Implementation and preliminary evaluation of an Honours-Satisfactory-Fail competency-based assessment model in a Doctor of Pharmacy programme

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Abstract

Introduction: A competency-based model of student assessment in a United States (USA) Doctor of Pharmacy (Pharm.D) programme within a research-intensive university is described.

Description: A competency-based assessment model that assigns levels of performance as Honours, Satisfactory, or Fail (H-S-F) was developed and implemented. Short-term measures of student performance in the curriculum and student experience were evaluated.

Evaluation: The majority of students demonstrated competency on all assessments in either one or two attempts. Introductory Pharmacy Practice Experience (IPPE) preceptor evaluations were consistent with performance of previous students in a letter graded system. Student progression statistics have improved for students within the H-S-F assessment model.

Conclusion: Preliminary evaluation of the competency-based assessment model indicates that students are demonstrating mastery and competence in curricular outcomes and that the structure provides a framework that is successful in supporting student re-engagement and learning.

Keywords: *Assessment, Competency-Based, Curriculum, Pass-Fail Grading, Student Learning*

Introduction

In a time of healthcare reform in the United States (USA), it is important to rethink what the expectations will be for all members of the healthcare team, including pharmacists. As healthcare transforms, we are moving toward a new healthcare delivery model that will empower pharmacists to provide increasingly advanced direct patient care services. Pharmacy education should ensure that graduates are poised and capable to practice at the level required of expanding pharmacist roles. The success of this model of care will depend on pharmacists practicing at the top of their education or license.

In order to graduate competent, workforce-ready health professionals prepared to serve the increasingly complex needs of patients, communities and populations, there is growing consensus that education reform must occur in the areas of competency-based education and assessment (Hill *et al*., 2006; Frank *et al*., 2010; Frenk *et al*., 2010; Lurie, 2012; Soares, 2012; Englander *et al*., 2013). Frenk and colleagues, in the Lancet Commission's 2010 report on health professions for a new century, state that transformative learning within the health professions will include instructional reforms such as "adoption of competency-based curricula that are responsive to rapidly changing needs rather than being dominated by static

coursework" (Frenk *et al*., 2010: p.1951).The Lancet Commission report asserts that identification of sound metrics and assessment practices that focus on educational outcomes – in this case, competency-based education outcomes – serve to increase transparency to all stakeholders, including learners and policy makers (Frenk *et al*., 2010). Banta suggests that assessment processes should provide students with feedback about the desired level of performance and their actual performance, in order for them to understand their competency level and thus facilitate self-directed learning (Banta, 2001). Accreditation Council for Pharmacy Education (ACPE) Standards require that students demonstrate competency throughout the professional programme (ACPE Accreditation Standards, 2011; 2016).

Within a competency-based assessment model, learners are required and motivated to review and learn material until competency is reached and mastery of the material is demonstrated (Wilkinson, 2009; Wilkinson *et al*., 2011). Traditional grading models, which are commonly used in undergraduate or pre-pharmacy education, assess students on a relative scale (A-F) and sometimes utilise "grading on the curve," *i.e.* assigning grades to yield a Gaussian distribution among the students in a course (Bresee, 1976). These traditional grading models evaluate student

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performance relative to the performance of other students in the course, and assign a grade that reflects the average of all assessments completed. This manner of assessment is often poorly suited for demonstration of competency, particularly on individual assessments. By contrast, a pass-fail assessment model expects all students to achieve a pre-defined, absolute level of competency on each assessment, which is not dependent on the performance of other students. Such "criterion-referenced" grading models assess performance against specific, fixed, and clear standards that "…help to direct learning and make the achievement of one student independent of the underachievement of another" (Wilkinson *et al*, 2007; Wilkinson, 2011: p.860).

Medical education in the USA and Canada overwhelmingly use criterion-referenced pass/fail assessment models (American Association of Medical Colleges, 2016). The impact of the change to a pass/fail grading model on first and second year medical students was studied by Bloodgood *et al*., who found that student psychological well-being improved when a change to pass/fail grading was implemented (Bloodgood *et al*., 2009). A study by Rohe and colleagues revealed students self-reported lower levels of stress and greater group cohesion when the first year medical courses where graded as pass/fail as opposed to the five-interval grading system (A, B, C, D, F) previously used (Rohe *et al*., 2006). White and Fantone found that pass/fail grading of medical students supported collaboration and fostered intrinsic motivation, which is key to self-directed, lifelong learning (White *et al*., 2010). Collectively, these studies suggest that using a pass/fail grading system has the potential to create an environment where: individual stress is reduced; collaboration and group cohesion are reinforced; and individual autonomy, intrinsic motivation, and self-directed learning are supported (Rohe *et al*., 2006; Bloodgood *et al*., 2009; White *et al*., 2010).

Meeting health professions' accreditation requirements for teaching and learning is an important driving force for change. ACPE Standard 10 of the 2016 Standards states that colleges of pharmacy will "promote student responsibility for self-directed learning" (ACPE, 2016: p. 7). The prevailing definition of self-directed learning comes from Knowles: "in its broadest meaning, self-directed learning describes a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes" (Knowles, 197: p.18). This definition implies that self-directed learners need to be motivated and self-assessing, referencing their performance against clear standards-based competency measures to guide learning; in a word, self-aware. Standard 4 of the ACPE 2016 Standards supports this, highlighting self-awareness as a key ingredient for the personal and professional growth needed to become self-directed, lifelong learners (ACPE, 2016).

Acknowledging the shifting landscapes of both healthcare and education, accreditation requirements that emphasise

demonstration of competency, and the importance of student experience in fostering self-directed and lifelong learners, the Washington State University's College of Pharmacy (WSU COP) faculty reconsidered how student mastery of Doctor of Pharmacy (Pharm.D) curriculum competencies was being assessed in their programme. Up to this point, the COP delivered an outcomes-based curriculum and assessed students in a traditional manner assigning course grades of A, B, C, and F. Throughout the 2011-2012 academic year, the faculty considered and discussed the following questions: "Is there a better way to assess student pharmacists to ensure the development of competent pharmacists? Are our graduates ready to practice pharmacy in a way that supports the health reform goals of better population health and lower healthcare costs? What are the contemporary educational assessment models that align best with a competency-based curriculum?" Internal discussions examined the programme's existing use of pass/fail grading for advanced pharmacy practice experiences, as well as the growing support for a competency-based assessment perspective that would focus the entire Pharm.D programme on preparing competent pharmacist practitioners, rather than on attaining overall course grades. During the May 2012 faculty retreat, these deliberations culminated in the faculty decision to adopt a competency-based assessment model that utilised a criterion-referenced grading scheme.

Description of the Honours-Satisfactory-Fail competency-based assessment model

This manuscript describes the following elements of the newly developed assessment model: the goals; the planning process; the design and implementation of an Honours-Satisfactory-Fail (H-S-F) competency-based assessment model; and the evaluation plan for monitoring student performance and continuous quality improvement.

Goals

The following goals, as adopted by the faculty, underpin and form the context for the design of the Honours-Satisfactory-Fail Competency-based Assessment Model:

Goal 1. **Students will demonstrate mastery of knowledge and skills.** Mastery will be the focus of the student assessment process through frequently provided opportunities to demonstrate competency. Re-tests for specific content and skills will be made available to ensure students have multiple opportunities to demonstrate mastery of all subject matter.

Goal 2. **Students will demonstrate competence within the curriculum**. Competency will be linked to college level curriculum outcomes.

Goal 3. **Students will experience an environment that supports their success**. Students who do not reach competency will be identified early in the semester in order to support and engage them. In addition, an environment will be created that fosters student success while decreasing stress, competition, and anxiety by

shifting the culture from attainment of grades to demonstration of competency.

Planning Process

Following faculty adoption of the concept of competency-based assessment, a faculty implementation team was appointed. The faculty implementation team included representation from Professional Year 1 (PY1) teaching faculty, curriculum and assessment committees, student services, and college operations personnel. Their charge was to develop the overall design and implementation plan for the new assessment model. They determined the assessment process and provided guidance for the overall testing logistics, structure of assessments, re-engagement, and recognition of academic excellence.

A faculty development programme, which included four workshops, was instituted in January until May 2013. These workshops were coordinated by the Associate Dean for Professional Education and delivered by outside experts to assure an understanding of the competency-based philosophy. The workshops provided an opportunity for faculty to enhance skills in writing competency-based objectives, designing assessments that determine whether competency was met, and creating/delivering appropriate student re-engagement with material if competency was not initially met. The faculty development programme allowed faculty to embrace the new H-S-F assessment approach, while also promoting open debate that facilitated adaptive decision-making and kept an aggressive implementation plan on track. Ongoing faculty training and development continued as the assessment model rolled out and included faculty orientations to the H-S-F model. Faculty were encouraged to attend de-briefs at the end of each semester and monthly "brown bag" education sessions relevant to teaching in a competency-based model. In addition to the stated goals for the H-S-F assessment model, important elements of the implementation were driven by three faculty consensus decisions, made during the May 2013 faculty retreat, which proved pivotal to the design of the assessment approach.

Decision 1: **Competency definition and testing frequency for Honours-Satisfactory-Fail (H-S-F):** It was determined that required Pharm.D courses would be evaluated through H-S-F competency-based assessment during the May 2012 faculty retreat. Over the next year, faculty discussed and debated the most appropriate competency level. In department and faculty meetings, concluding at the May 2013 faculty retreat that a reasonable "cut point" grade for 'Satisfactory' would be 80%. This decision was based on a review of cut points of other competency-based assessment models in pharmacy and medical education (Wright, 2012; American Association of Medical Colleges, 2016). Faculty rationale concluded that in a traditional grading system, 80% represents a low "B" grade and that an 80% competency level would exceed a traditional college pass score (*i.e.* D<70%). In

addition, it was decided that requiring demonstration of competency in a pass-fail system would be best managed by both students and faculty by having frequent assessments that were focused on smaller amounts of material. Faculty consensus was that students would test approximately every two weeks. The criterion for satisfactory demonstration of competency was therefore set at no less than 80% on each assessment. The specific parameters for attainment of an honours, satisfactory, or fail grade are described in Table I.

Decision 2: **Adoption of computer-based testing software:** In a competency-based assessment structure, with planned frequent testing and requisite feedback to students for self-reflection and direction, it was crucial to provide students with test results in a timely manner - within 48 hours. With this structure in mind, ExamSoft®, a computer-based testing software package, was adopted (ExamSoft, 2016). ExamSoft® is a proprietary electronic testing software system that allows secure assessments and includes a variety of question types such as multiple choice, select all that apply, fill in the blank, and essay. For each assessment, students can receive a report on their performance on learning objectives and outcomes, and can compare their performance relative to other students in their cohort.

Decision 3: **Implementation sequence:** It was agreed that the competency-based assessment design would be rolled out with the PY1 class matriculating in Autumn 2013, with sequential adoption in subsequent years of the curriculum as the cohort transitioned to Professional Year 2 (PY2) and Professional Year 3 (PY3). An incremental and iterative process encouraged faculty self-reflection and responsive quality improvement as the change was implemented.

Table I: WSU COP Honours-Satisfactory-Fail (H-S-F) Assessment Model Parameters

Competency level	Description
Honours	Within the curriculum framework, the *Honours* grade in a course will be determined at the course level and varies by course.
Satisfactory	The student pharmacist demonstrates attainment of knowledge and skills relevant to the defined learning outcomes by achieving at least 80% on the outcomes/learning objectives assessed unless otherwise more stringently specified by the course syllabus.
Fail	The student pharmacist fails to demonstrate attainment of knowledge and skills relevant to the defined learning outcomes by achieving at least 80% on the outcomes/learning objectives assessed unless otherwise more stringently specified by the course syllabus

Figure 1: Competency Process with Multiple Attempts

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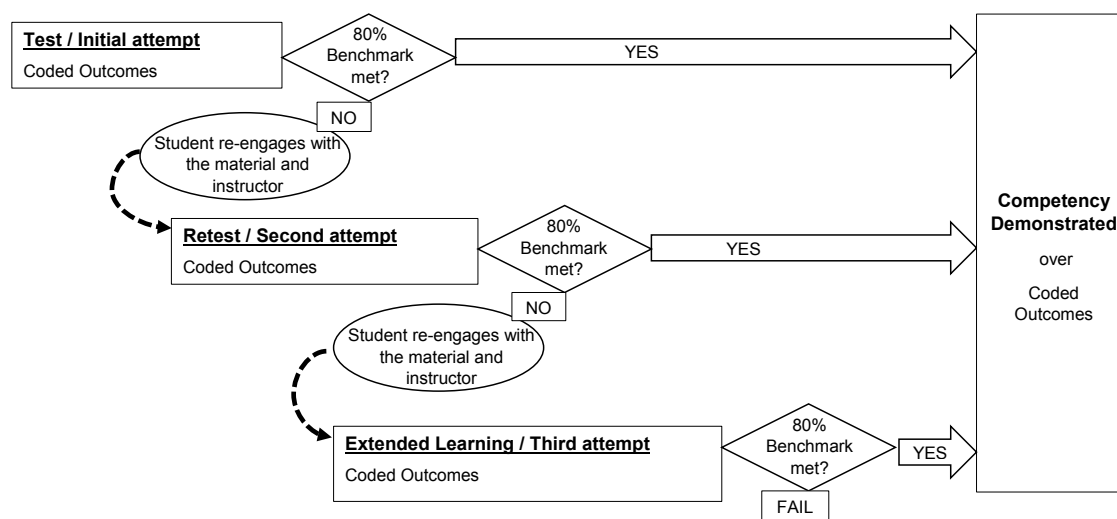
Structure of the H-S-F assessment model

In order to offer multiple opportunities to achieve competency, faculty in the focus group agreed that students should be provided three attempts to demonstrate the required 80% competency level for each summative assessment. For courses that utilised skills-based assessments, it was expected that students be provided with multiple attempts to demonstrate skills mastery. Figure 1 describes the block-testing process.

To facilitate the logistics of more frequent testing and additional testing attempts, tests from multiple courses are administered in the same block of time and thus are called "block tests". Six to seven block tests are scheduled for each course, at approximately two-week intervals within a 15-week semester. Each block test focuses on the preceding two weeks' material, and thus covers less information than was traditionally included in a mid-term and final testing model. Within the block, there is an individual test for each course and the number of tests within a block ranges from two to four, depending on the professional year. Each cohort takes their block tests during a single two to three-hour session, and approximately ten minutes of testing time is allotted for each credit hour of a course. The number of question items per test is approximately five to ten questions per credit hour. The majority of courses are two to four credits, with tests varying from ten questions for the two credit courses up to 30 questions for the four credit courses.

For each block testing period, the first attempt is called the 'initial test', the second attempt is called the 're-test' which occurs within one week of initial test and the third attempt is called the 'extended learning experience' (ELE), which occurs at the end of the semester. Students who are required to re-test are expected to keep up with new material while remediating on previous material. Students are required to achieve at least 80% on all assessments in order to pass the course. If a student does not reach an 80% after three attempts (initial test, re-test or ELE), it will result in a course failure. The maximum recorded score that any student can achieve on a second (re-test) or third (ELE) attempt is 80%.

While all courses within the competency-based assessment system utilise at least an 80% competency level, not all courses utilise the block-testing process. Non-block tested courses include lab-based courses, Introductory Pharmacy Practice Experience (IPPE) courses, electives, and other required courses not suitable to condensed testing.

Alignment of outcomes and assessments

The curriculum structure at WSU COP includes faculty-approved Competency-based Curriculum Outcome Categories including: Knowledge Acquisition and Critical Thought, Communication, Professionalism, Knowledge of the Profession, Medication Therapy and Management Systems and Operations (WSU College of Pharmacy, 2006). There are a total of 155 sub-outcomes housed under the six over-arching curriculum outcome categories. All outcomes and sub-outcomes are assigned and mapped to specific courses.

The computer-based testing system allowed for coding (or tagging) of questions and rubrics; this permitted the categorisation of the question bank according to the college's Competency-based Curriculum Outcomes and sub-outcomes, ACPE Appendix B accreditation standards, Bloom's taxonomy (knowledge, application, synthesis), systems, and course-level learning objectives (Bloom, 1956; ACPE Accreditation Standards, 2011). This allowed faculty to directly align question items with outcomes and learning objectives, and better ensure that the content, learning objectives, and cognitive level of questions were similar between each initial test, re-test, and ELE test.

Distinguishing academic excellence

During the planning process it was recognised that students would need the opportunity to demonstrate academic excellence for the following reasons: the Dean's List, admission to honour societies such as Rho Chi, academic scholarships, and residency applications. A multi-faceted approach was developed to highlight academic excellence in the absence of the traditional grade point average (GPA).

In the H-S-F model, students are able to demonstrate academic excellence through the achievement of 'Honours' within individual courses. In addition, a course average percent (CAP) approach was designed and implemented to provide meaningful student rankings. The CAP for each student is a calculated average of the students' final course percentages in all courses in any given semester. The CAPs are then used to determine the Dean's List each semester, and eligibility for Rho Chi membership from the third semester Dean's List and the sixth semester cumulative CAP. The cumulative CAP is included in the Semester Six Dean's Letter, which is provided to students during the residency application process and shares information with prospective residency committees about WSU COP's assessment model.

Student support with re-engagement and other services

To support student success, faculty identified the need to re-engage with student pharmacists who needed extra assistance learning course material as an important guiding principle. Faculty offered different approaches to the re-engagement process, which included any of the following: individual meetings, in-class and out-of-class review sessions, reports from ExamSoft® noting performance on tagged objectives, virtual chat rooms, and content clarification via email. Student participation in the re-engagement activities was optional, but strongly encouraged. The re-engagement process is believed to be an important step in developing self-directed and self-empowered learners by modelling different ways to identify and resolve knowledge gaps.

Students who did not reach competency on an assessment after two attempts in a block-tested course were invited, but not required, to meet with the Assistant Dean for Recruitment and Student Success to discuss effective strategies to support academic success. The intent of these 30-minute meetings was to uncover potential barriers that were preventing or stifling success. Topics of student meetings frequently included: identification of current learning strategies, improvement of learning strategies, effective time management strategies, approaches for engaging with faculty during office hours, referrals back to the Instructor of Record for additional course content related support, and information about counselling and learning support resources available both on- and off-campus.

Administrative support

A block-testing coordinator was hired to manage and communicate the logistics of a block-testing system, as well as to serve as the local super-user and faculty trainer for the computer-based testing system. For students, a block-testing schedule that included dates and times for the tests, re-tests, and ELEs was incorporated into course syllabi. For faculty, a coordinated calendar was developed to provide guidelines for test upload schedules, test result releases, and digital gradebook set-up. Responsibility for analysing and communicating aggregate results and data to the faculty was handled by the COP assessment office. Pass and re-test rates for each block-test were provided to all faculty electronically, analysed for Assessment Committee review, and discussed at faculty meetings.

Evaluation

An evaluation plan was implemented in order to assess progress toward achieving the three major over-arching goals of the H-S-F assessment model. Both short-term and long-term measures to evaluate these over-arching goals were developed as follows:

Goal 1. **Students will demonstrate mastery of knowledge and skills**. Short-term measures evaluating student mastery included tracking student re-test frequencies and student performance on IPPEs. Long-term measures evaluating student mastery included performance on advanced pharmacy practice experiences (APPEs), Pharmacy Curriculum Outcomes Assessment (PCOA) scores, pass rates on professional licensure examinations, employment and residency/fellowship rates.

Goal 2. **Students will demonstrate competence within the curriculum.** Short-term measures evaluating student achievement of competency will focus on student performance on WSU COP Competency-based Curriculum Outcomes (WSU College of Pharmacy, 2006). Long-term outcomes to evaluate success will include graduation rates, North American Pharmacist Licensure Examination (NAPLEX) and Multi-state Pharmacist Jurisprudence Exam (MPJE) pass rates, residency and employment rates, and satisfaction of employers with the caliber of graduates.

Goal 3. **Students will experience an environment that supports their success**. Short-term measures evaluating the student experience will include: 1) the number of students referred to and meeting with the Assistant Dean for Recruitment and Student Success; 2) student progression rates; and 3) student perceptions related to stress, camaraderie, and extra-curricular activity participation. Long-term measures that will be evaluated include student satisfaction with the educational experience.

The evaluation plan designed uses many data collection points. Described below is a summary of the data collection methods used to track short term measures of each goal:

Goal 1. **Students will demonstrate mastery of knowledge and skills**. At the end of each block test assessment, for each course, reports were generated indicating the number of students who achieved the 80%

benchmark for competency, and those who did not. These data were then categorised into numbers of students who demonstrated competency on first attempt, second attempt and third attempt. For each cohort, the competency attempts were aggregated by semester and by cohort, for six semesters for the Class of 2017, and four semesters for the Class of 2018. To verify that students were successful in IPPE, the Classes of 2017 and 2018 were compared to previous cohorts. IPPEs are scheduled during the summer between PY1 and PY2 (Community), and PY2 and PY3 (Institutional). Preceptors rate student performance on a variety of professional skills and behaviours using a scale of 1=does not meet expectations, 2=meets expectations, and 3=exceeds expectations. Each cohort is tracked according to an average of student ratings for that rotation, based on six or eight assessment items depending on rotation type.

Goal 2. **Students will demonstrate competence within the curriculum.** WSU COP's curriculum map includes six outcome categories and 155 sub-categories. Sub-outcomes are assigned to courses and question items are coded with the appropriate sub-outcome. At the end of each semester, competencies for the six outcome categories were calculated by ExamSoft® as an aggregate of student performance on questions coded to the sub-outcomes within each category. The competencies were reported as the student average percent correct. The outcome competencies were aggregated over six semesters for the Class of 2017 and four semesters for the Class of 2018.

Goal 3. **Students will experience an environment that supports their success.** The Assistant Dean for Recruitment and Student Success oversaw the student services unit that collected and reported attrition and progress data for students from the Class of 2017 and the Class of 2018. Data were summarised in the following categories as defined by the COP Academic Guidelines and the ACPE Standards: number of students decertified/ withdrawn, number of students with delayed graduation on academic probation, and number of students with on-time graduation on academic probation. Students placed on academic probation had received one or more failing grade in required coursework. These data were then compared to attrition statistics from two previous cohorts, Class of 2015 and Class of 2016.

In addition to progression statistics, student experience was evaluated through the H-S-F Student Surveys, which were designed to collect process improvement data as well as perception data related to certain aspects of the assessment model. These short electronic surveys were administered anonymously via Qualtrics™ at the end of each academic year. Specific measures were used to evaluate how the H-S-F competency based assessment model affected student experience in three important areas highlighted in our goals: perceptions of stress; camaraderie with peers; and time for co-curricular activities. Data related to students referred to and meeting with the Assistant Dean of Recruitment and student success was also tracked.

A continuous quality improvement (CQI) programme was implemented in order to assure that the H-S-F competency-based assessment processes were efficient and effective. Faculty and student input was frequently solicited to help evaluate and improve issues such as: question and assessment quality, student re-engagement, faculty workload, academic distinction, and block-testing logistics. Feedback was solicited through a variety of approaches, including: student town hall meetings, end-

Figure 2: Competency Attempts by Semester per Cohort
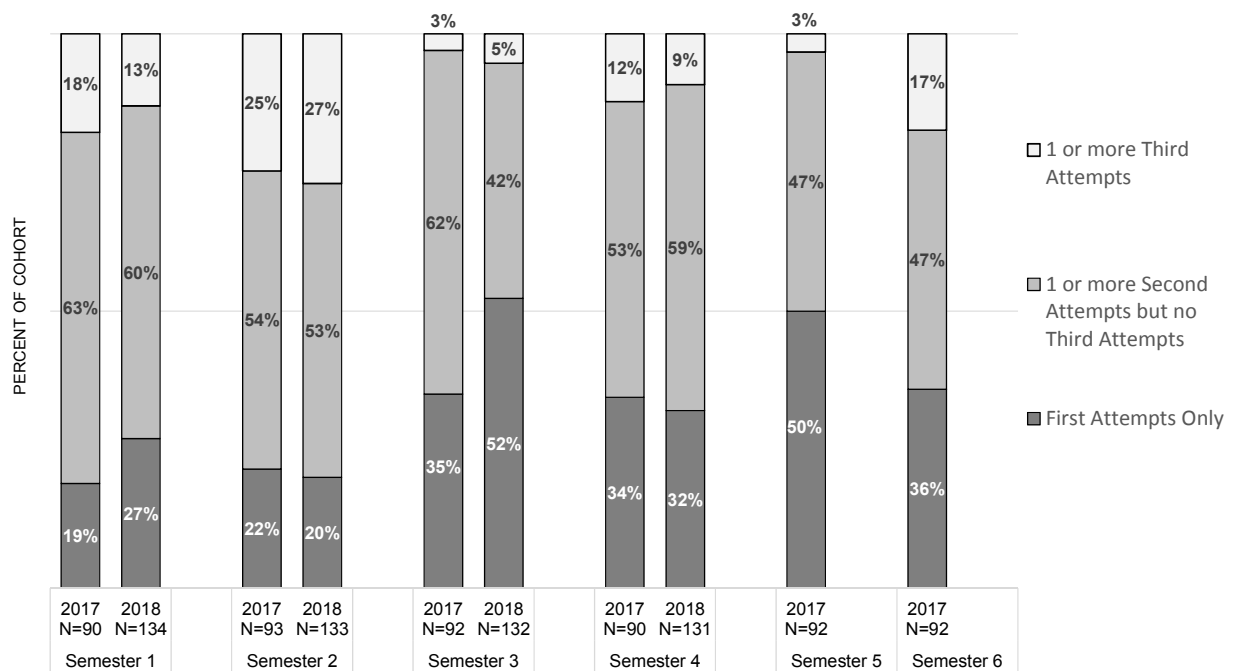
of-semester student and faculty H-S-F surveys, Pharmacy Student Advisory Council commentary, input from students serving on college committees (curriculum, assessment, and teaching/learning), and targeted surveys developed in response to anecdotal concerns.

Results of short-term measures

Demonstration of mastery and skills

Mastery of material in block-tested courses: The number of students who required one, two or three attempts to reach competency across all assessments in courses within a semester was measured for two cohorts, Class of 2017 (across six semesters) and Class of 2018 (across four semesters). For example, across all courses for the Class 2017 semester one, 19% reached competency on the first attempt, 63% reached competency with two attempts on at least one assessment and 18% required three attempts on at least one assessment. While results vary for each semester, data indicate that the majority of students reached competency within the first or second attempts. Detailed data are presented in Figure 2.

Student performance in IPPE: Cohort averages from preceptor evaluation in both Community IPPE (Class of 2017 and Class of 2018) and Institutional IPPE (Class of 2017) were on par with past evaluations of traditionally-graded student cohorts. Cohort averages under the H-S-F competency based assessment model differ from the past by no more than ± 0.1 (2.5%), and cohort averages for all items measured have remained at or above 2.2 for the past six years.

#### *Demonstration of competency within the curriculum*

Figure 3 illustrates the number of questions used on tests that were coded to each of the six WSU COP Outcomes categories , and the average percent correct for questions within each outcome categories for the Class of 2017 (over six semesters) and the Class of 2018 (over four semesters). The number of questions coded to a particular outcome category varied, ranging from 2,824 questions coded to knowledge down to 78 questions coded to communication. As noted in the figure, cohorts are achieving between 85-92 average percent correct on questions coded to each of the six outcome categories by the end of three attempts.

Student support and experiences

An important goal of the competency-based assessment model was to identify struggling students early, and to connect them with the Assistant Dean for Recruitment and Student Success. Through this administrator's direction, and based on specific needs, students are connected with student support services at the COP, University and community levels. All students who did

not meet competency after a second attempt were automatically referred to Assistant Dean for Recruitment and Student Success. The percentage of referred students who chose to take advantage of this opportunity within a specific semester varied from 50% (5/10) to 84% (31/37).

Figure 3: Outcomes - Stdent Average Percent Correct - Classes of 2017 (6 semesters) & 2018 (4 semesters)
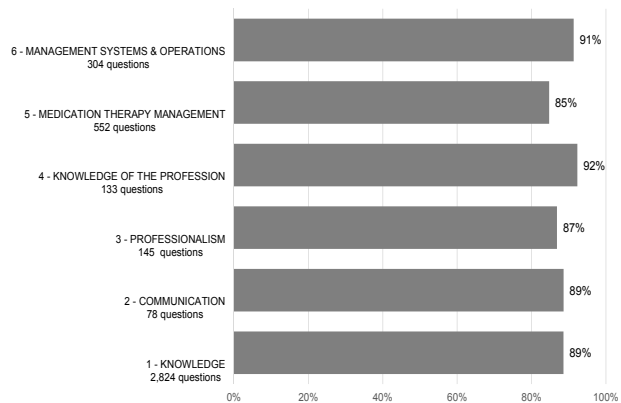
An aggregate measure of overall student success within professional healthcare programmes is student progression. Figure 4 shows how four unique cohorts (Classes of 2015, 2016, 2017, and 2018) differ in student progress from the PY1 to the PY2 year. The two cohorts since implementing the H-S-F competency-based assessment model have demonstrated decreases in the number of students within the cohorts for all progression related categories - decertified/withdrawn, delayed graduation and progressing/on probation.

Figure 4: Student Progression/Attribution between Semester 2 and Semester 3 by Cohort
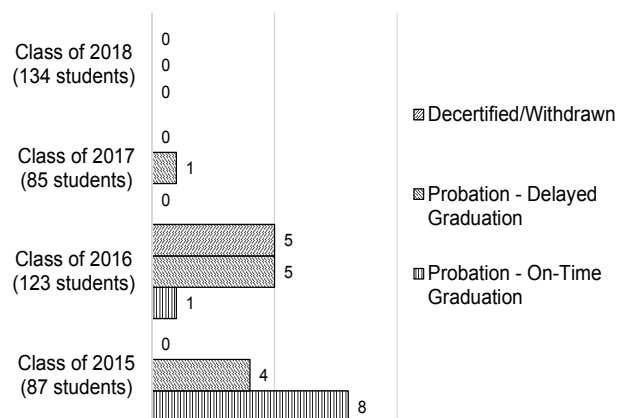
Another measure of the student experience is based on their perceptions of this assessment model Survey response rates for the class of 2017 cohort varied each professional year, but were always above 50%. Response rates follow: PY1 – 50/93 (54%); PY2 – 66/93 (71%); PY3 – 57/92 (62%). After two administration cycles of the survey for the class of 2018 the response rates equalled or exceeded 60% with response rates of 96/133 (72%) for PY1 and 78/131 (605) for PY2.

When asked to compare their experience under the H-S-F competency-based assessment model to past experiences under a traditional A-F grading model, approximately one-third of the class of 2017 agreed or strongly agreed that the new model "reduces stress" over all three administrations of the annual survey with the following results: PY1 – 18/50 (36%); PY2 – 20/64 (31%); PY3 – 21/57 (37%). To date, over two administrations of the survey, a little over one-half of the respondents for the class of 2018 agreed or strongly agreed that the new model "reduces stress" with the following results: PY1 – 52/96 (54%); PY2 – 44/78 (56%).

When asked whether the H-S-F assessment model, in contrast to a traditional A-F grading model, "promotes a culture of camaraderie among your peers" the two cohorts' responses are less consistent over multiple administrations of the survey. One third 18/50 (36%) of respondents for the class of 2017 initially agreed or strongly agreed that camaraderie was promoted. The Class of 2017's perception of increased camaraderie enlarged to two-thirds of respondents for PY2 at 56/64 (88%) then contracted to a little under one-half of respondents for PY3 at 27/57 (47%). Approximately three-fifths [60/95 (63%)] of respondents for the Class of 2018 initially agreed or strongly agreed that camaraderie was promoted. This Class of 2018 perception of increased camaraderie enlarged to over four-fifths of the respondents for PY2 [62/70 88%)].

When asked whether students felt they "have enough time to participate in extra-curricular activities" a clear majority of respondents for the Class of 2017 cohort reported "yes" over three administrations of the survey: PY1 – 29/50 (58%); PY2 – 47/63 (67%); PY3 – 35/53 (63%). The respondents for the class of 2018 indicated mixed results over two administrations of the survey with only one-third of respondents reporting "yes" for time for extra-curricular activities during their PY1 year [30/95 (32%)], but two-thirds reporting "yes" for time for extra-curricular activities during their PY2 [53/72 (74%)].

Discussion

When WSU COP started the transition to the H-S-F competency-based assessment model in 2013, only six USA schools/colleges of pharmacy used a pass/fail grading model in the PY1-PY3 professional years. None of them were public, land-grant, research-intensive universities (Wright, 2012). At the time of adoption and to our knowledge, WSU COP was the first US Pharm.D programme in a "very high research activity" (The Carnegie Classification of Institutions of Higher Education, 2016) to move to an H-S-F competency based assessment model.

WSU COP faculty and leadership fully endorsed the concepts of a competency-based assessment model, believing that it would transparently emphasise the professional development and achievement of knowledge, skills and abilities required of contemporary pharmacist practitioners. The Center for American Progress has called competency-based education "disruptive" because it changes the landscape of post-secondary education, focusing on an "outcomes-based approach to education where the emphasis is on what the graduates know and can do" (Soares, 2012a). This differs from traditional education "by focusing strictly on the demonstration of competency regardless of how long it took a student to gain that competency" (Soares, 2012b: p.2).

The journey has indeed been disruptive, interesting, and as expected, complete with challenges, but rich with opportunities and benefits as well. Key to the initial and continuing successes of the competency-based assessment model are the following: students who provided ongoing feedback and perspective; faculty who were willing to invest time and energy into a more robust assessment system; investment in a computer-based testing platform; a leadership team who recognised the importance of disruption in pharmacy education; provision of necessary resources for faculty and administrative support; and a logistical structure that has been flexible and rapidly adaptable when process improvements were needed.

Data constraints

As the first cohort of students (Class of 2017) to experience the H-S-F model have yet to graduate, data on many of the long-term outcomes to evaluate success of the assessment model have yet to be collected. Data on shorter term measures have been continuously collected and are being used to evaluate the assessment model during each subsequent year of implementation.

Not all courses are block-tested, such as the skills-based (lab) courses. These courses often used assessment methods outside of ExamSoft® such as performance-based grading rubrics. At the time of adoption, the rubrics function was not immediately available in ExamSoft® so our ability to capture these data was limited.

In addition to data that are currently being collected for student learning and programme evaluation, other planned quality assurance measures will be implemented within the next two years, including evaluation of the following: quality of question items used on assessments; alignment of assessments with learning objectives and consistency between tests, re-tests and ELE tests; and determination if assessment questions and overall assessments within courses match the curriculum map.

Evaluation of short term measures

Demonstration of mastery and skills. Prior to implementing the competency-based assessment model, it was not understood how frequently students would need second and third testing attempts. These data have been tracked very closely because second and third attempts may have important implications for student and faculty effort, particularly for students who re-test frequently. More research is required to understand if the timing (first, second or third attempt) of competency attainment is important and/or has implications for student learning. Anecdotal observations by some faculty indicate that some students may use the first attempt as a preview of the type and rigor of exam questions utilised, or as a "cushion" if they feel they need to spend a disproportionate amount of time to prepare for a different course assessment. These test-taking strategies are apparent for some students despite the maximum attainable score for the re-test being capped at 80%. Faculty have also observed that students who are required to take a third attempt to reach competency seem to exhibit higher levels of stress prior to the final test. This observed outcome is understandable since the third attempt is a high stakes assessment required for passing the course. Faculty workload is impacted by the requirement to write three unique assessments and also by the time it takes to re-engage students with the material in order to help them reach competency. Faculty workload impact is another area that requires further research to determine the workload cost associated with this assessment model.

Demonstration of competency. The average percent correct, per student on questions within each outcome, helps us understand aggregate competency across the cohort for each outcome. Since all of the scores are above the 80% criterion referenced for individual student competence (Figure 3), we are reasonably confident that these preliminary results indicate that both cohorts are demonstrating competency for all outcomes as measured by performance on tests, re-tests and ELE tests. Since competency is being demonstrated across the curriculum, these results support the value of criterion-referenced assessment for competency-based education.

Implementation of a competency-based assessment model, along with the simultaneous adoption of computer-based testing, has enabled our faculty, students and programme to understand the depth and breadth of our curriculum with a higher level of transparency and immediacy. It is important to understand the degree to which students are demonstrating competency for college curriculum outcomes from a big picture perspective. Data from the first two years (Figure 3) indicate that all WSU COP Curriculum Outcomes categories are being assessed, albeit to varying degrees. There are 2,824 questions tagged to knowledge and far fewer questions coded to communication and professionalism. This skewed distribution is expected; knowledge questions are frequent across all courses in the curriculum, whereas communication and professionalism are primarily skills-

based assessments typically included in performance-based courses such as patient care labs, which account for approximately one-third of the required courses during the first three professional years.

IPPE performance was used as a short-term measure for evaluating student mastery of knowledge and skills. Faculty expressed legitimate concerns that the new model might negatively impact student performance on experiential rotations. They wondered if students learning in the H-S-F competency-base assessment model would perform as well during IPPE as previous students from a traditionally graded assessment approach. IPPE evaluation data from summer rotations for cohorts educated within the H-S-F competency based assessment model (Classes of 2017 and 2018) are comparable with evaluation data from previous cohorts that were traditionally graded. This indicates that students progressing under the H-S-F competency-based assessment model appear to be performing as well as their predecessors. These data will be analysed annually, and will be supplemented with APPE evaluation data once the first cohort has completed their fourth year.

Student support and experience. The COP Student Services unit linked the success of this assessment approach to the early, prompt and real-time re-engagement with students who encountered academic hurdles. In our previous model, Student Services through the Assistant Dean of Student Recruitment and Success was notified of struggling students at the end of each semester, when failing grades were reported and progression was likely impacted. Under the H-S-F competency-based assessment model, struggling students are identified early, connected with academic services, linked with learning resources, and offered the opportunity to create a personal learning plan. Implementation of these strategies has resulted in improved progression rates for the Classes of 2017 and 2018 (Figure 4), where less than 1% of each cohort was classified as not progressing or decertified/withdrawn at the end of PY1. This is an improvement from two previous cohorts - up to 7% of WSU COP students were not progressing, and 3% were decertified/withdrawn entirely and is well below the national average attrition rate of 10.5% (American Association of Colleges of Pharmacy, 2016).

A positive outcome of early re-engagement is that students who re-test are provided the opportunity to reflect not only on the course content, but also their study approach and time management. Anecdotally, it has become common practice for students, prior to meeting with Student Services, to independently reflect on their academic performance and identify a basic plan for how they can personally change. Through increased understanding of the student perspective, the programme has been able to connect students with appropriate resources to assist in each specific situation. Student involvement in creating their plan for success aligns with an important component in the ACPE 2016 Standards, which encourages programmes to foster student initiated, self-directed learning (ACPE Accreditation Standards, 2016).

Survey findings regarding student perceptions of stress were neither universally positive, nor negative. As reported, the medical literature indicates overall benefits to student well-being in a pass/fail assessment model, but some portion of students will inevitably still experience stress and anxiety regardless of the model utilised. The data from the first two cohorts suggest that time for extra-curricular activities increased during the second year of H-S-F competency-based assessment.

Challenges/barriers to implementation

Although pedagogical planning and preparation occurred over 12 months, the actual operational implementation occurred rapidly over four months. Despite comprehensive forethought, it was inevitable that many systematic and logistical unknowns would emerge "on the fly" and need to be addressed as the model rolled out. There was also limited time to develop messaging to stakeholders about H-S-F competency-based assessment, which caused some misunderstandings and confusion among students who were unsure about how the new model would impact them individually and as a cohort. Some persistent challenges have been successfully addressed through the quality improvement process, such as the establishment of best practices for interpreting test results and evaluating question quality, and the development of an effective class ranking procedure.

Additionally, some faculty resistance to the transformation was encountered. WSU COP recognised that having a teaching and learning specialist on the faculty team was important for a smooth assessment transition – teaching, learning, and assessment being three interdependent pedagogical pillars - but a suitable candidate was not identified until after the transition had begun.

Lessons learned and best practices identified

The Office of Student Services has fundamentally changed from an office that manages students when they fall behind to an office that supports student success. The Class of 2017 identified a new class motto, "no pharmacy student left behind," and supported one another by sharing study materials, communicating regularly with each other, and forming student-led study groups. Faculty invested extra time to create additional assessments, supported one another by sharing tips and tricks regarding test questions and testing designs, held extra office hours, and provided regular review sessions. It was clear that our entire community - faculty, staff, student support services, and student pharmacists - worked together more closely and supported one another more authentically.

As the H-S-F competency based assessment model was rolled out, each additional year of experience brought development and refinement of best practices related to computer-based testing, learning objective alignment, and provision of remediation. These best practices were shared and reiterated with faculty during introduction and debrief sessions held each semester. Best practices identified to date include:

1. Learning objectives for each unit of content should be clearly stated and transparently communicated to students.

2. Assessments should ensure similar coverage of learning objectives and equal level of difficulty between initial tests, re-tests, and ELE tests.

3. Faculty should write test questions for all three potential test attempts at the same time, to ensure assessment of similar or equitable content and to decrease overall faculty effort.

4. Faculty should view test statistics for individual questions prior to analysis of overall class performance, to ameliorate potential bias or pressure to adjust questions to increase "pass rates".

5. Students should be provided with a report that details identified strengths and weaknesses related to curriculum outcomes and weekly learning objectives.

6. Faculty should choose the remediation strategy that works best for their courses whether it is individualised or group review sessions.

Future Directions

Programmatic, curricular and student learning evaluation efforts will be ongoing for both continuous quality improvement purposes and to measure the success of the H-S-F competency-based assessment model. Evaluation of programmatic impacts such as faculty workload is underway.

In addition to the current data analyses surrounding student learning, data from important evaluative measures are forthcoming as the first cohort of students enters APPE rotations in the fourth professional year. Results of APPE preceptors' evaluations of student performance will be explored to determine strengths and weaknesses of students prepared within the H-S-F model. Finally, objective measures of student performance on the PCOA will be analysed as well as first-time pass rates on the pharmacy and law licensure examinations.

Summary

WSU COP has successfully transitioned to an H-S-F competency-based student learning assessment model. Preliminary results after two full years suggest the following: the majority of individual students, with few exceptions, successfully reach competency (80%) on all assessments; cohort data indicate satisfactory achievement (> 80%) on all six COP Competency-based Outcomes; and aggregate student performance during IPPE rotations is comparable to previous cohorts. Student survey results suggest the model fosters a positive student experience as related to perceived stress and camaraderie amongst classmates. Student progression rates have improved when compared to previous cohorts.

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