Multidisciplinary Integrated Pharmacotherapy Curriculum in a Doctor of Pharmacy Program: Educators’ Perceptions, Views, and Perspectives

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ABSTRACT

BACKGROUND: In pharmacy education, an integrated curriculum in which the full spectrum of foundational and pharmaceutical sciences is integrated with pharmacotherapy and clinical pharmacy is considered relatively new. At Unaizah College of Pharmacy (UCP), Qassim University, Saudi Arabia, a 6-year PharmD program was developed with a multidisciplinary integrated pharmacotherapy curriculum. The integrated pharmacotherapy curriculum represents approximately half of the didactic curriculum.

OBJECTIVE: The aim of this study was to evaluate the perceptions, the views, and experiences of academic faculty members regarding the impact and implementation of the multidisciplinary integrated pharmacotherapy curriculum in the PharmD program.

METHODS: A cross-sectional study was conducted with all pharmacy faculty members involved in the integrated curriculum. The data-capturing technique in this study was a Web-based survey. In addition, the survey included an open-ended section in which the participants were encouraged to provide comments/feedback and share their experiences about the integrated curriculum.

RESULTS: The majority of participants (96.88%, n = 31) believed that the integrated curriculum is well suited for developing problem-solving skills needed in pharmacy practice. Similarly, 93.76% (n = 30) believed that the integrated curriculum results in better student learning experiences. Of the participants, 81.26% (n = 26) believed it results in a better understanding and application of pharmaceutical sciences in practice compared with traditional courses. Moreover, 71.88% (n = 23) considered that the required depth and breadth of the content related to their disciplines is achievable with this model. Of all participants, 96.88% (n = 31) believed that the successful implementation of this integrated curriculum needs strong collaboration, effective communication, good coordination between all departments, and a flexible, fully customizable, and effective e-learning system. Moreover, all participants believed that full integration requires careful design and implementation to ensure no overlapping or marginalization of topics/disciplines. In this study, 62.51% (n = 20) believed that the fully integrated curriculum results in a relatively higher workload compared with traditional courses.

CONCLUSIONS: The majority of faculty members had positive perceptions regarding the multidisciplinary integrated pharmacotherapy curriculum. Moreover, the majority had positive views and experiences regarding the implementation of this integrated curriculum. The study identified several factors that helped in the successful implementation of this curriculum. Moreover, several challenges have been identified, including more investment in time and effort to implement this fully integrated curriculum.

KEYWORDS: curriculum, education, innovation, integration, learning, pharmacy, teaching

Introduction

Pharmacy education has undergone revolutionary changes in its philosophy and orientation in recent decades. These include changes in the scope, curriculum model, degrees offered, and study duration of pharmacy programs. Similarly, pharmacy practice has been transformed from a product-oriented to a patient-oriented practice in many countries. Therefore, contemporary pharmacy practice in health care systems requires graduates to be well trained in providing direct patient care services and in making clinical judgments and therapeutic interventions as drug therapy experts. To meet these requirements, many pharmacy institutions have adopted contemporary curricula with horizontal and vertical integration of content and skills. Horizontal integration can be done via eliminating departmentally segmented courses and planning a coordinated module to support the learning of a particular topic from different disciplines simultaneously. This includes integration among the disciplines of pharmaceutical sciences (pharmacology, medicinal chemistry, pharmacognosy, and pharmaceutics) and crossing the boundaries of these disciplines. On the contrary, vertical integration brings together pharmaceutical and foundational sciences and practice experience/clinical sciences (ie, clinical experiences are introduced in the early phase of the curriculum and the sciences are reintroduced/incorporated during the advanced/clinical phase). This helps to connect theory/science with clinical practice. Therefore, to implement this, some pharmacy institutions have transformed the traditional discipline-based pharmacy curriculum into an organ-system-based, multidisciplinary integrated curriculum. In traditional curricula, each department/discipline is responsible for teaching the subjects related to that department,
including development of the course contents. However, in an organ-system-based, multidisciplinary integrated curriculum, these different departments/disciplines come together to teach about a particular organ system from their perspective. Decisions about these modules/blocks, including the module specifications such as how much content and how many exams, are made by the faculty of all the disciplines involved in the module. In pharmacy education, the organ-system-based, multidisciplinary curriculum can be used for pharmacotherapy and other relevant domains. For example, a multidisciplinary integrated cardiovascular system pharmacotherapy block/module can be designed and implemented. In this integrated pharmacotherapy module, for example, a medical condition such as chronic stable angina will be taught by all disciplines, including the pathophysiology of the disease, the pharmacology of the drugs used to treat this disease, the medicinal chemistry of the drugs used to explain the relationship between the pharmacological action and chemical structure, and the pharmaceutics discipline, for example, different dosage forms used for angina (sublingual, patches) and their pharmacokinetics and storage requirements. This will be followed by the pharmacotherapy of the disease and the clinical applications, including case studies and clinical skills to manage patients with this disease.

Compared with medical education, the fully integrated pharmacy curriculum, including a module/block-based curriculum, is considered relatively new in many countries. The integration of the full spectrum of foundational sciences with pharmacotherapy and clinical pharmacy skills is still uncommon. However, it has started to gain attention in recent years due to improved student engagement, diverse discipline engagement, higher order learning to enhance the ability of students to deal with more complex issues in health systems (ie, well suited to develop problem-solving skills that are most needed in real practice), and increased curricular efficiency. Other advantages include reinforcement and deep learning, preparation for lifelong learning, cooperation between faculty members from different departments, and heightened relevance of learning.

Currently, curricular integration is explicitly called for and referenced to in several accreditation standards for pharmacy programs in a number of countries such as the United States, Canada, and Ireland. Now, curricular integration is an essential element in contemporary approaches to curriculum renewal in pharmacy programs. Poirier et al conducted a survey to explore the ways in which curricular integration is implemented in US pharmacy schools. The study included results from 94 pharmacy schools and showed that the most common methods used by schools to achieve curricular integration is to arrange similar content from various disciplines in a course according to common themes (66%), to include them in a skills laboratory (62.8%) and pharmacy practice experiences (50%). In addition, more than half of the schools (51.5%), foundational sciences (eg, medicinal chemistry, pharmacology, and pathophysiology) are integrated with the pharmacotherapy courses.

Based on an extensive literature search, few experiences are reported in the pharmacy literature regarding a fully integrated pharmacy curriculum that combines the full spectrum of foundational and pharmaceutical sciences with pharmacotherapy and clinical pharmacy skills. Hence, the aim of this study was to evaluate the views, perceptions, and experiences of academic faculty members regarding a fully integrated multidisciplinary pharmacotherapy curriculum in a Doctor of Pharmacy program at Unaizah College of Pharmacy (UCP), Qassim University, Saudi Arabia.

**UCP PharmD Program**

Unaizah College of Pharmacy started a 6-year Doctor of Pharmacy (PharmD) program in 2012. The UCP PharmD comprises 5 years of didactic education and 1 year of experiential education (ie, a 12-month internship program). The didactic component (191 credit hours) provides the necessary foundations in general sciences, biomedical sciences, pharmaceutical sciences, social/behavioral/administrative pharmacy, and clinical sciences (Figure 1), and is implemented in 4 distinct phases. The first phase is conducted over 1 year (36 credits) and is called the "preparatory year" (health sciences track). This contains many subjects, including English language, statistics, physics, computer skills, thinking skills and learning styles, English for health professions, human biology, biochemistry, medical ethics, and health professional educational and communication skills. The second phase is conducted over 1 year and covers the biomedical sciences (36 credits). This includes multidisciplinary integrated blocks in body structure and function, growth and development, molecular genetics, health care systems, principles of diseases, nutrition and metabolism, and hematology and immunology. The third phase covers the principles of pharmaceutical sciences (2 blocks with 11 credits over almost 1 semester). The fourth phase includes 13 integrated pharmacotherapy blocks (90 credits conducted over 2.5 years). Along with these multidisciplinary integrated blocks, there are several longitudinal courses (eg, evidence-based practice, graduation project, molecular biology) and university general requirements (ie, Arabic and Islamic courses; Figure 1).

The multidisciplinary fully integrated pharmacotherapy blocks are considered a major component of the program (ie, they represent 47.12% of the didactic component). Each block focuses on a particular body system (cardiovascular, respiratory, endocrine, etc) or disease group/specialty (eg, infectious diseases, oncology). This is summarized in Table 1. In each block, the relevant and common topics (ie, diseases/disorders) are selected by taking into consideration several factors, including the local context (eg, prevalence, health priorities) and international references such as the 2016 American College of Clinical Pharmacy (ACCP) pharmacotherapy didactic curriculum toolkit. For example, the integrated respiratory system pharmacotherapy
(6 credit hours) includes asthma, chronic obstructive pulmonary disease (COPD), drug-induced respiratory disorders and other related topics.

Regarding the implementation of these blocks, each block is conducted over several weeks (the duration determined by the number and complexity of conditions to be covered). The blocks are conducted in a sequential manner. For example, the fourth year consists of 5 major pharmacotherapy blocks and they are taught one by one in a sequence (ie, block 1 is musculoskeletal system pharmacotherapy, block 2 is respiratory system pharmacotherapy, and so on).

In each block, the topic (ie, the disease or disorder) is covered in 1 week from all aspects, including the pathophysiology of the disease, pharmacology, medicinal chemistry, pharmaceutics, and clinical aspects/skills related to the disease. For example, as shown in Figure 2, asthma in the respiratory system pharmacotherapy block is covered over 1 week. This includes the pathophysiology of asthma, followed by the pharmacology of drugs used in asthma. Then, the medicinal chemistry of drugs used in asthma, including structure-related activity, is explained. After that, in the pharmaceutics lecture, the dosage forms (eg, metered-dose inhalers [MDIs], dry powder inhalers [DPIs]) used in asthma and their pharmacokinetics are discussed thoroughly. Following these foundations, the students will be taught the pharmacotherapy of asthma, including the evidence-based guidelines to manage asthma patients. At this stage, the students have covered the topic (ie, asthma) from all 5 main aspects in an integrated approach. Then, they will apply this content in 2 active-learning sessions. The first session is a 4-hour team-based learning (TBL) session. This strategy, in general, consists of an individual readiness assurance test (IRAT) and a group readiness assurance test (GRAT), followed by case study applications. This strategy is described in detail elsewhere. The second main session is a 4-hour integrated pharmaceutical care lab (IPCL). In this lab, the student will learn practical/clinical patient care skills. For example, the
Table 1. Characteristic and demographic data of participants.

| VARIABLE                                              | N (%) |
|-------------------------------------------------------|-------|
| Gender                                                |       |
| Male                                                  | 21 (65.63) |
| Female                                                | 11 (34.38) |
| Age (in years)                                        |       |
| 30-40                                                 | 14 (43.75) |
| 41-50                                                 | 10 (31.25) |
| >50                                                   | 8 (25.00)  |
| Academic rank                                         |       |
| Lecturer                                              | 12 (37.50) |
| Assistant professor/associate professor/professor     | 20 (62.50) |
| Academic department                                   |       |
| Pharmacy practice                                     | 14 (43.75) |
| Pharmacology and toxicology                           | 7 (21.88)  |
| Pharmaceutics                                          | 5 (15.63)  |
| Pharmaceutical chemistry and pharmacognosy            | 6 (18.75)  |

Moreover, the data can be collected from all the academic faculty members from all the departments all over the campus in a relatively short period of time compared with traditional methods. In addition, it is easier and more cost-effective and provides rapid responses, and response rates can be calculated. The study protocol was reviewed and ethically approved by the Committee of Health Research Ethics, Qassim University. The participation in this study was strictly voluntary, and all the responses were anonymous.

Questionnaire development and validation

The questionnaire was developed based on extensive review of the literature including the works of Islam et al\textsuperscript{13} and Khalil and Kibble.\textsuperscript{14} Moreover, some additional items were added based on the author’s experience and observations of the current UCP integrated curriculum. To ensure face and content validity of the questionnaire, it was given to 2 academicians with experience in integrated curriculum for their comments, suggestions, and feedback to ensure clarity, applicability, and suitability of the questionnaire items to the study setting. Slight modifications were made according to their feedback and input. The questionnaire consisted of 4 parts. Part 1 collected the demographic and characteristics of the participants, including age, gender, academic rank, and department. Part 2 consisted of 6 statements to evaluate faculty members’ perceptions about the impact of multidisciplinary integrated pharmacotherapy blocks. Part 3 consisted of 8 statements to evaluate faculty members’ perceptions about the implementation of multidisciplinary integrated pharmacotherapy blocks. In parts 2 and 3, the participants were asked to indicate their agreement or disagreement on a 5-point Likert-type scale (strongly agree, agree, neutral, disagree, and strongly disagree). Part 4 was an open-ended section in which the participants were encouraged to provide comments/feedback and share their experiences about integrated pharmacotherapy blocks (ie, advantages, disadvantages, challenges, views, opinions, etc).

After the development of the questionnaire, it was converted from paper form to electronic form as a Web-based survey. Then, prior to administration, it was tested on different Internet browsers to identify any technical problems and to ensure it was feasible and compatible with computers and other handheld devices, including smartphones.

Study population and sampling method

The study population included all full-time pharmacy faculty members at UCP, Qassim University, Saudi Arabia. Teaching assistants (TAs) were not included as they have limited involvement in this integrated pharmacotherapy curriculum. The universal sampling method was adopted in this study in which all the faculty members who met the criteria were invited to participate in the study.
Data collection

An e-mail with a link to the Web-based survey was sent to the faculty members’ e-mail addresses to invite them to participate in the study. In addition, the invitation e-mail contained the following: the aim of the study, general instructions on how to access the electronic survey, the estimated time to answer the questionnaire, statements on anonymity and confidentiality of responses, and a statement to indicate that the participation was strictly voluntary.

The survey was conducted in May 2018. Within 1 week after the original/initial e-mail, a reminder was sent to encourage non-respondents to participate in the study. The data were designed and implemented using a Web-based survey platform with security features (SurveyMonkey 2018, California).

Data management and analysis

The Statistical Package for Social Sciences (SPSS), version 22, for Windows and Microsoft Office Excel were used to analyze the quantitative data. Data were analyzed descriptively using frequency distribution and percentage. The free text (ie, qualitative data) was analyzed using thematic analysis.

Results

Response rate

A total of 32 out of 36 faculty members participated in the study, giving a response rate of 88.9%.

Characteristics and demographic data of the participants

The participants represented all the 4 departments, namely, pharmacy practice, pharmacology and toxicology, pharmaceutics, and pharmaceutical chemistry and pharmacognosy. The participants were in different age groups with 43.75% (n=14) in the age group of 30 to 40 years. The details are presented in Table 1.

Faculty members’ perceptions about the impact of integrated pharmacotherapy blocks

The vast majority of participants (96.88%, n = 31) believed that the integrated blocks are well suited for developing problem-solving skills needed in practice. Similarly, 93.76% (n = 30) believed that the current approach of integration results in better student learning experiences, and they also believed that the application of knowledge, skills, and attitude is best achieved in this type of integrated blocks. Moreover, the same proportion of participants (93.76%, n = 30) believed that the evidence-based pharmacotherapy/practice is best achieved with integrated blocks. Of the participants, 81.26% (n = 26) believed that the current approach of integration results in a better understanding and application of medicinal chemistry, pharmacology, and pharmaceutical sciences in practice compared with traditional courses. The vast majority of participants (93.76%, n = 30) believed that this type of integration helps students see the big picture and make relevant and necessary connections. These results are presented in Table 2.

Faculty members’ views about the implementation of integrated pharmacotherapy blocks

The participants were asked about their views and opinions regarding the implementation of this system. Almost three quarters of participants (71.88%, n = 23) believed that the current distribution of contact hours of each discipline ensures adequate depth and breadth of the contents in each component.

| Sunday | Monday | Tuesday | Wednesday | Thursday |
|--------|--------|---------|-----------|----------|
| **Pathophysiology** | **Pharmacology** | **Medicinal Chemistry** | **Pharmacoeconomics** | **Pharmacy practice** | **Pharmaceutical care lab (PCL)** | **Team-based learning (TBL)** |
| Asthma | Pharmacology of drugs used in asthma | Medicinal chemistry of drugs used in asthma | Dosage forms for medications used in asthma and their pharmacokinetics etc. | Pharmacotherapy of asthma | Integrated pharmacological care lab (PCL) (Asthma) | Longitudinal courses and other educational activities |

Laboratory, tutorial, longitudinal courses and seminar sessions

Figure 2. Timetable of asthma teaching (1 single theme).
of the block. Most participants (84.38%, n = 27) stated that the timing and sequencing of subjects in the block are appropriate. The vast majority of participants (96.88%, n = 31) stated that the planning and design of integrated blocks need joint collaboration between the faculty of all departments. Similarly, 96.88% (n = 31) of participants stated that effective communication and good coordination among all departments and the availability of a full e-learning system are essential for the successful implementation of this type of integration. Moreover, all participants believed that full integration requires careful design and implementation as some contents of the block might be marginalized due to their difficulty or students’ lack of interest toward a certain component of the block or small contribution to the assessment. Almost all participants (96.88%, n = 31) indicated that this type of integration results in more interaction, involvement, and knowledge/ideas sharing among the faculty. However, 62.51% (n = 20) believed that the integrated block results in a relatively higher workload compared with traditional courses. These results are presented in Table 3.

Thematic analysis of open-ended comments on integrated pharmacotherapy blocks

In the open-ended comments section, 24 (75%) of the participants provided feedback about their experiences regarding the integrated system. The thematic analysis of the participants’ responses resulted in 4 major themes that included Theme 1: General Opinion/View of the System, Theme 2: Benefits/Advantages of the System, Theme 3: Challenges and Disadvantages, and Theme 4: Suggestions and Areas for Improvement. These findings are presented in detail in Table 4.

Discussion

We believe that this is the first study from the Middle East to report on experiences with a multidisciplinary, fully integrated PharmD curriculum delivered in a block format. In fact, in the literature, reports on experiences with pharmacy curricular integration in general, and on curriculum delivered in a sequential fully integrated block format is relatively limited.4,15 Therefore, we believe this study could provide insight into this type of curriculum, including its benefits and challenges.

In this study, the majority of participants believed that this curriculum with multidisciplinary integrated pharmacotherapy blocks is more innovative, learner-centered, and results in a better understanding and application of pathophysiology, medicinal chemistry, pharmacology, and other pharmaceutical sciences in practice compared with traditional courses. This in turn leads to better student learning experiences. This is in line with the work of Islam and Schweiger15 in which this integrated approach improved student learning experiences and provided them with a better application of their knowledge in making therapeutic interventions/recommendations. The current body of evidence from literature suggests that, in managing disease, students’ understanding and skills are enhanced when the disease is taught from several aspects and when the pathologist, pharmacologist, pharmaceutical scientist, and clinical pharmacist come together to discuss it in an integrated approach, including the rationale behind choices and relevance to patient care. This will bridge the gap between theory/scientific principles and patient care. Moreover, the majority of faculty members in our study believed that this integration is helpful in developing the problem-solving skills needed in practice (ie, it provides real-life context). This is similar to the findings reported by Islam et al13 in which 76% of pharmacy faculty respondents from US schools of Pharmacy agreed or strongly agreed that integration helped in developing problem-solving skills. Moreover, in another survey of US pharmacy schools, most respondents believed that integration implemented at their schools enhanced students’ acquisition of

Table 2. Faculty members’ perceptions about the impact of integrated pharmacotherapy blocks.

| STATEMENT                                                                 | STRONGLY AGREE n (%) | AGREE n (%) | NEUTRAL n (%) | DISAGREE n (%) | STRONGLY DISAGREE n (%) |
|--------------------------------------------------------------------------|----------------------|------------|---------------|---------------|-------------------------|
| I believe the integrated blocks are well suited for developing problem-solving skills needed in practice. | 22 (68.75)           | 9 (28.13)  | 1 (3.13)      | 0 (0.00)       | 0 (0.00)                |
| I believe the current approach of integration results in better students’ learning experiences than traditional courses to offer effective patient care. | 19 (59.38)           | 11 (34.38) | 2 (6.25)      | 0 (0.00)       | 0 (0.00)                |
| I believe the application of knowledge, skills, and attitude is best achieved in this type of integrated blocks. | 17 (53.13)           | 13 (40.63) | 2 (6.25)      | 0 (0.00)       | 0 (0.00)                |
| I believe the evidence-based pharmacotherapy/practice is best achieved in this type of integrated blocks. | 20 (62.50)           | 10 (31.25) | 2 (6.25)      | 0 (0.00)       | 0 (0.00)                |
| I believe the current approach of integration results in better understanding and application of medicinal chemistry, pharmacology, and pharmaceutical sciences in practice compared with traditional courses. | 9 (28.13)            | 17 (53.13) | 3 (9.38)      | 3 (9.38)       | 0 (0.00)                |
| I believe this type of integration helps students see the big picture and make relevant and necessary connections. | 16 (50.00)           | 14 (43.75) | 1 (3.13)      | 1 (3.13)       | 0 (0.00)                |
knowledge, higher order thinking, and ability to apply the concepts during pharmacy practice experiences. In addition, this type of curriculum could help to prepare the students to be lifelong learners.3 Overall, the views and opinions regarding the implementation of this system were positive. The majority believed that the current distribution of contact hours of each discipline ensures adequate depth and breadth of content in each component of the pharmacotherapy block. Moreover, they stated that the timing and sequencing of subjects in the block are appropriate. In fact, the design and structure of the curriculum are considered an essential step to ensure that integrated pharmacotherapy courses are structured with appropriate weight given to the foundational sciences. This is important to address the concern that science content could potentially be marginalized in integrated curricula.10,16,17 Hence, the college initially gave careful consideration to this aspect during the development phase of the curriculum and involved all disciplines in the development and planning of the curriculum. Moreover, during the implementation phase, continuous improvements were made based on faculty and students’ feedback.

According to the faculty members, several factors facilitated the successful implementation of this curriculum. These include college leadership commitment, strong collaboration between the faculty members of all departments, effective communication, and good coordination among all departments. In fact, these factors are emphasized in the literature as key factors in the success of any integrated curriculum.3,5,13-15,18 Moreover, according to the participants, this fully integrated curriculum results in more interaction, involvement, and knowledge/ideas sharing among faculty members. This is in line with several reports in the literature that have highlighted this benefit of integration.3,7 Moreover, the participants believed that having an effective e-learning system is essential for the successful implementation of these integrated blocks, that is, having a flexible, fully customizable, e-learning platform that provides students, educators, and administrators with a robust integrated system and is accessible by all. This is because, in each block, several faculty members from different disciplines are involved in the teaching process. Therefore, through the e-learning system, all the block timetables, booklets, learning objectives, learning outcomes, lecture slides, references, laboratory manuals, announcements, assignment topics, seminar topics, and all other materials are published together. This should be done in a timely manner and be communicated to all those involved in the block. All faculty members and students receive immediate notifications of any announcements related to the timetable, and so on. This system also provides a platform for communication and interaction between students and faculty members. Therefore, from

| STATEMENT | STRONGLY AGREE n (%) | AGREE n (%) | NEUTRAL n (%) | DISAGREE n (%) | STRONGLY DISAGREE n (%) |
|-----------|----------------------|------------|---------------|---------------|-------------------------|
| I believe the current distribution of contact hours of each discipline ensures adequate depth and breadth of contents in each component of the block. | 7 (21.88) | 16 (50.00) | 5 (15.63) | 4 (12.50) | 0 (0.00) |
| I believe the planning and design of integrated blocks need joint collaboration between the faculty of all departments. | 25 (78.13) | 6 (18.75) | 0 (0.00) | 1 (3.13) | 0 (0.00) |
| I believe the timing and sequencing of subjects in the block are appropriate. | 10 (31.25) | 17 (53.13) | 3 (9.38) | 2 (6.25) | 0 (0.00) |
| I believe effective communication and good coordination among all departments are necessary for the successful implementation of this type of integration. | 29 (90.63) | 2 (6.25) | 1 (3.13) | 0 (0.00) | 0 (0.00) |
| I believe full integration requires careful design and implementation as some contents of the block might be marginalized due to their difficulty or students’ lack of interest or small contribution to the assessment. | 14 (43.75) | 18 (56.25) | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| I believe the e-learning system is essential for the successful implementation of these integrated blocks. | 18 (56.25) | 13 (40.63) | 1 (3.13) | 0 (0.00) | 0 (0.00) |
| I believe the integrated block results in a relatively higher workload compared with traditional courses. | 7 (21.88) | 13 (40.63) | 3 (9.38) | 8 (25.00) | 1 (3.13) |
| I believe this type of integration results in more interaction, involvement, and knowledge/ideas sharing among the faculty. | 19 (59.38) | 12 (37.50) | 1 (3.13) | 0 (0.00) | 0 (0.00) |
Table 4. Major themes of the qualitative analysis of participants’ responses.

| MAJOR THEME                              | FINDINGS                                                                 | COMMENTS/FEEDBACK                                                                                                                                 |
|------------------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| General Opinion/View of the System       | The integrated system is an innovative, learner-centered approach, and helpful for the students. | This pedagogic methodology of learner-oriented approach proves to be fruitful as it leads to in-depth understanding of the subject. The students are contented by learning through this methodology. Their performance in the assessments is outstanding (P18). Curriculum is well designed and is helpful for the students (P16). Overall, the idea is very innovative (P14). |
| Benefits/Advantages of the System        | – It provides the learners with real-life context/experiences.             | – Quite advantageous as it gives/provides the learner the real-life context, that is, it allows the interdisciplinary skills to develop (P2). |
|                                          | – It is effective for developing students practice skills.                 | – The current system of teaching in our college (block system) may help to produce cognitive thinking in students, which may help for making them competitive and dynamic for decision making such as regarding drug interventions (P4). |
|                                          | – It provides students with cognitive thinking and decision-making skills.  | – I strongly agree with effectiveness of active learning in the implementation and development of student practice skills (P11). |
|                                          | – It provides students with better understanding of the therapeutic principles, and faster than those who are learning through the traditional approach. | – Integrated pharmacotherapy blocks will give the evidence-based approach to students to implement the real practice experience in their future practice (P12). |
|                                          | – This system applies an evidence-based approach taking into consideration all aspects/perspectives, which helps students in their future practice. | – Advantages: Student-centered learning and objective-oriented teaching and learning (P17). |
|                                          | – Faculty members from pharmaceutical sciences viewed it as a practice-oriented curriculum with less emphasis on traditional pharmaceutical sciences and industrial pharmacy. | – The integrated pharmacotherapy blocks are easier for the student to understand the therapeutic principles, and faster than those who are on the traditional approach (P23). |
|                                          | – It is challenging as it requires more time and effort in coordination and communication of all departments and staff simultaneously. More positions need to be created, including block organizers and coordinators. | – It has a big advantage in helping students taking all subjects complementarily instead of as separate compartments; this helps in practice (P13). |
|                                          | – It requires more time to coordinate and implement it in a harmonious and consistent fashion. | – Some challenges need to be addressed, especially some overlapping/repetition in teaching, potential missing of some topics, and careful consideration when developing integrated exams and overall assessment plan. |
|                                          | – Some challenges need to be addressed, especially some overlapping/repetition in teaching, potential missing of some topics, and careful consideration when developing integrated exams and overall assessment plan. | – Although our curriculum is best in its content, it is inclined toward pharmacy practice subject more than core pharmaceutical science courses. We have to create diverse pharmacists who are able to work as manufacturing pharmacists, production pharmacists, QA pharmacists, or any other stream of pharmacy apart from clinical pharmacists (P3). |
|                                          | – Faculty members from pharmaceutical sciences viewed it as a practice-oriented curriculum with less emphasis on traditional pharmaceutical sciences and industrial pharmacy. | – One of the challenges is that it requires all staff to be aware of each other’s work. Also, it needs close cooperation between staff to complement each other’s information with no repetition (P13). |
|                                          | – It is challenging as it requires more time and effort in coordination and communication of all departments and staff simultaneously. More positions need to be created, including block organizers and coordinators. | – Disadvantage: More staff time-dependent (P17). |
|                                          | – It requires more time to coordinate and implement it in a harmonious and consistent fashion. | – Including all subjects in 1 exam paper allows the student to omit some subjects because of a small share in the overall assessment (P1). |
|                                          | – Some challenges need to be addressed, especially some overlapping/repetition in teaching, potential missing of some topics, and careful consideration when developing integrated exams and overall assessment plan. | – My suggestion is if we introduce the TBL system in all departments, at least 1 topic in a block may be good for the students (P4). |
|                                          | – Faculty members from pharmaceutical sciences viewed it as a practice-oriented curriculum with less emphasis on traditional pharmaceutical sciences and industrial pharmacy. | – Pharmaceutical sciences should be included in TBL. I suggest putting medicinal chemistry + pharmaceutics questions in TBL for third-year students. For the fourth year and fifth year, I suggest including pharmacology questions in TBL (P5). |
|                                          | – It is challenging as it requires more time and effort in coordination and communication of all departments and staff simultaneously. More positions need to be created, including block organizers and coordinators. | – All subjects should be included in TBL (P8). |
|                                          | – It requires more time to coordinate and implement it in a harmonious and consistent fashion. | – To ensure excellent graduates, the students should have a strong background and foundations in pharmaceutical chemistry, basic pharmacology, and physical pharmacy (P2). |

Abbreviations: TBL, team-based learning; QA, quality assurance.
our experience, we believe that a robust, highly flexible, fully customizable, and effective e-learning system is essential for the implementation of integrated blocks.

There were several challenges reported by the participants. They stated that this system resulted in a heavier workload and needed more time compared with traditional courses. This is because more effort is needed in communication, coordination, and arrangements among the teams to smoothly deliver the block, because each block is delivered by several faculty members from several disciplines. Hence, the preparation of block materials, review of block specifications, block reports, exam preparation and review, and other relevant issues (eg, records of student attendance) need to be done collaboratively.

Moreover, faculty members need to be aware of their colleagues’ work to ensure there is no repetition or overlapping in the lectures and materials. Hence, more time and administrative work is needed to ensure all things are agreed upon and consistent among all the members and disciplines. This is in line with the experience of the Bernard J. Dunn School of Pharmacy at Shenandoah University, in which the implementation of this type of curriculum required a considerable investment of faculty time. This is because it required additional time for the coordination of several faculty members involved in each block and more time was needed for other academic tasks (eg, exam preparation/review, scheduling).7 In addition, there is a recent experience reported in the literature from the School of Pharmacy and Pharmaceutical Sciences, Trinity College Dublin, Ireland, in which a novel 5-year integrated pharmacy program curriculum was designed and implemented.8 The implementation of this integrated curriculum required considerable time and resources, and the main challenges that were addressed included logistics, workload, concern regarding marginalization of some foundational sciences, and a greater need for pharmacy practice experiences (ie, placement numbers).8 Therefore, as these are the expected challenges of the implementation of a novel integrated curriculum, colleges need to consider them and have the necessary plans to address them when conducting curriculum renewal and implementing curricular integration. In addition, from our experience, we believe there should be specific rules and clear guidance on all aspects of the block, including coordination (ie, assignment of a block organizer/coordinator, scheduling), objectives and content review, exam question writing and preparation (including the percentage of each discipline), exam review process, and the policy and procedures for further development and continuous improvement processes of the block. In addition, all disciplines should be involved in the decisions when making revisions or changes via an approved administrative framework.

Another challenge is that some contents of the block could be marginalized. In fact, the faculty members felt that some topics could be marginalized by students, especially when it had a small contribution to the assessment. This is similar to the findings reported by Islam et al13 from the United States, in which some respondents stated that some disciplines (eg, medicinal chemistry and toxicology) became marginalized due to their small contribution to assessments compared with the other disciplines.13 Therefore, improved strategies are needed to ensure that this issue is solved. This can be done by introducing several assessment methods with several evaluation sessions rather than 1 or 2 major exams for the block. Hence, we have adopted a comprehensive assessment plan in this system. It includes a weekly TBL session (ie, 1 TBL session for each major topic), weekly IPCL (1 IPCL session for each major topic), laboratory sessions (discipline-based), weekly seminars (each student is required to have 1 seminar per block), and simulation sessions and assignments (each student is required to have 1 assignment per block, and at least 1 in each discipline in the academic year). In addition, for some blocks, where relevant, progress exams were introduced. Then, a final comprehensive integrated exam for the block was conducted (which covers all disciplines). Currently, the final exam consists of 2 papers. The first paper consists of 100 MCQs covering all disciplines. The second paper consists of MEQs and SAQs with fully integrated case-based scenarios. Alternatively, perhaps, a minimum pass rate or achievement level for the disciplines and related learning outcomes can be set. However, this is challenging and requires further planning and considerations, including the related university regulations in this regard. Hence, we are considering this in the future after finalizing the full implementation plan.

Currently, the TBL sessions are practice-oriented TBL (conducted by the pharmacy practice department) with less emphasis on basic pharmaceutical sciences. In fact, from our experience, it was challenging to fully integrate the TBL session with input from disciplines other than pharmacy practice. This was mainly because high-quality multidisciplinary TBL sessions with co-developed case scenarios that integrate several elements including pharmaceutical, medicinal, and pharmacological sciences require effort in coordination and a significant investment in faculty time.9 This is particularly difficult as there are several TBL sessions in a week in the integrated curriculum, and there is a requirement to have different and updated case scenarios. Also, to implement this, additional faculty members in pharmaceutical sciences are required. However, other teaching and assessment methods are now integrated, including the final exams of the block in which fully integrated case-based scenarios are used.

**Strengths and Limitations**

The study had a number of strengths. It used a mixed-methods design that included a structured questionnaire and a qualitative part in which participants were encouraged to share their experiences, feedback, and comments. This helped in providing
greater insight and views about the integrated curriculum. Moreover, a response rate of 88% is considered a high response rate. In addition, the faculty members in the college had different academic backgrounds and experiences with other curricular models (ie, Saudi Arabia, Malaysia, Sudan, Egypt, India, etc). However, the study had some limitations. This study was conducted at a single institution. In addition, the study represented only the faculty members’ perceptions, views, and experiences with this curricular model. Therefore, more evidence and data are required to measure the impact of this type of curriculum on students’ learning experiences and improvement in learning outcomes. However, given the limited pharmacy literature on this topic, especially colleges’ experiences in implementing this curricular model worldwide, we believe that these findings and experiences could be useful and provide future guidance.

Conclusions
The majority of faculty members had positive perceptions regarding the multidisciplinary integrated pharmacotherapy blocks in terms of their impact on student learning experiences, skills, and knowledge applications in patient care. Moreover, the majority had positive views and opinions regarding the implementation of this integrated curriculum. The facilitators of a successful implementation were strong collaboration, effective communication, good coordination, leadership commitment, and an effective e-learning system. The challenges included a higher workload and more time requirements compared with traditional courses. In addition, when adopting this integrated curriculum, effective strategies need to be in place to ensure no marginalization of any components/disciplines in the program.

Author Contributions
All the work in this article is done by the author AAA

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REFERENCES
1. Fathelrahman AI, Ibrahim MI. Introductory notes: why do we need a book on pharmacy education? In: Fathelrahman AI, Ibrahim MI, Alrasheedy AA, Wertheimer AI, eds. Pharmacy Education in the Twenty-First Century and Beyond: Global Achievement and Challenges. San Diego, CA: Academic Press; 2018:1-7. doi:10.1016/B978-0-12-811909-9.00001-0.
2. Ming LC, Khan TM. Curricula orientations: classical–versus clinical-oriented curricula. In: Fathelrahman AI, Ibrahim MI, Alrasheedy AA, Wertheimer AI, eds. Pharmacy Education in the Twenty-First Century and Beyond: Global Achievement and Challenges. San Diego, CA: Academic Press; 2018:89-100. doi:10.1016/B978-0-12-811909-9.00008-3.
3. Bradley P, Martick K. Integration of basic and clinical sciences—AMEE 2008. UK: Peninsula College of Medicine and Dentistry. 2008. https://amee.org/getattachment/Conferences/AMEE-Past-Conferences/AMEE-Conference-2008/Introduction-to-Medical-Education-Bradley-Martick.pdf. Accessed June 12 2018.
4. Loewen PS, Gerber F, McCormack J, MacDonald G. Design and implementation of an integrated medication management curriculum in an entry-to-practice doctor of pharmacy program. Pharm Educ. 2016;16:122-130.
5. Hasan Z, Sequeira R. Challenges of teaching physiology in an integrated system-based curriculum. Can Med Educ J. 2012;3:e73-e76.
6. Unaizah College of Pharmacy. Doctor of Pharmacy Handbook, Version 2. Qassim (Saudi Arabia): Qassim University; 2019.
7. Stall R, Carter RA. Integrating the pharmacy curriculum: more to consider than improving learning. Am J Pharm Educ. 2002;66:407-410.
8. Ryan TJ, Grimes T, Henman MC, et al. Design and implementation of an integrated competency-focused pharmacy programme: a case report. Pharmacy (Basel). 2019;2:121. doi:10.3390/pharmacy2020121.
9. Pearson ML, Hubball HT. Curricular integration in pharmacy education. Am J Pharm Educ. 2012;76:204. doi:10.5688/ajpe7610204.
10. Poirier TI, Fan J, Nieto MJ. Survey of pharmacy schools’ approaches and attitudes toward curricular integration. Am J Pharm Educ. 2016;80:96. doi:10.5688/ajpe8096.
11. Husband AK, Todd A, Fulton J. Integrating science and practice in pharmacy education in the Twenty-First Century and Beyond: Global Achievement and Challenges. San Diego, CA: Academic Press; 2018:125-145. doi:10.1016/B978-0-12-811909-9.00010-1.
12. Almenaa AA, Atebhish SA. Teaching strategies used in pharmacy. In: Fathelrahman AI, Ibrahim MI, Alrasheedy AA, Wertheimer AI, eds. Pharmacy Education in the Twenty-First Century and Beyond: Global Achievement and Challenges. San Diego, CA: Academic Press; 2018:89-100. doi:10.1016/B978-0-12-811909-9.00010-1.
13. Islam MA, Talukder RM, Taheri R, Blanchard N. Integration of basic and clinical science courses in US PharmD programs. Am J Pharm Educ. 2016;80:166. doi:10.5688/ajpe80166.
14. Khalil MK, Kibble JD. Faculty reflections on the process of building an integrated preclerkship curriculum: a new school perspective. Adv Physiol Educ. 2014;38:199-209. doi:10.1152/advan.00055.2014.
15. 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;28:220-226. doi:10.1177/1090429314544821.
16. Hassan S. Concepts of vertical and horizontal integration as an approach to integrated curriculum. Educ Med J. 2013;3(4):e1-e5. doi:10.5594/ijemj/v3i4.163.
17. Husband AK, Todd A, Fulton J. Integrating science and practice in pharmacy curricula. Am J Pharm Educ. 2014;78(3):6. doi:10.5987/ijemj/0105169.
18. Wong E, Nguyen TV. Introduction of an integrated curriculum: early outcomes and experiences within a large private university. Cu Cham Pharm Teach Learn. 2019;11:528-532. doi:10.1016/j.cptl.2019.02.015.