In response to a reduced response rate observed between the Pre-Year 1 and Post-Year 1 questionnaires—potentially due to diminished student engagement with academic activities after examinations—the Post-Year 2 questionnaire was administered prior to final examinations. This adjustment was made to mitigate the risk of non-response bias and to maintain the integrity of the dataset.

To minimise repetition and reduce survey fatigue, the Post-Year 2 questionnaire employed a new set of prompts. These questions were designed to capture students' perspectives on pharmacists' roles within routine, real-world contexts. The first question focused on a direct patient interaction, while the second and third questions invited responses to broader healthcare-related issues presented through various media sources. The diversity of scenarios enabled students to articulate their reasoning more fully, thereby facilitating deeper insight into the extent of their internalisation of health advocacy concepts.

Consistent with the Post-Year 1 interviews, the Post-Year 2 interviews aimed to explore shifts in students' levels of health advocacy internalisation following continued exposure to the integrated curriculum, as well as to identify factors influencing these changes. A total of six guiding questions were used for the Post-Year 2 interviews.

Framework for evaluating questionnaire responses

Drawing on principles of critical reasoning derived from generic questioning [27], the study assumed that students who had internalised health advocacy would demonstrate the ability to apply its concepts meaningfully within their responses. Given the absence of standardised instruments for measuring critical reasoning [28], an adapted version of Westheimer and Kahne's Good Citizenship Model [29] was employed to assess students' levels of health advocacy internalisation.

The Good Citizenship Model delineates three archetypes of civic engagement: the "Personally Responsible Citizen," the "Participatory Citizen," and the "Justice-Oriented Citizen." Individuals categorised as personally responsible demonstrate an individual-level sense of responsibility. Participatory citizens extend beyond personal responsibility to actively engage in and lead collective initiatives addressing societal challenges. Justice-oriented citizens, representing the highest level, critically interrogate and seek to address the underlying social, political, and economic structures that perpetuate inequity.

Developed through collaborative efforts among educators, these categories reflect educational values commonly shared by practitioners and curriculum designers [29]. When adapted for the context of health advocacy, the model offers a structured means of distinguishing varying depths of internalisation. However, not all questionnaire responses demonstrated even the minimum level of individual responsibility required for classification within the original framework. Excluding such responses would risk selective reporting and introduce bias, while misclassifying them as "personally responsible" would undermine the conceptual integrity of the model.

To address this limitation, an additional preliminary category—termed the "Understanding Pharmacist" level—was introduced. Consequently, responses were classified into four levels (**Table 1**): Level 1 "Understanding Pharmacist," Level 2 "Personally Responsible Pharmacist," Level 3 "Participatory Pharmacist," and Level 4 "Justice-Oriented Pharmacist." All questionnaire responses were systematically coded and analysed using the computer-assisted qualitative data analysis software NVivo.

Table 1. Evaluation framework for determining levels of health advocacy internalisation

Internalisation Level	Description	Underlying Premise	Illustrative Example
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Level 1: Awareness- Oriented Pharmacist	Demonstrates foundational understanding of health advocacy and its relevance to pharmacy practice	Recognises that pharmacists have a professional responsibility to support and promote health	Acknowledges the importance of encouraging healthy lifestyle behaviours
Level 2: Individually Focused Advocate	Engages in advocacy at the level of individual patients	Assumes responsibility for patient education and health promotion through professional interactions	Provides counselling on lifestyle changes, explores patients' perspectives, and corrects health-related misunderstandings
Level 3: Community- Engaged Advocate	Extends advocacy efforts beyond individuals to population-level initiatives	Takes an active role in developing or supporting community-based health programmes	Initiates or coordinates large-scale public health campaigns promoting healthy living
Level 4: Systems- Focused Advocate	Develops and applies innovative approaches to address health challenges at a societal level	Critically analyses social, economic, and political structures to tackle the root causes of health inequities	Identifies structural barriers to healthy behaviours and implements policy-level interventions in schools and workplaces

Interview procedures

Interviews commenced with broad, open-ended prompts designed to establish rapport and elicit participants' baseline perspectives. These introductory questions were followed by targeted core items that explored whether, and in what ways, the curriculum influenced students' internalisation of health advocacy concepts [26]. Consistent with the semi-structured interview format, additional probing questions were posed as needed to clarify or expand upon participants' responses [24, 30].

All interviews were conducted individually via ZOOM video conferencing. This approach offered logistical flexibility and addressed potential barriers to participation arising from inconvenience and COVID-19-related restrictions. One-to-one interviews were selected in preference to focus groups to allow for in-depth exploration of individual attitudes, experiences, and viewpoints without peer influence.

Interview data were systematically examined using thematic analysis to identify common patterns and recurring ideas [31]. Coding and data management were carried out with the assistance of NVivo qualitative analysis software.

Data analysis and evaluation process

Analysis of questionnaire responses and interview transcripts followed a structured and iterative workflow. Initially, both researchers independently reviewed the datasets to become familiar with the content. This was followed by independent coding of all data. Questionnaire responses were categorised according to the evaluation framework outlined in **Table 1**, while interview transcripts were analysed thematically through

the identification and organisation of salient and recurring themes.

Each questionnaire dataset—Pre-Year 1, Post-Year 1, and Post-Year 2—was treated as a distinct unit of analysis, with coding conducted separately for each before cross-dataset comparisons were undertaken. Similarly, Post-Year 1 and Post-Year 2 interview transcripts were analysed independently, with thematic findings subsequently compared to examine changes and trends over time.

Both researchers were final-year undergraduate students in the NUS Pharmacy programme but had no involvement in the design, delivery, or implementation of the spiral integrated curriculum. Their academic training provided sufficient familiarity with discipline-specific terminology commonly used in participant responses, while their lack of direct association with the curriculum under study helped to minimise potential bias and support an objective analytical perspective.

Ethical considerations

To ensure ethical integrity, researchers and teaching faculty did not directly recruit participants for questionnaires or interviews. Instead, participation invitations were disseminated by a research assistant who had no role in curriculum teaching or assessment. It was clearly communicated that participation was entirely voluntary, unrelated to academic evaluation, and that non-participation would carry no negative consequences. No personally identifiable information was solicited at any stage of the study.

Audio recordings of interviews were transcribed verbatim and securely deleted within two weeks once

transcript accuracy had been confirmed. Any personal information inadvertently disclosed during interviews was anonymised or coded during transcription, and all study findings were reported in de-identified form. Questionnaire and interview responses were independently coded by two researchers, with discrepancies resolved through consultation with the Principal Investigator.

Ethical approval for the study was obtained from the National University of Singapore Learning and Analytics Committee on Ethics (LACE).

Results and Discussion

Analysis of coded questionnaire responses

Each response to the questionnaire items was treated as a separate unit of analysis during the coding process. In Academic Year 2020/2021, the Pharmacy Class of 2024 comprised 150 students. From this cohort, 215 responses

were collected for the Pre-Year 1 questionnaire, which consisted of two items, corresponding to a response rate of 72%. Following completion of Year 1, 126 responses were obtained for the Post-Year 1 questionnaire, representing a 42% response rate. In Academic Year 2021/2022, the Post-Year 2 questionnaire, which included three items, yielded 383 responses, accounting for an 85% response rate.

To examine changes in the distribution of health advocacy internalisation levels over time, the Mann–Whitney U test was employed. Comparisons were conducted between the Pre-Year 1 and Post-Year 1 datasets, as well as between the Pre-Year 1 and Post-Year 2 datasets. Summary statistics are reported as median values with interquartile ranges (IQR), as shown in **Table 2**. All statistical analyses were performed using one-tailed tests, with the threshold for statistical significance set at 0.05.

Table 2. Statistical analysis of questionnaire results

	Post-Year 1 Questionnaire	Pre-Year 1 Questionnaire	Post-Year 2 Questionnaire	Mann–Whitney U test (Pre-Year 1 vs. Post-Year 2)	Mann–Whitney U test (Pre-Year 1 vs. Post-Year 1)
Level 4: Justice-Oriented Pharmacist	1 (0.8%)	1 (0.5%)	29 (7.6%)		
Level 3: Participatory Pharmacist	2 (1.6%)	6 (2.8%)	59 (15.4%)		
Level 2: Personally Responsible Pharmacist	116 (92.1%)	192 (89.3%)	286 (74.7%)		
Level 1: Understanding Pharmacist	7 (5.5%)	16 (7.4%)	9 (2.3%)		
Total number of completed answers	126	215	383		
Median level (IQR)	2 (2–2)	2 (2–2)	2 (2–2)		
P-value				< 0.01	0.44

Despite exposure to the curriculum during the first academic year, students' overall positioning within the health advocacy internalisation framework remained unchanged. Analysis showed that the distribution of internalisation levels before entry and after completion of Year 1 did not differ in a statistically meaningful way, with identical median values and interquartile ranges observed across both time points [2.0 (2.0–2.0) at each time point; $p = 0.44$]. In contrast, evidence of progression emerged following continued curricular exposure. Comparison between responses collected after Year 1 and those obtained at the end of Year 2 demonstrated a statistically significant shift in internalisation patterns

[2.0 (2.0–2.0) vs 2.0 (2.0–2.0); $p < 0.01$], suggesting that extended engagement with the integrated curriculum was associated with deeper assimilation of health advocacy concepts.

Post-Year 1 interview findings

Five students contributed to the Post-Year 1 interview phase. Qualitative analysis of their accounts identified recurring themes that captured both how participants conceptualised health advocacy and how they experienced the first year of the revised curriculum. These themes and illustrative excerpts are summarised in **Table 3**.

Table 3. Thematic analysis of post-year 1 interviews

Theme	Interview Excerpts
Recognition of the importance of robust pharmacological expertise in supporting health advocacy	
Recognition of the importance of strong pharmacological expertise in health advocacy	One participant explained that pharmacists have a natural responsibility to promote public health, describing their role as experts in medications who guide patients on proper use. (Interviewee 2) Another participant emphasised that a key advocacy role of pharmacists lies in ensuring safe and appropriate medication use through patient education. (Interviewee 5)
Uncertainty regarding pharmacists' capacity to influence health at the community and population levels	
Hesitation about pharmacists' involvement in health advocacy beyond individual patient care	
Interest in increased experiential and practical learning	One participant felt that pharmacists have a relatively small role in preventive health at the population level, suggesting that mass media may have a greater influence on public health than individual pharmacist–patient interactions. (Interviewee 3) Another participant shared that early exposure in the revised curriculum helped students recognise the significance of pharmacists' advocacy roles and how these roles can be developed over time. (Interviewee 2)
Divergent views on how effectively health advocacy is integrated into the curriculum in health advocacy beyond individual patient care	
Interest in expanded hands-on and practice-based learning experiences	
Interest in increased experiential and practical learning	One participant stated that experiential activities were helpful because they allowed students to practise skills directly with patients rather than learning only in theory. (Interviewee 1) Another participant described virtual befriending sessions as motivating and expressed interest in participating in more similar activities to deepen engagement with health advocacy. (Interviewee 2) A participant suggested that additional community-based, real-life experiences—rather than virtual ones—could further enhance learning. (Interviewee 4)
Divergent perceptions of how effectively health advocacy is integrated within the curriculum	
Divergent views on how effectively health advocacy is integrated into the curriculum	One participant suggested that health advocacy should be clearly introduced as a distinct topic, with explicit explanation of its importance to help students better understand their role. (Interviewee 1) Another participant recommended using more real-world case studies to illustrate how pharmacists can contribute to health advocacy. (Interviewee 5) Conversely, one participant felt that early-year modules successfully conveyed that pharmacists are involved not only in treatment but also in health maintenance and disease prevention. (Interviewee 2) Another participant highlighted that improving medication affordability could itself be considered a form of health advocacy by enabling better access and adherence. (Interviewee 4)

Overall, most participants demonstrated limited internalisation of health advocacy concepts and perceived the integration of these ideas within the curriculum as insufficiently explicit. In response, the Year 2 curriculum placed greater emphasis on strengthening the connections between foundational, clinical, and systems-based sciences. This was achieved by deliberately linking new content to previously covered

materials, enabling students to better connect and synthesise related concepts across different subject areas. In addition, in light of students' positive responses towards experiential learning, the Year 2 curriculum incorporated additional hands-on opportunities designed to support the integration of knowledge and skills and facilitate their application in real-world practice.

Following the completion of the Year 2 pharmacy curriculum, six students participated in post-Year 2 interviews. A subsequent thematic analysis was

performed to examine their perspectives, with the findings summarised in **Table 4**.

Table 4. Thematic analysis of Post-Year 2 interviews

Themes and Description	Sample Interview Excerpts
Curriculum integration across basic, clinical, and systems sciences supported students' internalisation of health advocacy Participants demonstrated the ability to synthesise knowledge from foundational sciences, clinical training, and systems-based modules, and to apply this integration in pharmacy practice. They showed a comprehensive understanding of the healthcare environment, including social, political, economic, and cultural determinants of health. Health advocacy was viewed as an inherent professional duty of pharmacists, extending from individual patient care to community and system-level engagement, including the use of digital platforms to reach broader populations.	"We can clearly see how the modules are connected. In the skills module, for example, we apply what we learned from the systems modules, and there is also an overarching module that covers law, regulations, ethics, and related topics." (Interviewee 10) "Health advocacy is not something separate from our role as pharmacists; it is part of what we do." (Interviewee 6) "Modules on social inequality, pharmacoeconomics, and pharmacy law help develop us more holistically, beyond just the basic and clinical sciences like treatment decisions and therapy selection." (Interviewee 8) "Health advocacy can be practised at both individual and community levels. For instance, dispensing addresses individual patients, while using public or government websites allows us to reach a wider audience and educate them about medicines, side effects, and what to watch out for." (Interviewee 7)
Progressive increase in curricular complexity reinforced learning Students recognised that concepts were revisited with increasing depth and sophistication over time, reflecting the principles of a spiral curriculum that supports gradual and sustained learning.	"The way the professors structured the learning was very stepwise. In Year 1, we focused only on history taking. In Year 2, we learned to diagnose minor ailments, and now we are learning how to recommend treatments. This gradual progression really helped my learning." (Interviewee 6) "The curriculum is organised like a ladder. We build a foundation in Year 1, then add systems modules on top of that, and even those systems modules are further built upon later." (Interviewee 8)
Role-playing and experiential learning enabled application of knowledge in clinical and community contexts Participants valued role-playing activities and patient interaction simulations as effective opportunities to translate theoretical knowledge into practice. Experiential learning, particularly through Pharmacy Experiential and Clinical Training (PECT) attachments in community pharmacies, polyclinics, and hospitals, was perceived as crucial for contextualising learning and understanding real-world pharmacy practice.	"What we learn in the patient communication and skills module is directly applied when we talk to patients, gather information, and provide appropriate pharmacological and non-pharmacological recommendations, as well as monitoring and follow-up in a pharmaceutical care plan." (Interviewee 11) "I would like more experiential learning where we can actually practise the skills and apply what we've learned, instead of only studying the content theoretically." (Interviewee 10) "Having more PECT rotations and spending more time outside the classroom helps me better understand what pharmacists do and how much impact they can have in the healthcare system and in educating the public." (Interviewee 9)
Curriculum fostered increased confidence in professional practice Students reported greater confidence in their ability to practise as future pharmacists, attributing this to the knowledge, skills, attitudes, and experiences gained through the curriculum.	"I feel more capable of making informed judgments in the future as a healthcare professional." (Interviewee 9) "With the integrated knowledge from the curriculum, I am able to practise health advocacy even with my own family and support them in managing their health." (Interviewee 11)

The minimal improvement observed in students' internalisation of health advocacy following Year 1 may be attributed to the limited explicit emphasis placed on this concept within the early curriculum. During the

Post-Year 1 interviews, several participants indicated that clearer definitions and more explicit learning objectives related to health advocacy would be beneficial (**Table 3**). When health advocacy is conveyed implicitly,

students may undervalue its importance relative to basic and clinical sciences, thereby hindering its internalisation [32]. At this stage, students also tended to perceive health advocacy as a discrete construct, rather than recognising its interconnectedness with basic, clinical, and systems sciences. While making health advocacy more visible is important, it should also be embedded longitudinally throughout the curriculum to support the development of habitual practice over time [33, 34].

In addition, many students expressed the perception that pharmacists' roles in health advocacy are largely confined to individual patient interactions (**Table 3**). This perception may be influenced by the Year 1 curriculum representing the introductory phase of the spiral curriculum, where learning is focused on establishing foundational concepts. At this stage, greater emphasis is placed on conceptual grounding rather than on application at population or systems levels. For example, Year 1 introduces fundamental principles such as healthcare financing and escalating healthcare costs (**Figure 1**). Although these topics provide students with an understanding of the economic context of healthcare, opportunities to apply these concepts at broader population or systems levels are typically introduced in later years with increasing complexity. Consequently, the limited internalisation of health advocacy observed after Year 1 may not reflect shortcomings of the curriculum, but rather an expected outcome of the essential introductory phase of a spiral curriculum.

Following completion of the Year 2 curriculum, students demonstrated a clearer and more substantial internalisation of health advocacy. Consistent with the principles of spiral learning, Year 2 reinforced previously introduced concepts while expanding upon them with greater depth and complexity (**Table 4**). Curriculum integration enabled students to more readily identify relationships between concepts, enhanced knowledge retention by situating health advocacy principles introduced in Year 1 within specific contexts [35], and supported the translation of this knowledge into practical settings [36]. This progression may explain why integration was perceived as insufficient in Year 1 but became more evident and meaningful in Year 2, as reflected in the thematic findings.

Post-Year 2 interviews further highlighted the value of role-playing and experiential learning in fostering health advocacy competencies (**Table 4**). These approaches expose students to the diverse concerns, expectations, and perspectives of patients, thereby promoting empathy

and encouraging consideration of patients' lived experiences alongside their medical conditions [37]. Role-playing and experiential activities also serve as effective mechanisms for consolidating theoretical knowledge and applying it to authentic scenarios [38, 39]. The Year 2 curriculum incorporated experiential components such as Pharmacy Experiential and Clinical Training (PECT) placements (**Table 4**). Engagement within community-based settings provides students with a tangible and emotionally resonant understanding of how social structures, socioeconomic determinants, healthcare policies, and systemic factors influence patient decision-making and health outcomes [23, 40]. Through structured reflection on these experiences, students may become increasingly empowered and confident in addressing upstream determinants of health inequities during both their undergraduate education and future professional practice [41–43].

Overall, the observed improvement in students' internalisation of health advocacy underscores the effectiveness of spiral integrated curricular designs in fostering this competency. These findings align with cognitive psychology literature, which suggests that integrating basic sciences with clinical instruction provides meaningful context for knowledge acquired in formal academic environments [44]. Unlike traditional block curricula, where foundational sciences are taught in isolation, integrated curricula facilitate the organisation and application of core concepts within clinical practice [36, 45]. Such approaches also enhance knowledge retention by allowing learners to apply newly acquired information within a relatively short timeframe [22, 35, 46].

Study limitations

Several limitations should be considered when interpreting the findings of this study.

First, the use of open-ended questionnaire items relied on participants' ability to clearly articulate their views, which may not have fully captured their underlying attitudes toward health advocacy. Additionally, the thematic coding process was inherently interpretive and may have been influenced by researcher subjectivity. To mitigate potential bias, two researchers independently coded the questionnaire and interview data. Any discrepancies were subsequently reviewed and resolved through discussion with the Principal Investigator.

Second, participation in interviews was voluntary, introducing the possibility of voluntary response bias.

Students who elected to participate may have held stronger opinions regarding health advocacy or the curriculum, potentially leading to an overestimation of the curriculum's impact on internalisation.

Third, the relatively small interview sample size, coupled with the voluntary recruitment process, may have limited the diversity of perspectives captured. This constraint makes it difficult to determine whether data saturation was fully achieved.

It is acknowledged that both quantitative and qualitative methodologies possess inherent limitations and biases [47]. These issues may have further affected the internal validity of the study due to the absence of a control group. To strengthen the validity of the findings, a mixed-methods approach was employed. The convergence and mutual reinforcement of questionnaire and interview results helped to offset the limitations of each method, thereby enhancing the credibility of the study outcomes [48, 49]. Furthermore, the mixed-methods design provided multiple perspectives on the impact of the integrated curriculum, enabling a more comprehensive and holistic interpretation of the findings [50, 51].

Future directions

Although this study did not assess whether participants subsequently engaged in health advocacy during their professional careers, future longitudinal studies could follow the same cohort to examine the sustained impact of the curriculum on professional practice. Such investigations may also identify additional critical components and areas for refinement within the integrated curriculum, thereby informing the development of similar curricular models in postgraduate pharmacy education, other pharmacy programmes, and broader healthcare disciplines.

Given that experiential learning opportunities in the current curriculum are largely centred on patient care settings, future curriculum designers may consider establishing partnerships with social, governmental, and political organisations. Such collaborations could expose students to grassroots initiatives and policy-making processes [33], thereby enabling a more comprehensive internalisation of pharmacists' roles in health advocacy beyond individual and community-level care.

Conclusion

This study evaluated the effectiveness of a spiral integrated undergraduate Pharmacy curriculum in

promoting the internalisation of health advocacy among pharmacy students. The observed improvement in students' internalisation of health advocacy suggests that spiral integrated curricular designs that deliberately integrate basic, clinical, and systems sciences hold significant promise in cultivating health advocacy competencies in future pharmacists.

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Conflict of Interest: None

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Ethics Statement: Approval for the research protocol was granted by the Learning and Analytics Committee on Ethics (LACE) of NUS. The LACE reference number for this study is L2020-07-03. All methods were carried out in accordance with relevant guidelines and regulations as follows: National University of Singapore Institutional Review Board (NUS-IRB) guidelines, Personal Data Protection Act of Singapore, Student Data Protection Policy of NUS, Data Protection Policy of NUS, and IT Security Policy of NUS.

During recruitment, an invitation email was sent out to the students to obtain voluntary informed consent to participate in the questionnaires and semi-structured interviews. Students who consented were then provided with the attached participant information sheet and consent form. No personal information was requested nor needed to be provided to the research team beyond the details necessary for scheduling and conducting the interview.

Any such details provided by participants were not recorded as research data. Although an audio version of each interview was recorded, the interviews were transcribed as soon as possible and the audio files were destroyed once the transcripts were verified as accurate. This occurred no more than two weeks after the conducted interviews. All personal data revealed in the interviews were masked or coded in the transcripts. The written surveys were completely anonymous as well.

Acknowledgement of the consent terms of the interviews and questionnaires was implied once a student participated in the interviews and questionnaires.

Consent statements were also read to each student by the research assistant, and each participant had to verbalize agreement before proceeding with the interview. Suppose a participant changed their mind about participating prior to participating in the interview, they might choose to inform the research assistant at any time and the scheduled interview would be cancelled. As their participation was anonymous, there would be no way for research data to be deleted if a participant decided to withdraw from the research after participating in the interviews or surveys.

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