Design and implementation of a novel doctor of pharmacy curriculum

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Abstract

Introduction: The University of California San Francisco School of Pharmacy has a rich tradition of transforming curricula to graduate pharmacists who are equipped to serve the current and future healthcare needs of the public. **Description of programme**: This paper describes the process of the design, build, and implementation of a three-year, year-round, competency-based, integrated, Doctor of Pharmacy curriculum with a pass/no pass grading policy. **Evaluation**: A variety of data streams are in place to collect data on courses, teaching, and student performance as part of continuous quality improvement activities. **Future Plans**: In addition to traditional evaluation metrics of the curriculum the school will implement a career outcomes project to track students' career and employment placements. The results of the evaluation and assessment activities will be shared in future manuscripts.

Introduction

Curriculum transformation is in the 'DNA' of the University of California San Francisco (UCSF) School of Pharmacy (SOP). The School has a long and rich history of curriculum transformation efforts that prepares its graduates to serve the current and future healthcare needs of the public. The roles and responsibilities of pharmacists have evolved over time, similarly UCSF has evolved its curriculum to align with those evolutions. As far back as the 1960's with the project known as the '9th Floor Project' (Smith *et al.*, 2015) UCSF SOP took the lead in advancing pharmacists as medication experts and less of a medication dispenser. It then became necessary to change the curriculum requiring additional training outside of the classroom setting and thus clinical patient care rotations became a new requirement of the Doctor of Pharmacy degree programme in the 1970s. Today, pharmacists serve as medication experts on healthcare teams ensuring that

patients are on evidence-based and cost effective medications to treat medical conditions.

The next curriculum shift occurred in the late 1990's with the goal to develop models of education that went beyond the conventional training of pharmacists to work in hospital and community pharmacy. The professional roles for pharmacists again began to change and a need was growing to have pharmacists who were prepared to take on roles in areas of research related to drug discovery, new models of patient care, cost-effective models of care, public health policy, informatics, pharmacy administration, and information management. In 1998 the 'Pathway' curriculum was implemented to expose learners to these new roles and the exponential growth of scientific data. The 'Pathway Curriculum' allowed students to pursue one of the following three pathways that culminated in a capstone research project. The pathways were:

1. Pharmaceutical Care that focused on patient care activities and emphasised the development of clinical pharmacy practice skills,

2. Pharmaceutical Sciences that focused on basic and clinical pharmaceutical sciences research (i.e. drug discovery and development and pharmacogenomics), and

3. Health Services and Policy Research which focused on policy, economic, and health services research.

As we moved into the 21st century it became even more apparent that along with the continued evolution of pharmacists' role, the increasing amount of scientific medical information, and the enormous numbers of drugs being produced, change again was inevitable. Pharmacists became more involved in managing therapeutic regimens of chronic medical conditions in acute and ambulatory patient care settings, and there were increased opportunities in the pharmaceutical industry for a Pharm.D. graduate to participate in drug discovery and clinical trials. The time had come once again for the school to fulfil its responsibility to find alternative ways to prepare learners to make contributions to improving the quality of health care as clinicians and scientists in the 21st century.

The purpose of this paper is to describe the process by which UCSF undertook (2014 – 2018) to design, build, and implement a bold and innovative curriculum that was implemented in July 2018. The paper will describe the infrastructure built to support the project, strategies used to involve faculty, staff, learners, our UCSF partners, and external stakeholders during this process, lessons learned, and the future work required to sustain and continually improve the quality of the new curriculum.

The catalysts for change

The UCSF SOP found itself in a unique time in history as curriculum transformation was sweeping the Unite States. The school made the decision to rethink how our curriculum would change to prepare pharmacists to practice in the 21st century. Many factors were taken into consideration that provided the rationale for a total redesign of the curriculum. First, we were faced with the rapidly changing global landscape of the healthcare environment and how pharmacists continue to take on non-traditional roles in all patient care settings as medication experts, members of interprofessional healthcare teams, researchers, and patient advocates.

Second, changes in regulatory and law requirements in California expanding the scope of pharmacy practice along with the implementation of the 2016 Accreditation Council on Pharmacy Education (ACPE) standards for Doctor of Pharmacy programmes necessitated that we ensure that this programme met the regulatory requirements and standards for our learners to be practice ready upon graduation.

Third, being part of a campus that is focused on the health sciences, it was an opportunity to continue to make the science the focal point of the curriculum in new ways and frame the teaching and training that would allow learners to develop a scientific mindset to view problems and develop solutions. It had become clear that the amount of information has increased exponentially but the time to teach the programme as required by the accrediting agency had not. The challenge was to design a curriculum that would teach learners how to not only learn facts, but also how to think, evaluate, and synthesise information from a variety of sources and thus using their judgment make the best informed decisions (Duffy, 2011; Romanelli, 2017). The authors desired to create a curriculum that would be nimble and flexible to allow for continuous quality improvement revisions.

Fourth, due to the financial implications of increasing costs of higher education and costs of living in the San Francisco Bay area the authors took under serious consideration how they could shorten the time to graduation, post-graduate training, and employment. Other important considerations included the costs of delivering a curriculum that required increased numbers of staff and the use of various education technologies and platforms.

Lastly, the UCSF community of health profession programmes (dentistry, medicine, nursing, and physical therapy) were at various stages of curriculum transformation and this allowed the programme to better align specifically with the school of medicine to support interprofessional education opportunities.

Methods

Fundamental design process

Curriculum reform does not originate from the administrative level alone, therefore, to be successful faculty, staff, and learners must be intimately involved in the change process. The authors sought to cast a wide net of engagement both with internal and external stakeholders to revolutionise our curriculum. This included soliciting input from UCSF SOP administrators, faculty, staff,

preceptors, alumni, and learners. Several interprofessional groups comprised of educators and administrators were formed to better understand how each school was tackling their own curriculum challenges and further explore potential collaborative solutions for integrating interprofessional education into each school's curricula, in both didactic and experiential learning.

In 2014, UCSF SOP embarked upon its first of several faculty retreats to discuss the reform of its Pharm.D. curriculum. Led by both internal UCSF leaders as well as outside invited guests, the retreats provided a platform for open discussion, small group dialogue, and free spirit exploration of how the Pharm.D. curriculum could be reimagined. It provided an opportunity for introspection to identify the limitations of our Pathway Curriculum as well as establishing goals and future aspirations for the new curriculum and the pharmacy profession.

The UCSF SOP early in its planning stages created a committee called DRIVE—Design, Resources, Integration, Visioning, and Execution Team. DRIVE was charged with designing a framework and schedule for the curriculum and to create multiple workgroups responsible for detailing the specifics around different aspects of the curriculum including the didactic component, the skills component, the inquiry component, and finally the 'staff support' to complement each of these areas. The experiential programme of the authors Introductory Pharmacy Practice and Experiences were modified and the Advanced Pharmacy Practice Experiences basic structure and sequence of rotations remained the same. The Drive Team's work was completed in March 2016.

Essential to the success of any curriculum is the collaboration amongst its faculty. UCSF prides itself on the accomplishments of its scientific research and its faculty have contributed heavily to the armamentarium of science knowledge upon which good clinical practice rests. Historically, basic scientists responsible for teaching in the UCSF Pathway curriculum were at a loss as to what pharmacists did and what exactly pharmacy learners needed to learn or were expected to know. This challenge was due to the systemic silo design of the curriculum which did not lend itself to collaboration amongst faculty. The faculty retreats provided a unique forum for faculty to break down the silos that existed amongst the courses in the legacy curriculum as well as an opportunity to better reacquaint colleagues with one another. To facilitate the conversation, the SOP adopted the UCSF School of Medicine Six Domains of Science (Biomedical, Clinical, Social and Behavioural, Epidemiology and Population, Education, or Health Systems Sciences) to drive the

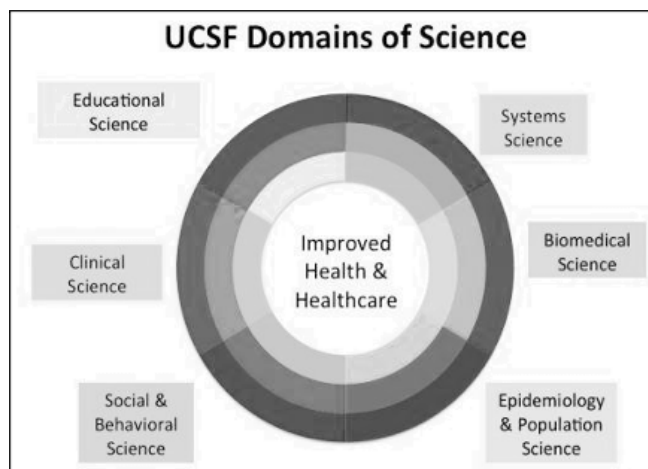curriculum building process and to bridge conversation amongst faculty, pictured below.

Figure 1: Domains of Science – UCSF School of Medicine

The SOP also established the Student and Stakeholder and Advisory Committee (SSAC) to formally engage stakeholders and solicit feedback on the curriculum implementation process. This committee was comprised of current preceptors, alumni, administrators and pharmacists that partner with the UCSF SOP experiential program, faculty and learners. It allowed learners in the Pathway curriculum to represent their constituents (each of the four classes) and receive information regarding the progress of the new curriculum. Once the new curriculum was launched, learners from the new curriculum were also represented on the SSAC. This overlap of learner representation—from both the new and legacy curricula—also created a valuable conduit of information sharing and sound inquiry between the two learner cohorts and the other stakeholders.

A vital component to the UCSF SOP curriculum design process was the use of a project manager. In conjunction with the project manager, a project consultant was used to help establish processes. Before embarking upon any major curriculum reform, systems had to be created whereby roles and responsibilities were defined and redefined, communication channels were created, and a process for decision making and archiving decisions was established. The project consultant also identified major resources needed and a systematic process to track the various needs throughout the project. Once all aspects of the project were identified by the consultant, these elements were handed over formally to the project manager to oversee the curriculum reform and sustain the systems created by the consultant, faculty, and staff.

Fundamentals of the novel curriculum

The transformed Pharm.D. curriculum—a three-year-round, 12-quarter integrated programme—was launched in 2018. It was designed and implemented with the intention of creating an integrated, contemporary, and flexible program of learning. Its approach is predicated on the vision that tomorrow's pharmacist must be a lifelong learner who is scientifically and clinically enlightened, patient and service-centered, and who understands the economic underpinnings of the US health care system. Faculty wanted to strive to train learners who will ultimately provide informed and compassionate care while at the same time serving as leaders and change agents for the health care system and the pharmacy profession.

Historically, pharmacy education, as with most professional curricula, provided massive amounts of content directly to the learner and subsequent assessments very frequently required the learner to simply regurgitate the information back through examinations that contained multiple choice, fill-in-the-blank, or true/false questions.(Schuwirth & Van der Vleuten, 2011) Nearly two decades ago, ACPE specified that an examination of student outcomes 'should extend beyond the acquisition of knowledge by students to the application of knowledge and skills in the care of patients in improving medication use' thereby shifting pharmacy education from a completion of requirements to an achievement of learning outcomes (Anderson, 2005; DiVall *et al.*, 2014).

With the rapidly ongoing evolution of the fields of pharmacy, UCSF SOP recognised the need to re-evaluate not only how it assessed its learners, but how key material was delivered and what was the learner experience. It embarked upon a paradigm shift embracing the ideal that it is not what a learner knows, but what one does with what they know. The authors therefore moved to a competency-based curriculum, a novel transition for pharmacy education. Such a curriculum emphasises the complex outcomes of a learning process (i.e. knowledge, skills and attitudes to be applied by learners) rather than mainly focusing on traditionally defined subject content learners are expected to master. The curriculum, in principle, is learner-centred and adaptive to the changing needs of learners, teachers and society. It implies that learning activities and environments are chosen so that learners can acquire and apply the knowledge, skills and attitudes to situations they encounter in everyday life. Delivery of the Pharm.D. curriculum is based upon five

components (threads) that are intimately woven over a three-year period.
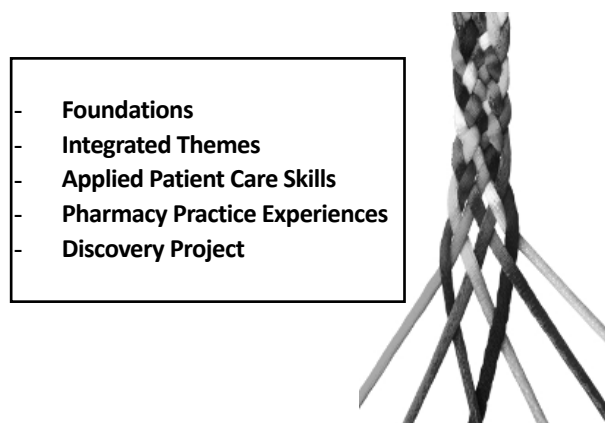

- **Foundations**
- **Integrated Themes**
- **Applied Patient Care Skills**
- **Pharmacy Practice Experiences**
- **Discovery Project**

Figure 2: UCSF Curriculum Five Components

The approach to assessment of learner performance in the Pharm.D. programme is integration across the curriculum beyond any one subject or course and embraces the philosophy of assessment for learning. (Pearson & Hubball, 2012) Integrated coursework along with integrated assessments encourage learners to connect all of the knowledge and skills they are learning in the classroom and clinical settings. The assessment programme promotes an individual path for each learner's competence in the unique knowledge, skills, and attitudes necessary for a successful pharmacist. Assessment activities contribute significantly to the learner experience by giving each learner ongoing feedback about performance that is key to guiding their individual next steps in achieving the required Pharm.D. competencies and milestones.

18 core educational outcomes define the expectations for learners throughout the curriculum. Frequent formative assessments will guide learners, promote reflection, and help shape learner values about continuous improvement in their practice of pharmacy. Formative assessments have additional benefits because the act of testing has a positive direct impact on learning. Numerous studies suggest the active process of retrieving information from memory strengthens memory and leads to longer retention than re-studying or reviewing material (Carpenter *et al.*, 2008; Roediger, & Karpicke, 2006; Spitzer, 1939). Summative assessments are designed to evaluate learning at the end of an instructional unit in comparison to an established standard or benchmark. Both forms of assessments are constructed around short answer or essay and complex multiple-choice questions, forcing the learner to demonstrate not only mastery of

fundamental content, but how they apply their foundational knowledge to new clinical scenarios.

Conversion to PASS/NO PASS curriculum

The SOP faculty adopted a PASS (P) or NO PASS (NP) grading policy for all academic work towards the Pharm.D. degree. The expected standard of achievement for learners in the Pharm.D. curriculum is a passing grade (P) for all coursework. A learner passes a course by demonstrating the requisite knowledge and skills and application of those knowledge and skills, at a level of competency established by the faculty. How learners perform in a course is measured through assessments and all other activities and requirements in a course.

The process of shifting from a traditional grading schema to a pass/no pass model started with an extensive literature search and exploration as to why other professional schools employed this paradigm. Johnson, Johnson and Holubec in Advanced Cooperative Learning (1998) suggest how the selection of an evaluation system is intimately related to the pedagogy of an educator and ultimately impacts the structure of education delivered. In learning environments where tiered ABCDF grading schemes are in place, individuals strive for benefits that enrich themselves, often to the detriment of others. However, in a more cooperative learning environments established by pass/no pass grading schemas, learners seek beneficial outcomes for both themselves as well as all other group members. 'What pass/no pass grading is meant to represent is a distinct move towards criterion-referenced standard setting' (Wilkinson, 2011).

Students overwhelmingly matriculate into the UCSF SOP from intensely competitive undergraduate programmes. Yet, to become a successful member within a healthcare team, the development of strong collegial relationships and a more collaborative mindset is required. Such professional characteristics, in conjunction with self-directed lifelong learning, necessitate persistent nurturing and deliberate practice. It is thought that pass/no pass grading fosters such an environment of learning for adult learners (White & Fantone, 2010).

Scouring the literature revealed no recent publications from the arena of pharmacy education addressing pass/no pass grading on academic outcomes or student well-being. A paucity of literature exists on effective grading schemes for clinical education and what does exist originates from medical education. Medical schools first explored pass/no pass grading in the late 1960s trying to tackle concerns over learners 'performing for a grade' at the expense of

the fundamental values of learning, in addition to demonstrating a tenuous relationship between grades and internship performance (Korman & Stubblefield, 1971). Pass/no pass grading was also found to decrease competition for grades without compromising the time spent by students studying (Jessee & Simon, 1971). As a result, several medical schools began converting their curricula to pass/no pass grading systems.

Short and Bloodgood (2009) references data from AAMC which reports that that among US schools of medicine (N = 133), 40 use two grading intervals (usually pass/fail), 35 use 3 intervals (usually pass/fail/honors), 32 use four intervals (usually pass/fail/honors/high honors) and 26 use five intervals (usually A/B/C/D/F) during the pre-clinical years. Some of what complicates study in this area is a lack of clear definitions combined with multiple measures of assessment.

When considering the shift to pass/no pass, the UCSF SOP followed its extensive review of the literature with multiple presentations to faculty. This provided an opportunity to deliver a consistent set of facts to faculty and solicit feedback upon which to revise the proposed grading schema. Outreach to residency program directors and clinical preceptors also took place to better understand the implications of a new grading program and its downstream effects. The pathway curriculum was already comprised of 42.6% of courses which were designated as pass/no pass, mostly experiential courses. Therefore, the debate centred around its value in the didactic courses.

Governance of curriculum development

The UCSF SOP employs the Curriculum and Educational Policy Committee (CEPC) to govern its Pharm.D. curriculum. In addition to maintaining its traditional curriculum, CEPC assumed responsibility for the approving the new Pharm.D. curriculum and the courses comprising it. CEPC fundamentally has three distinct roles within the SOP:

1. Curriculum development,

2. Programmatic evaluation, and

3. Quality assurance (including quality control and improvement).

The committee functionally writes curriculum policy and approves courses and/or course modifications. It routinely reviews course evaluations and other performance metrics, intervening with faculty when the committee deems necessary.

The committee is comprised of a mixture of faculty, administrators, staff, and learners. Faculty representatives come from each of the three departments in the SOP and there are learner representatives for each graduating class. The Chair of CEPC drives the agenda of the committee and regularly gives reports at the SOP faculty council and at faculty meetings.

As courses for the new curriculum were developed, CEPC approved each of these courses via a democratic voting process. While CEPC does not micromanage the daily delivery of individual course curricula, it does have a role in reviewing course objectives for the purposes of Pharm.D. curriculum continuity. CEPC is the one body within the SOP that has the view of the entire Pharm.D. curriculum which is important as a major change (e.g., removal or addition of a specific course objective) in a single course could have a downstream effect elsewhere in the curriculum. CEPC plays a vital role in ensuring both vertical and horizontal integration of content within the Pharm.D. curriculum.

CEPC plays a vital role in curriculum policy development for the new Pharm.D. curriculum. The committee took existing educational policies and engineered them into new drafts to reflect the needs and oversight for the new curriculum. It is the responsibility of CEPC to ensure policy alignment with ACPE 2016 standards (ACPE, 2015), the Center for the Advancement of Pharmacy Education (CAPE) 2013 outcomes (Medina *et al.*, 2013) and the Joint Commission of Pharmacy Practitioners (JCPP) (Joint Commission of Pharmacy Practitioners. Pharmacists' Patient Care Process, 2014). Internal alignment of new policies also occurred by reviewing them against UCSF SOP regulations and programmatic outcomes. Policies are finalised by the CEPC and then voted on by the faculty for final approval.

Implementation of curriculum

The cornerstone to implementation was the utilisation of an independent project manager who was not an educator, but one who bore the responsibility of the planning and execution of the curriculum-establishing a clear and defined timeline as well as ensuring vital milestones were completed. As we maintained the Pathway curriculum and began implementation of the new curriculum the Curriculum Transformation Team (CTT) was created in May of 2016. CTT was charged with specific oversight into the intimate composition of the curriculum and all of its courses. CTT was composed of education administration, faculty, and staff, meeting

regularly to work with issues both the curriculum and the administrative support needs. The project consultant worked closely with the along with (CTT) and the project manager and together developed a RACI (responsibility, accountability, consulted, and informed) chart to better organise faculty and staff with clearly defined roles.

One of the key efforts that CTT established was the Curriculum Readiness Review (CR2) as quality control checkpoints for the new courses. On a timed and monthly basis, each course of the new curriculum participated in a CR2 that all faculty could attend. This CR2 allowed the course director to share their course design, course objectives, course content, assessment and evaluation strategy, projected resource burden (from staff to technology), its integration amongst other courses and within the curriculum as a whole, as well as any challenges preventing launch of the course. CR2 served as a peer review process and allowed for further scrutiny of the course prior to CEPC formally approving the course. Once all courses in the curriculum had undergone a CR2 review, the CTT was retired and CEPC assumed oversight of both curricula in June 2020.

Curriculum administrative support

The design, build, and implementation of a curriculum is more than just new courses, labs, and learning materials. Faculty have limited time and often do not have the training required to maintain education technology systems, therefore an infrastructure is needed to support the curriculum and includes finances, education technology, and professional staff support. The Office of Education and Instructional Services (OEIS) was established to help support faculty with the delivery of courses whether it be large group, small group, skills labs, and the entire experiential program. Pharmacy education has evolved over the years becoming more complex with the integration of new teaching strategies and modalities as well as education technology to enhance the teaching and learning experience. The staff are made up of professionals with various education training and work experience in higher education, instructional design, and education technology.

The staff work in direct partnership with faculty and were part of teams building the curriculum. The team in charge of ensuring that the course materials are made available electronically, manage the systems for course and teaching evaluations, electronic exams, recording of lectures, training materials for faculty. The group serves as

the intersection in supporting students with their electronic devices required for courses work.

The staff are the custodians of the learning data and provide reports for ongoing assessment of student progress, course performance, and teaching performance. The staff stays up to date on the latest technologies that are being considered on a campus level as well as the specific needs of the Pharm.D. programme. This unit has been the secret sauce to the successful implementation. The staff responsibilities allow faculty to focus on teaching and administration of the courses and less on making the technologies work.

The Office of Student and Curricular Affairs (OSACA) played a vital role in the design and implementation of the new curriculum as a main function of the office is to nurture an environment that supports students success, professional development, and well being. With a new curriculum comes changes that are required to prepare prospective students to apply to the authors programme; The OSACA houses our admissions and recruitment activities for the programme. The admissions committee was charged with approving revised pre-requisite courses.

The outreach programme and web presence were redesigned to provide information not only on the programme itself, but to highlight the students who serve as examples of the types of students who would be a good fit for this programme. The authors have been fortunate to recruit very strong students, so they did not have to change the strategy of what we wanted, only to make if clearer from a communication perspective of what the new curriculum details.

An important component to any successful project is clear, concise, and continuous communication with all stakeholders, both internal and external. Updates were provided at school faculty meetings, department meetings, student leadership meetings, student town halls, alumni meetings, and updates from the Dean. Information was made available on the school's website to inform prospective students, alumni, and donors of the authors efforts.

Discussion

The oversight and ongoing evaluation of the curriculum rests with the faculty. Practices are in place to evaluate courses, teaching, and the lived experience of students. The ultimate evaluation is the how students are performing on assessments in terms of acquiring the necessary knowledge and applying that knowledge, skills, and values to achieve the curricular educational competencies.

A newly formed Assessment and Evaluation Team is responsible for assessment priority setting, oversight of assessment and evaluation activities, and ensuring that student learning and perception data are used to inform curricular decision making of faculty, committees, and school leadership. The Team is co-chaired by a faculty member and the assessment manager and the membership is comprised of faculty with expertise in the basic sciences, therapeutic sciences, and experiential education, and a staff member with data and technology expertise. One other main responsibility of the Team is to report out to various constituents within the infrastructure of the school, such as faculty, committees, department chairs, students, staff, alumni, and external stakeholders.

We are currently on the fourth iteration of the curriculum with the first cohort to graduate in Spring of 2021. The authors have made adjustments to courses based on student and faculty feedback. The current curriculum is flexible enough to make changes that will not collapse the course. Evaluation plans for assessment items are in place to ensure that the items indeed ask the students to demonstrate knowledge and skills that it was intended too.

Evaluation of the curriculum includes not only courses and assessment activities, but the impact of the schedule change for four calendar years to three years, eliminating the use of letter grades, and how the graduates perform in the placement of post-graduate training and employment opportunities. There are plans to monitor the resource needs for faculty and staff to support and administer the curriculum, related to education technologies and professional development.

Future plans

Moving forward we are now in the process of preparing for our ACPE site visit and the self-study report under the 2016 Standards. The authors plan to evaluate the impact of delivering this curriculum on faculty and staff. The authors want to evaluate the use of education technology and how, during the COVID-19 pandemic, in what ways has technology enhanced the teaching and learning experience. Plans are in place to collect career outcomes data from alumni at specific intervals and use the data to inform curricular changes that will prepare our students for the evolving post-graduate and employment opportunities. Further improve assessments that allow for students to demonstrate competencies in the didactic and experiential courses. The curriculum will be a work in progress with ongoing improvements.

Conclusion

The undertaking of building a new curriculum is time consuming and requires thoughtful attention to goals and objectives that the school is trying to achieve. It takes courage and bold thinking to make major changes, especially those that are not in the mainstream of pharmacy education. The concepts and philosophy behind the 'integrated' curriculum are often more well-conceived intellectually and pose other challenges once implementation begins. As with all new creations, time will tell the ultimate impact on our measures for success. The curriculum was built to be nimble and flexible to absorb any changes without destabilising the curriculum. The authors believe that this curriculum has very high potential to prepare students for current and future roles, traditional and non-traditional in the healthcare profession.

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