

A Longitudinal Integrative Course Series to Prepare Students for Advanced Pharmacy Practice Experiences

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Abstract

Background: This paper describes a series of integrative courses intentionally designed to prepare students for Advanced Pharmacy Practice Experiences (APPEs) in a block system curriculum. **Innovation:** Three integration blocks are interspersed throughout the didactic curriculum to serve as checkpoints to ensure competency as students progress in the curriculum, rather than waiting until the end to determine competency. Complex patient case discussions and a series of high-stakes assessments are used to reinforce and evaluate cumulative retention of knowledge, skills, and attitudes. **Findings:** Class of 2022 exam results showed that in the cohort of students who failed the high-stakes comprehensive knowledge assessment (CKA) and pharmacy calculations exams during the first integration block (IB), failure rates decreased in subsequent IBs, indicating early detection of knowledge deficiencies and either exam performance improvement in each IB or failure to progress to the next IB. A survey of the same cohort indicated that the final integration block prior to advanced pharmacy practice experiences (APPEs) helped improve confidence in applying key knowledge and skills into practice. **Conclusion:** The series of integration blocks designed and implemented at WesternU provides opportunities to reinforce knowledge and skills while requiring students to demonstrate maintenance of core competency as they progress through the curriculum.

Keywords: capstone course, curricular integration, pharmacy education, high-stakes assessment, curriculum design

DESCRIPTION

In professional pharmacy education, retention of knowledge, development of skills, and building professional attitude are all vital, as they aim to produce practice-ready pharmacists. Pharmacy education is broadly divided into two components: didactic and experiential education, with the former laying the foundation for the latter. As such, ensuring advanced pharmacy practice experience (APPE)-readiness and thereby promoting practice-readiness, serves as an interim goal for the didactic component of PharmD education. The Accreditation Council for Pharmacy Education (ACPE) standards provide guidance on defining APPE- and practice-readiness.¹ However, the responsibility of determining how to achieve these goals lies with each pharmacy program.

Curricular integration is a commonly used approach to enhance retention in professional education, including pharmacy.² Data supports the idea that structured repetition, application and reinforcement of knowledge and skills improve retention.³ Several models of capstone courses at the end of the didactic curriculum have been shown to improve student preparedness

for APPE.⁴⁻⁶ Additionally, studies have examined the correlations between various assessments in pharmacy curriculum and APPE performance.⁷⁻⁹ However, a single capstone course with multiple diagnostic assessments at the end of the didactic curriculum may lead to delayed detection of struggling students. A system developed at Western University of Health Sciences College of Pharmacy (WesternU) aims for early detection and preparation throughout the curriculum to ensure APPE-readiness.

STATEMENT OF INNOVATION

The curriculum at WesternU is delivered through a block system. Three integration blocks (IBs) were strategically interspersed throughout the didactic curriculum to serve as maintenance checkpoints for student retention of cumulative knowledge and skills acquired in prior courses. The IBs do not introduce new concepts, but rather serve to integrate and reinforce previously acquired knowledge and skills and evaluate students using a series of high-stakes assessments that are consistent, yet progressive, as they matriculate through the IBs, as seen in Figure 1. Rather than waiting until the end of the didactic curriculum to detect students who are unprepared to transition to APPE, this approach allows students multiple opportunities to identify their weaknesses and adjust their strategies to better prepare for core competencies. The purpose of this report is to describe the structure, logistics, and evaluations of the IBs.

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Figure 1: Cumulative Structure of Integration Blocks and Assessments

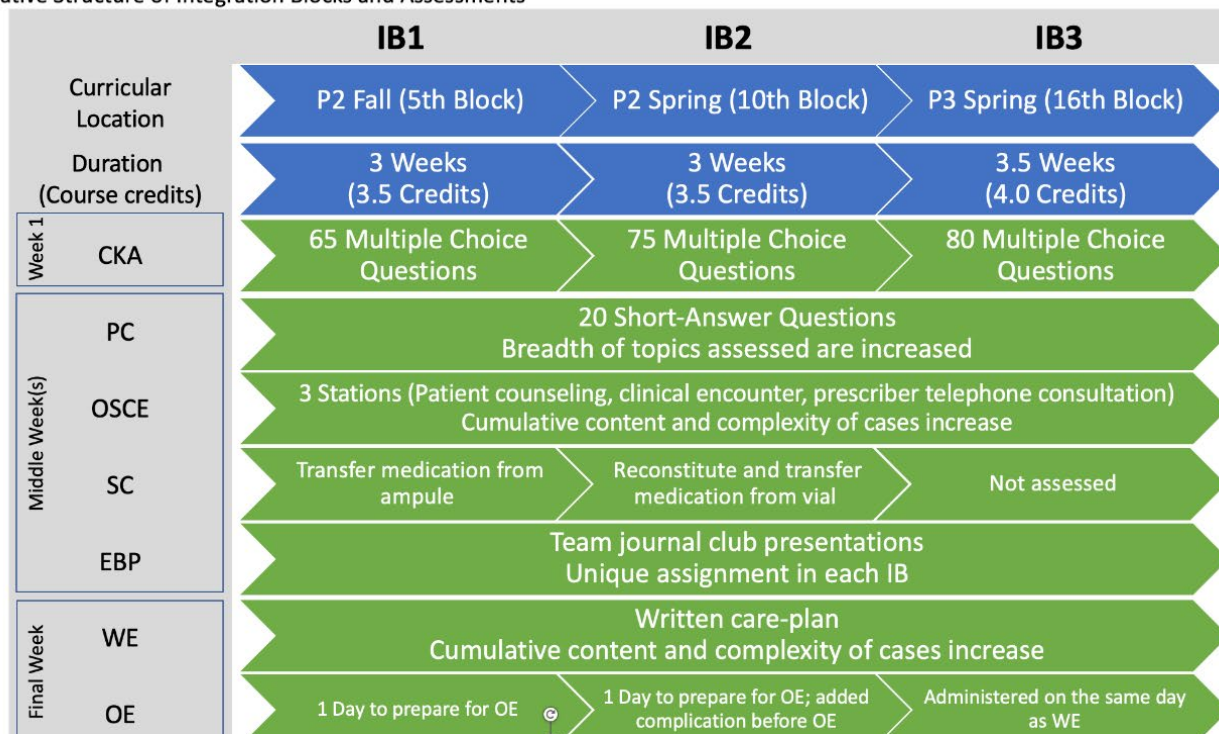


Figure 1: Block structure is highlighted in blue and assessments in green. Abbreviations: CKA = comprehensive knowledge assessment, EBP = evidence-based practice, IB = integration block, OE = comprehensive case-based oral examination, OSCE = objective structured clinical exam, PC = pharmacy calculations exam, SC = sterile compounding practicum, WE = comprehensive case-based written examination.

DESCRIPTION OF THE INNOVATION

Course Structure and Instructional Strategy:

The 4-year professional curriculum at WesternU is composed of 2.5 years of didactic curriculum delivered in a block system (i.e., one course at a time sequentially, each lasting 3-4 weeks) followed by 1.5 years of experiential curriculum. While the block system allows more flexibility in incorporating innovations in curricular design, the rapid pace and short duration of courses may channel learning into short-term memory. In order to aid knowledge retention, three IBs were placed in the middle of P2, at the end of P2, and as the last course in the didactic curriculum midway through the P3 year, to ensure smooth transition to experiential education. Students are expected to enter the IBs retaining fundamental knowledge and skills previously acquired; that way, they can engage in higher-level application and problem-solving exercises and demonstrate proficiency through a series of assessments, many of which are administered as high-stakes. A comprehensive study-guide mapping core competencies to different courses is provided to students four months prior to the first IB to use as a guidance document to prepare for all of the IBs. The study guide includes questions for each major topic organized by course. It also includes a list of key medications and important information related to each medication.

The IBs start with a student survey to assess topic and skill preparedness. Students then take the Comprehensive Knowledge Assessment (CKA), which covers the information defined in the study guide. In the first two weeks, the integration of topics is facilitated through complex case-based learning in teams, paying close attention to areas identified as weaknesses in the initial survey. Each IB usually consists of three inpatient complex cases, and three ambulatory care complex cases, with transitions of care components integrated into one case. Each case requires approximately four to six hours of class time. Patient interviews, physical assessment, or conversations with a medical provider to replicate real-life patient-care environments are also incorporated into some cases. The IBs culminate with a week of major assessments. As described in Table 1, each assessment was intentionally developed to assess fundamental knowledge, communication skills, critical thinking skills, pharmacy practice skills, professional attitude, or a combination of these. Communication skills, pharmacy calculation, and sterile compounding are all taught during the P1 year; however, students must demonstrate retention of these skills in each IB. Due to the increase in breadth of therapeutic knowledge and practice skills covered over the curriculum, IB blocks become increasingly more challenging sequentially.

Table 1. Structure, Purpose and Mapping of Integration Block Assessments

Assessment	Format	Purpose	High-Stakes	Aptitude Outcome(s)	Study Tools
Clinical Knowledge Assessment (CKA)	Multiple choice exam	Assess retention of basic cumulative knowledge	Yes	Knowledge	Study guide
Pharmacy Calculation (PC)	Calculations-based short-answer written exam	Assess ability to solve patient-specific pharmacy calculations	Yes	Knowledge, skills	Pre-recorded lectures from P1 year and practice problem sets
Evidence Based Practice (EBP)	Critical appraisal of evidence via team presentation followed by question and answer	Assess ability to critique, utilize, and communicate evidence in making therapeutic decisions with appropriate communication and professionalism	No	Knowledge, skills, attitude	Prior EBP lecture critically appraised topic handouts, grading rubric
Sterile Compounding (SC)	Hands-on demonstration of sterile compounding techniques	Assess sterile compounding skills including proper technique, and maintenance of sterility and accuracy	Yes	Skills	P1 lecture material, independent practice session in lab
Objective Structured Clinical Exam (OSCE)	Multi-station simulation of patient care roles with written and oral components	Assess ability to demonstrate pharmacist role in interacting with patients and other health professionals	No	Knowledge, skills, attitude	Standard communication rubric, sample station formats, P1 OSCE experience
Case-based Written Exam (WE)	Case-based, closed-book written patient care plan for three specified disease states	Assess ability to think critically and problem-solve a complex patient case.	Yes	Knowledge, skills	In-class case discussions, template format
Case-based Oral Exam (OE)	2-minute patient presentation followed by Q&A session with a faculty evaluator	Assess ability to present patient case to another health professional and demonstrate application of knowledge and clinical reasoning skills	Yes	Knowledge, skills, attitude	In-class case discussions, 2-minute presentation guide, grading rubric

Students who do not achieve a passing score on any of the high-stakes assessments are given one opportunity to study and retake the assessment, which is a different exam composed of similar content. Only students with a course grade of 70% or higher at the end of the IB are eligible for the retake assessments, and retake opportunities are limited to a maximum of 2 different high-stakes assessments per student per IB. Students who are not qualified for the retake assessments or failing to achieve a passing score on the retake assessments receive a “no pass” grade for the IB. Students receiving a no pass for the course are provided one opportunity to remediate the entire course at the end of the school year. Failure to remediate successfully will require repetition of the course the following academic year. A maximum of two courses can be remediated per academic year.

The IBs require a coordinated team effort to prepare and execute. Each IB is facilitated by two faculty members, one acute care specialist and one ambulatory care specialist. This allows proper integration of knowledge and skills applied in both inpatient and outpatient practice settings, as well as transitions of care. Additionally, an Integration Task Force consisting of all six of the IB facilitators, three additional faculty and the Associate Dean for Curricular Affairs meet regularly to ensure continuity and consistency among the IBs. The high-stakes assessments, exam blueprints, and grading rubrics are developed collectively by this group. The Integration Task Force holds semi-annual retreats to review the performance data for all major assessments, survey results, and facilitator reflections on logistics. These three major components, along with feedback from students, are utilized to determine key changes for future IBs.

CRITICAL ANALYSIS

Literature supports effectiveness of capstone courses occurring at the end of the didactic curriculum.⁴⁻⁶ However, our curriculum instituted multiple capstone courses to reinforce mastery and to provide diagnostic opportunities for achievement of competency along the way.

For the Class of 2022, 21 (15.7%) students did not pass the initial CKA during the first IB. Of those 21 students, 6 students passed all subsequent CKAs, perhaps indicating that the assessment was successful in serving as an early warning for these students to modify study and test preparation habits. Six students in this class ultimately did not progress into P3 and all of those students failed the first CKA. Failure of the first CKA may be a sensitive indicator of students at high risk for academic non-progression and could be used with future classes to offer early intervention academic assistance to specific students.

Seventeen (12.7%) students in this same class failed the pharmacy calculation exam in the first IB, ten of those students failed in the second IB, but only one of those students failed in the third IB, with two of the students not progressing to P3.

Students who fail the pharmacy calculation exam in any IB are encouraged to meet with faculty to identify strategies for improving pharmacy calculation skills, including peer tutoring, practice problem resources and attending faculty office hours. As a result, we observed decreasing failure rates with each IB among the cohort of students failing the pharmacy calculation exam in IB1.

In 2017, the Integration Task Force was alarmed by over 60% of the Class of 2019 students identifying immunization as a topic that they felt *least* prepared for transitioning to practice through the survey administered at the beginning of the IBs. This was surprising given that all students successfully earned American Pharmacists Association Immunization Certificates during their P1 year. The Task Force recognized that continual reinforcement and practice was needed to boost student confidence in recommending patient specific vaccinations. A decision was made to have students routinely evaluate and recommend vaccines for all cases discussed in all IBs and to incorporate immunization into oral exams. In 2022, the data collected for the Class of 2024 showed that only about 25% of the students identified immunization as a topic that they felt unprepared for in practice.

In 2021, additional questions were added to standard course evaluations for the IBs to evaluate student perceptions on effectiveness of the IBs. During the last IB for the 2022 class, over 98% of the students responded that they agreed or strongly agreed that because of their experience in IBs, they felt more confident in their ability to think critically and apply the knowledge into patient care. Most students also agreed or strongly agreed that because of the IBs, they felt more confident in their communication skills (97.71%), pharmacy calculation skills (98.5%), and literature evaluation skills (98.5%). For sterile compounding skill, only 83.34% of the students either agreed or strongly agreed that their confidence increased because of their experience during IBs. However, this was most likely impacted by the COVID-19 pandemic that led to less hands-on practice of sterile compounding skills for this cohort of students. The students and alumni have always provided overwhelmingly positive feedback regarding the IBs unofficially and officially through curriculum focus group meetings. This data supports that the positive feedback received in the past is representative of the overall student perception.

The primary curricular goal at WesternU is to deliver an innovative educational program that prepares life-long learners for successful careers in pharmacy. Achieving professional competency requires an intricate interplay of pharmacy knowledge, skills, and professional attitude. Multi-dimensional teaching and assessment strategies deployed in IBs are instrumental in attaining this curricular goal. Although this approach is resource-intensive, we believe that the added reinforcement of knowledge and skills is critical to our

program's success in transitioning students into independent clinicians.

NEXT STEPS

Future plans include validating APPE-readiness of the students that successfully matriculate through the IBs. Most students successfully complete all APPE rotations in their first attempt (e.g. 96.3% for PharmD 2022). We plan to evaluate the small percentage of students who are not successful in APPE and identify gaps in early detection of these students in the IBs. Additionally, APPE evaluation tools will now include a component for preceptors to evaluate the overall APPE-readiness of the students at the beginning of the rotation. Other plans include exploring correlation between student performance in IBs and different APPE evaluation domains, such as professionalism/communication, pharmaceutical care, and pharmacy practice skills.

Conflicts of Interest: None

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