REVIEW

The Use of Portfolios in US Pharmacy Schools
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Objective. To conduct a review of the pharmacy literature on the use of portfolios in US pharmacy schools.

Findings. This study provides examples of how pharmacy schools are using portfolios in various parts and across their curricula, however, assessment/outcome data is lacking. These examples can be used as a starting point for schools as they begin to design their own use of portfolios. Overall, students indicated that the use of portfolios is important in their professional development, but significant time is needed to complete.

Summary. Things to consider when implementing a portfolio system include how it will be used, who will review it, and what resources will be needed to sustain the project. It is important for schools to consider these items at the start of the process to ensure the portfolio process that is created is useful for assessing the overall programmatic or course outcomes being proposed by their use. More scholarly work needs to be published on the use of portfolios.

Keywords: portfolios, pharmacy, schools of pharmacy, college of pharmacy

INTRODUCTION

Academic performance is measured in a myriad of ways. One that has been considered useful as a way to collect evidence of learning and encourage reflection is the academic portfolio.1 The portfolio in a university setting typically consists of documents that demonstrate a student has engaged in personal and professional development.2 Over the past decade, the use of portfolios has expanded from the arts, humanities, and education to health care disciplines such as medicine, nursing, and pharmacy. Within these health care disciplines, portfolios fill the need to enhance student learning and provide the evidence that student learning has indeed taken place.3

There have been multiple definitions used for portfolios over the years. McMullan and colleagues offer a definition that synthesizes the definitions found in earlier literature.2 They define a portfolio as a collection of evidence demonstrating personal and professional development through critical analysis and reflection of the portfolio’s content by the student. There are many reasons that portfolios are recommended as the best way to assess the skills mentioned in the pharmacy accreditation standards. First, portfolios are suggested to be a more “authentic” method of assessing student learning, especially if the student is required to define for themselves what evidence will be placed in the portfolio. Second, depending on the type of portfolio (reflective vs showcase) that is used, portfolios can provide both formative and summative assessment to display development of a student across a curriculum.4

Of the two portfolio types, reflective portfolios are used to demonstrate student growth both personally and professionally as students select artifacts that show how their proficiency in an area has grown over time.2 Reflective portfolios are discussed as being a more “constructivist” approach to assessing learning due to the need for students to select and assess the evidence of their learning.5 Learning that occurs with reflective portfolios is most effective when used as a formative assessment. In these instances, students are more comfortable including personal and more accurate reflections of their learning rather than feeling the pressure to write and include what they think the assessor wants.2 Conversely, showcase portfolios are commonly used for summative assessments, whereby students select their best work.5 These types of portfolios can limit the potential for learning from the portfolio process as students may limit inclusion based on assumptions of what artifacts will appeal to the assessors.2 This review focuses, unless otherwise stated, on reflective portfolios as they help bridge the divide between practice and theory, allowing students to
take a deeper approach to learning and improve the students’ ability to develop critical thinking and problem-solving skills.\textsuperscript{5,6} The use of student portfolios as a way to illuminate student achievement of professional development competencies has been detailed by the Accreditation Council for Pharmacy Education in both Standards 2007 and 2016. Arguing for the use of reflective portfolios, the 2007 Standards suggest that portfolios include both student self-assessment as well as faculty and preceptor assessment of student achievement of the school’s educational outcomes.\textsuperscript{7} The 2016 Standards not only include the development of student self-awareness, but also call on pharmacy schools to develop other skills in students including problem solving, educating different audiences, patient advocacy, interprofessional collaboration, cultural sensitivity, communication, leadership, innovation/entrepreneurship, and professionalism.\textsuperscript{8,9} Both sets of standards strongly recommend the use of reflective portfolios as the best method to assess these competencies in students.\textsuperscript{7-9}

With the call in 2012 for portfolio use in the accreditation standards, 70 pharmacy schools, out of the 80 that responded to an electronic survey (73\% response rate) reported using portfolios in their curriculum. Results from this survey show despite such high usage, most of the pharmacy schools were not using portfolios to fulfill the accreditation requirements of assessment of competency and programmatic outcomes. Furthermore, there was a wide variation in the content and the methods of portfolio assessment among the programs.\textsuperscript{10} Since Plaza and colleagues’ seminal review of portfolio usage in 2007, there has been no synthesis of the studies published in the literature on portfolio usage, assessment, or best practices. Therefore, the purpose of this paper is to review the pharmacy literature on the use of portfolios in US pharmacy schools that has occurred over the past 10 years. This work will be helpful as pharmacy schools continue to work on implementing portfolios in their student assessment plans.

This paper begins by describing the methods used for conducting this literature review. Next, a discussion on and how portfolios are used in general in pharmacy education will be discussed. This is followed by a review of specific curricular uses of portfolios such as uses in specific didactic courses, Advance Pharmacy Practice Experiences (APPEs), and the full curriculum. Next, student perspectives on the use of portfolios will be discussed, followed by barriers to portfolio adoption. Finally, this review concludes with a set of questions for pharmacy schools to consider as they start to adopt portfolios as an option for calibrating student learning.

**METHODS**

A systematic literature search was conducted using the PubMed, CINAHL, MEDLINE, and ProQUEST Dissertation/Thesis databases. Search terms used included “pharmacy” and “portfolios.” Currents in Teaching and Learning was also searched outside the databases as it is a newer journal and is not yet indexed. The original search produced 98 articles and 5256 dissertations. Articles and dissertations were included in this study if they were published in the last 10 years (2006-2016), were written in English, and discussed the use of portfolios in pharmacy schools. Articles prior to 2006 were excluded due to a literature review on this subject that had been published in 2007. Reference lists for all included articles were reviewed to determine other papers that met the inclusion criteria. The inclusion criteria led to the review of one dissertation, 11 journal articles, and one poster abstract. A complete summary of included articles can be found in Appendix 1.

**RESULTS**

Trends in Portfolio Usage in Schools and Colleges of Pharmacy

When Plaza and colleagues conducted their seminal literature review, there was little scholarly work in the pharmacy literature on the use of portfolios.\textsuperscript{3} In fact, much of what was published was only available in the form of poster abstracts at academic conferences. In her 2006 dissertation, Plaza described three uses for reflective portfolios in pharmacy education: within specific courses in the didactic curriculum, during the experiential parts of the curriculum, and integrated throughout the entire curriculum.\textsuperscript{4} Each is described below.

Plaza’s dissertation described three specific didactic course examples that used portfolios prior to 2006.\textsuperscript{4} One course used a web-based portfolio in a five-quarter pharmacy practice skills laboratory associated with the college’s pharmaco-therapeutics courses. This portfolio documented student growth throughout the laboratory course, but there was no mention on whether reflection was part of the course. Another pharmacy program used a portfolio in a compounding course to document individual student activities, assessments, reflections, and to document group activities. The individual portfolio assessed the achievement of course objectives. The group portfolio contained assessments on a student’s ability to collaborate on the group assignment as well as their communication skills. The last course Plaza documented involved a problem-based learning course in human resources management.\textsuperscript{4} Students in this course were required to keep a reflective portfolio, which was then used to assess student learning and effectiveness of the course but not much detail was provided in the abstract.
Plaza’s review of the use of portfolios prior to 2006 in the experiential parts of the curriculum indicates there is ambiguity on whether reflections were used as part of these portfolios. Most of these portfolios did, however, show accomplishment of objectives and competencies using both formative and summative assessments. Northeastern University School of Pharmacy was one of the few to document student use of portfolios during APPEs in a reflective manner. Students not only set goals at the beginning of each experience, they charted achievement of competencies during the experience, and wrote reflections using a template provided to assist them in writing their reflections. Only completion data was provided in the poster abstract presented at the AACP 2003 Annual Meeting, and no data related to assessment of the activities themselves were included.11

Plaza’s review noted only a handful of reflective portfolios integrated across the entire curriculum prior to 2006. Furthermore, most did not contain enough detail to determine the nature of the portfolio and whether it contained a reflective component or not. The University of Arizona College of Pharmacy offered one example of a portfolio integrated across the entire curriculum. In this example, student portfolios consisted of a reflective report on each domain of the college’s educational outcomes and included evidence that they have achieved the competencies and domains covered in that particular year.4 The student turns in the portfolio at the end of each spring quarter.

Since Plaza’s review and dissertation, Skrabel and colleagues conducted a cross-sectional survey of 109 US pharmacy schools to examine the usage of portfolios, content, method, training, resource support, and the benefits and challenges encountered when portfolios are inserted in the curriculum.10 The response rate for the survey was 73% (80/109 schools). Eight-eight percent of schools (70 schools) used a portfolio with 91% providing institution-specific purpose statements for the use of the portfolio and its assessment. Most schools used a behavioral and rubric-based approach for the portfolios while only a few used a reflective approach. Twenty-three schools did not assess their portfolios and of the 47 that did, 16 had one specific person who reviewed the assessment. Most schools used a committee or group consensus approach to assessment. Other ways to assess included use of a combination of non-graded and graded process using standardized rubrics. The study also found that despite 80% of schools favoring comprehensive portfolio usage, most schools (62%) report usage limited to the experiential parts of the curriculum.10

The following sections of this review will discuss the ways that pharmacy schools have published using portfolios since 2006. Interestingly, usage can still be divided into the same three categories that Plaza found in her dissertation: specific courses in the didactic curriculum, during the experiential parts of the curriculum (APPEs), and integration throughout an entire curriculum.4

Two studies were reviewed that focused on the usage of portfolios in individual courses. These works offer different approaches to using portfolios in specific classes. Ashcroft and Hall’s survey study of undergraduate pharmacy students focused on the use of a portfolio in a prescribing course taught in the final year of a pharmacy program with an emphasis on the development of the skill of prescribing.12 While the Ashcroft and Hall article is not based on experience in a US pharmacy school, it provides an example of one way that a portfolio system can be incorporated into a school’s curriculum.12 During a student’s final year of an undergraduate pharmacy degree, students participate in a course module that is designed to teach them the principles of prescribing, such as selecting medicines that are effective, safe, and cost effective and how to respect patient choices. As part of this course, students were asked to submit a portfolio in which they gathered evidence and reflected on how modules such as pharmaceutical care, therapeutics, and their clinical rotations link with the concept of prescribing. Ashcroft and Hall found that the use of a portfolio was accepted by most pharmacy students and students found portfolios a good assessment approach along with their more traditional assessments. Students in the study indicated that the portfolio helped them develop skills that would be useful later in their continual professional development.12

An alternative approach, used within an individual class, is described in Hobson and colleagues’ study.13 These scholars examined the use of a portfolio in a capstone course, whereby students reflected on their professional development, assessed their achievement of the college’s outcomes, and established a continuing professional development plan.13

In their case study, Hobson and colleagues detailed how students in their fourth year of a doctor of pharmacy curriculum took a 1-credit hour graduate capstone course that required them to complete a “professional portfolio” using an electronic portfolio system provided by the college.13 The purpose of the portfolio was to have students demonstrate their development from a student to a practitioner. Students were mentored by faculty members on what to put into their portfolios with emphasis placed on items that employers and residency directors might want to see. Required elements of the portfolio include a general biography, education history, courses taken, experiential rotations, employment history, professional activities (association memberships, community
The portfolio.13
given a restrictive presentation template to use to develop a lot of higher-order thinking to complete as students were problem with the portfolio was that it did not require documentation that they had the skills needed for career vice of others, leadership, completion of core courses, and fraternities/sororities, publications, research experience, grants, cultures, committees/boards), and other accomplishments. The portfolios were then graded by the course instructors using a three performance-level rubric (excellent, acceptable, and unacceptable). Portfolios were considered excellent (pass) if all required and selected optional items were included with equal depth, detail, and quality. The portfolio may not contain any inappropriate or inaccurate content. The portfolio also had to show that it had been thoroughly reviewed with limited errors. Portfolios were considered acceptable (pass) if they included all required and some selected optional elements but the elements may have needed some further development in depth, detail, or quality. There may also have been some inappropriate or inaccurate content or the portfolio may have needed some further editing. An unacceptable portfolio (fail) did not have all required elements or did not establish that the author had a commitment to developing a quality portfolio.

Data from two of the classes who completed the projects showed that at least 100% (103 students excellent and 36 acceptable) of enrolled students passed the portfolio project. According to course instructors, the portfolios only took about 5 minutes to grade and most student portfolios showed they were excelling in the areas of service of others, leadership, completion of core courses, and documentation that they had the skills needed for career mobility. Hobson and colleagues concluded that one problem with the portfolio was that it did not require a lot of higher-order thinking to complete as students were given a restrictive presentation template to use to develop the portfolio.13

These two studies suggest pharmacy schools can have different approaches for how portfolios can be instituted into course work. A common finding, however, was that instructors were specific on the information they wanted to be included in the portfolio, thus limiting student creativity and critical thinking.12,13

An alternative approach for instituting portfolios is within APPEs. Portfolios can be used and submitted (via email or through use of a patient care portfolio system) in different ways during a student’s APPEs. One usage is to document the patient care interventions that students are conducting while on rotations. This information could be used to document student achievement of the patient care outcomes in the ACPE standards. Another method includes allowing students to pick artifacts and write reflections that demonstrate achievement of multiple outcomes in the ACPE standards included in Domain 4.

The University of Georgia College of Pharmacy portfolio is directed to the skill of pharmaceutical care as students are required to upload information on six patients related to analyzing patient data, developing plans for medication therapy, and implementing the plans. Patients discussed are required to have certain disease states as determined by the school.14

The purpose of the patient care portfolio is to help students learn how to document and develop patient-centered pharmaceutical care plans. The portfolios are also assessed to see if there was continuity of patient-care activities across the state during APPEs. Most of the disease states chosen to be included in the portfolios represented core disease states recommended by the American Association of Colleges of Pharmacy’s professional affairs committee (diabetes mellitus, oncology, hypertension, urinary tract infection and pneumonia). The most commonly documented therapeutic interventions were therapeutic duplicates (332 times) and drug interactions (250 times). An average of 1.8 therapeutic interventions per patient case was documented with interventions occurring in all geographical regions across the state. Approximately half (48%) of all submitted cases were completed during students’ acute medicine APPE.14

In contrast to the University of Georgia’s use of portfolios to focus on patient care, Albany College of Pharmacy and Health Sciences uses APPE portfolios to demonstrate student achievement of multiple outcomes in the ACPE standards, including many of the outcomes listed in Domain 4. Students select artifacts from any of their APPEs that demonstrate achievement of ability-based outcomes specified in the college’s APPE course manual. Outcomes assessed include the ability to provide pharmaceutical care, drug information/literature evaluation skills, managing the medication use system, and self-learning abilities and habits (assessed using a reflective paper).15

Albany’s portfolio is assessed in multiple ways. The first three outcomes are assessed by the director of experiential education. The fourth outcome is evaluated by two reviewers using a 4-point scale rubric. If the evaluators differ in their rankings, then the rankings are averaged. The portfolios are required to be completed prior to graduation. In Briceland and Hamilton’s study of Albany’s portfolio usage, all student portfolios that were available for review (138/141) contained work product that demonstrated achievement of the three ability-based outcomes. Work product submitted in the portfolio included: provision of pharmaceutical care outcome (patient case studies, patient care notes, formal consultations,
and medication reconciliation reports), drug information/literature evaluation skills outcome (patient education materials, journal article reviews, formulary reviews, during information responses, newsletters, case studies), and managing medication use system outcome (drug use reviews, formulary management reviews, and clinical practice guidelines). Data on how many times a portfolio had to be sent back for further information was not collected. For the fourth outcome, 135/138 students were assessed. Three of the reflections were lost electronically. The reflections were assessed for two domains: domain one assessed what was learned and applicability to future practice and domain two assessed continuous professional development plans. On a scale of 1 (not proficient) to 4 (exemplary), students scored an average of 2.9 on Domain 1 and 2.3 on Domain 2.\textsuperscript{15}

These two studies illustrate different specific uses of portfolios during APPEs, with pharmacy schools using the portfolios to show student achievement of specific outcomes that are listed in the ACPE accreditation standards. The studies found the portfolios were a useful vehicle to demonstrate student achievement of programmatic outcomes and development of skills.\textsuperscript{14,15}

Portfolios can also be used to display student ongoing development across the entire curriculum. The University of the Incarnate Word Feik School of Pharmacy, West Virginia University School of Pharmacy, and University of Arizona College of Pharmacy have implemented portfolios across their curriculums.

Feik School of Pharmacy developed a proprietary electronic portfolio system.\textsuperscript{16} This system has three components. One component allows students and faculty members to use the system to develop an electronic resume and/or curriculum vita. Information included in this section may not be useful for students while they are in school but will be useful later in their careers (continuing professional development, licensure, liability insurance, preceptor training). The second section is related to the school’s ability-based outcomes. Certain student assessments and year-end tests are mapped to the school’s outcomes and students are required to upload this information into the portfolio. Students are then asked to write a reflection on the course-embedded assessments that are uploaded. To help students know which items to upload each semester, they are given a checklist of items to upload. Upon review of the student portfolios, 100% of the students uploaded items to the portfolio, but no student uploaded every one of the required elements. Reasons for not uploading include misplacing the assignment, faculty members forgetting to return the assignment, and faculty members forgetting to conduct the assignment.\textsuperscript{16}

West Virginia School of Pharmacy implemented a purchased electronic portfolio to implement across the curriculum. The portfolio is not graded but is considered a curriculum requirement for all students. Students are provided with a mentor (faculty members, alumni, or preceptors) to help them in developing their portfolio. Students and mentors are asked to meet (via phone or in person) at the beginning and end of the semester. As part of their portfolio, students are asked to write an autobiographical sketch for their mentor. Students are instructed on what assignments should be included in the portfolio. Assignments include three self-assessments (provided rubric) of course-related assignments per semester (two pre-chosen and one chosen by the student from a list) and one professionalism submission per semester. Mentors do not grade the student course assessment, but do grade the student self-assessment responses on a 3-point scale (3=excellent, 2=satisfactory, 1=unsatisfactory). Self-assessment questions include the following: “Question 1: Describe those aspects of the assignment you were most satisfied with, Question 2: Briefly describe how this assignment helped you achieve the development or improvement you indicated in question 3.”\textsuperscript{17}

Results from a review of the West Virginia student portfolios showed first professional year (P1) students had significant improvements in the self-assessment question scores of question 1 ($p=.002$) and question 3 between fall and spring semester whereas the second professional year (P2) students did not have any significant improvements in these questions. Scores on the self-assessment question 2 and question 4 were not statistically different for either P1 or P2 students between fall and spring semester. At the end of the spring semester, the scores of P1 students were higher on three of the four questions (questions 1, 3, and 4) compared to the scores of P2 students.\textsuperscript{17}

In both the Feik School of Pharmacy and West Virginia University School of Pharmacy, students were asked to upload course-embedded assessments that are reflective of the outcomes provided by the school. Students were also asked to reflect on the items that were added. West Virginia University School of Pharmacy takes the process one step further by including mentors into the system to help students through the process.\textsuperscript{16,17} The University of Arizona College of Pharmacy takes a different approach in its use of its portfolio.

The University of Arizona College of Pharmacy requires all students to complete a paper-based portfolio each year they are enrolled in the program. The goals of the portfolio are to have students reflect on their
professional growth throughout the program by using the school’s outcomes statements as the backbone of the portfolio. Guidance is given to students on what to include in the reflections and portfolio by the course coordinators. Portfolios are graded by one professor using a 50-point grading rubric. The rubric is provided to the students as a tool to help them in the development of their portfolios. Advisors meet with the individual students to discuss their grades as well as any thoughts/concerns that were discussed in the student’s reflections. The advisors collect all de-identified student responses and share this information with the college’s assessment committee annually. Areas for improvement are discussed with individual faculty members or department heads. No specific outcomes information on the portfolios was provided in the study.18

Whether a pharmacy school decides to use an electronic or paper-based portfolio system, a portfolio can be a useful tool in assessing student achievement of programmatic outcomes across a curriculum. While all three schools used a slightly different approach, all three schools found the portfolios to be a useful tool in assessing student achievement of their programmatic outcomes with only one of the schools providing outcome results other than completion rates.

**Student Perceptions**

Multiple studies have been conducted on student perceptions of the use of portfolios in pharmacy schools.1,12,14,18 All of the examined studies used convenience sample surveys of students in the programs using the portfolio systems. Response rates on the student surveys varied by study, but ranged from 67% to 90%.1,12,14,18 Three of the studies reviewed student perceptions on the design of the portfolio and implementation of the portfolio process. The fourth reviewed student buy-in to the portfolio process.

There were several commonalities across the three studies on perceptions on the design and implementation of the portfolio process. Overall, students believed that the portfolio process helped them develop knowledge in the areas that were assessed, encouraged them to develop insights into their learning, and allowed them to identify their strengths and weaknesses.12,14,18 Students also believed that the portfolios would be useful to them later in their careers.12 Table 1 provides details from each of the studies in these areas.

These three studies also identified areas for improvement in either development or implementation of the portfolio. In these studies, students indicated that they would prefer to have more information on how to construct the portfolio (80%) and that creating the portfolio took too much time or required completion of too much paperwork (40%).12,18 Murphy and colleagues asked students to rate on a 5-point Likert scale how much time they spent working on their portfolio (1=very little, 3=moderate amount, and 5=a great deal).18 P3 students indicated they spent more time (4.4 out of 5) on their portfolio than P1 or P2 students (2.1 and 3.1, respectively out of 5) and they perceived the amount of time spent increased incrementally from the first to the third years. Students discussed that the portfolios should be worth more credit (7%) and that more portfolio examples would have been helpful (34%).

Despite these commonalities, however, portfolio use by students varied by school. For example, Mercer University College of Pharmacy and University of Arizona College of Pharmacy require all students to complete a paper-based or electronic portfolio each year they are enrolled in the program,1,18 the Centre for Innovation in Practice Schools of Pharmacy and Pharmaceutical Sciences (in the UK) requires the use of a portfolio in a particular class,12 and the University of Georgia College of Pharmacy requires the use of a portfolio in their APPEs only.14

Mercer University College of Pharmacy implemented Practitioner’s Roundtable Discussions into their PharmD curriculum to help students develop “buy-in” to the portfolio development process. These discussions are incorporated as part of a first-year course. Practitioners from multiple areas of pharmacy are invited to come and speak about their careers and the impact, value, and application of portfolios. Students are surveyed prior to these discussions and again at the end to determine if their perceptions on portfolio use had changed based on the practitioners’ comments. The survey asked students questions related to the impact on their learning, value of the portfolio process, and practical application. Survey responses were based on a 5-point Likert scale (1=not beneficial, 2=slightly, 3=moderately, 4=very, and 5=extremely beneficial). Results from the pre-survey found most students already found portfolios moderately beneficial in all four areas except for questions related to organizational skills and the portfolio process being informative which were rated at very beneficial. There was little change in the students’ perceptions on the use of portfolios from the pre- and post-surveys except on the manageability of the process which changed from 37% saying moderately beneficial and 25% saying very beneficial to 31% saying moderately beneficial to 40% saying very beneficial. Secondly, scores on the “likely to make an abbreviated portfolio for interviews” also changed from 61% saying moderately beneficial or lower (25% moderately and 36% slightly/not at all) to 80% saying moderately to extremely beneficial (29% moderately and 51% very/extremely). This indicates
that students would consider using portfolios after graduation.\(^1\)

Despite the differences in portfolio models used across the studies, overall student perceptions on the portfolio use was positive. Students believed that portfolios can be useful to enhance their learning in pharmacy curricula. Students also indicated that portfolios may be useful tools to use for interviews and continued professional development after graduation.

**Barriers to Portfolio Adoption**

While data on the use of portfolios from students overall is positive, there are still several barriers that need to be addressed when schools launch a portfolio program. The most cited barriers were workload and time associated with the implementation and maintenance of a portfolio system. Schools also reported that student buy-in and motivation hamper the implementation of these somewhat cumbersome projects.\(^10\)

While not discussed in this review, faculty members also tend to have lots of questions when starting a portfolio system. These questions include how to use the system, where will the portfolio be used, how will it be incorporated into the full curriculum, how and by whom it will be assessed, and what type of new and useful information will it provide to the program.\(^10\) These questions, if not addressed, can also lead to barriers in starting a portfolio system.

The challenges mentioned previously must be considered when developing and implementing a new portfolio system. These barriers can be addressed by asking questions around two areas when developing a program: composition of the portfolio and the implementation process. The first question to ask regarding composition is what is the purpose of the portfolio and should it be used to assess just a few very select, but maybe difficult to

| Perceptions                                                                 | McDuffie and colleagues\(^14\)                                                                 | Ashcroft and Hall\(^12\)                                                                 | Murphy and colleagues\(^18\)                                                                 |
|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| Portfolio process helped students develop knowledge in areas that were being assessed. | 71% felt portfolios helped them learn to develop logical pharmaceutical care plans.        | 64% felt portfolios helped them develop knowledge on prescribing.                       | P1 students felt the portfolio helped them understand how the school’s extracurricular activities fit into their achievement of the college’s program outcomes (3.1 out of 5 on a Likert scale). |
|                                                                              | 75% felt portfolios helped them develop communication and documentation skills.              | 63% felt portfolios helped them incorporate knowledge across the curriculum.            |                                                                                           |
| Portfolios helped students develop insights into their learning and allowed them to identify their strengths and weaknesses. | 60% of students felt they gained insight into their learning.                                | Students had an increased perception of overall benefit in the areas of increased understanding of professional program outcomes, impact of extracurricular activities on achievement of the programmatic outcomes, identification of what should be learned, strength and weakness identification, and modification of a student’s learning approach. |
| Students were asked if they saw a use for portfolios later in their careers. | 71% felt that portfolios would be a useful way for them to document their continuing professional development throughout their career. |                                                                                        |                                                                                           |
|                                                                              | 53% felt that portfolios would be a useful way to judge pharmacists for re-certification.    |                                                                                        |                                                                                           |
The use of portfolios is becoming an important part of the assessment plan for all pharmacy colleges given the

These questions are hard to answer as they require a college to review its curriculum to determine if there is a course to add the portfolio to if a grade is given and to review workload to determine who may be the best person to review the portfolios. The literature is clear that the best experience with portfolios occurs when they are reviewed and feedback is provided to the student. The last question needs to be: “What is the best way to introduce students to the portfolio process?” To get the most out of a portfolio system, the college needs to provide clear and thorough instructions as well as continual reinforcement of the process throughout the students’ time at the college.

Even after considering all of these questions, there will be many roadblocks that a school will encounter when starting a portfolio process. One roadblock is the decision on whether to implement a paper or electronic portfolio. If electronic is chosen, then a college must decide which storage solution to use. Determining the best storage solution (cloud-based, portfolio vendor, other) will depend on cost, ease of use, how complicated the system is, and whether students need to maintain access after they graduate. A college must also be prepared for the fact that once a portfolio is started, the goals and system needs may change which can make selecting a storage solution difficult as further flexibility may be needed.

Another roadblock to be aware of is the underestimation of time and resources that portfolios can consume. In the planning process, schools should consider doubling or tripling both the time and resource estimates. There is also the roadblock of information dissemination to consider. Students may not want to attend activities that are outside of class time so schools may want to consider carving time out of a class or a group of classes to make announcements regarding the portfolios. Schools also need to be aware that despite the “tech savvy” student most colleges are recruiting today, technology frustrations are still common and will be one of the first frustrations that will make students lose “buy-in” to the system. This may even require additional technology resources for the college depending on the software vendor chosen. Two last roadblocks to consider are who will oversee the portfolio process and how will reviewers be trained. These are very important as who oversees your portfolio needs to be able to champion both the process and the portfolio itself. The training is also important to ensure consistency in reviews and timely feedback.

CONCLUSION

The use of portfolios is becoming an important part of the assessment plan for all pharmacy colleges given the

measure, student outcomes or should it be used to measure all of the school programmatic outcomes. The medical education literature shows that portfolios can be useful for both activities. More studies need to be conducted to show the same benefits in pharmacy education. One thing to consider when making a decision is student time needed to document on multiple outcomes as well as the faculty time needed to review portfolios.

The second question to ask regarding composition is whether the college wants to implement a portfolio process whereby the evidence used is dictated by the college or whether the evidence should be student driven. In 2007, a meta-analysis was conducted on portfolio use in medical education. This analysis included a review of 1939 empirical studies on portfolio use in all parts of medical education. The results of this analysis found that effective portfolios were ones that had flexible but clear structures that allowed learners opportunities to describe their own development. The studies also found that when portfolios were heavily prescribed, students felt they were bureaucratic instruments only. Students/learners appreciated more the learning from the portfolios when there was some freedom given to determine the content. This is echoed by McMullan and colleagues who stated that portfolios can be a “catalyst for growth” through the process of developing the portfolio as much as the documentation the portfolio provides. The development of the portfolios itself can lead to student self-awareness of their own skills, strengths, and limitations. When deciding content for the portfolio, care needs to be taken to balance a heavily prescriptive portfolio versus one in which students can have full freedom to determine all content so as to provide an easy-to-use and measurable system.

The last composition question to consider is whether the portfolio should contain a reflective component. Studies on the use of portfolios indicate that the best student learning from portfolios comes from the reflective components of the process, not just when the student selects artifacts. However, students may sometimes be reluctant to engage in reflections due to fear of pointing out their weaknesses or uncertainty on how to reflect. Also, portfolio mentors are not necessarily the best at helping facilitate student self-reflection. Care needs to be taken that when reflections are added to a portfolio that training for both the student and facilitator/grade/mentor is provided.

Once the composition has been decided, the college needs to focus on the implementation stage. There are several questions that need to be asked in this stage. Two questions that a college needs to review when implementing a portfolio system have to do with how the portfolios will be reviewed (who and how) and how to ensure the students complete the portfolio (ie, will it be graded).
current ACPE accreditation requirements. This study provides examples of how pharmacy schools are using portfolios in various parts and across their curricula, however, assessment/outcome data is lacking. These examples can be used as a starting point for schools as they begin to design their own use of portfolios. There are many factors that need to be considered when implementing a portfolio system, from how it will be used, and who will review it, to what resources will be needed to ensure ongoing usage. It is important for schools to consider these items at the start of the process to ensure the portfolio process that is created is useful for assessing the overall programmatic or course outcomes being proposed by their use.

Overall, students indicated that the use of portfolios is important in their professional development, but significant time is needed to complete. This may pose a problem when securing student buy-in. Student buy-in is one reason why planning for the use of portfolios is so important. Care needs to be taken to ensure the portfolios being implemented are useful for both the school and the student. The amount of student time involved in creating and documenting in the portfolios needs to be taken into account when starting a portfolio system. As the use of portfolios becomes more ingrained in the assessment work of schools, more scholarly work needs to be published on the use and outcomes to provide evidenced-based best practices for schools seeking to start these large assessments.

REFERENCES
1. Advani A, Ashworth L, Barnett C, Miller SW, Sachdeva V. Assessment of pharmacy students’ attitudes regarding professional development portfolios: before and after practitioners’ roundtable discussion. Curr Pharm Teach Learn. 2014;6(3):373-379.
2. McMullan M, Endacott R, Gray MA, et al. Portfolios and assessment of competence: a review of the literature. J Adv Nurs. 2003;41(3):283-294.
3. Stefani D, Smith MJ, Peterson S, et al. Electronic portfolios: questions, implementation, and lessons learned in a doctor of pharmacy program. Curr Pharm Teach Learn. 2011;3(3):164-170.
4. Plaza CM. The Application of Transformative Learning Theory to Curricular Evaluation [doctoral thesis]. Tucson: University of Arizona, 2006.
5. Plaza CM, Draugalis JR, Slack MK, Skrepnek GH, Sauer KA. Use of reflective portfolios in health sciences education. Am J Pharm Educ. 2007;71(2):Article 34.
6. Tsingos C, Bosnic-Anticevich S, Smith L. Reflective practice and its implications for pharmacy education. Am J Pharm Educ. 2014;78(1):Article 18.
7. Accreditation Council for Pharmacy Education. Accreditation standards and guidelines for the professional program in pharmacy leading to the doctor of pharmacy degree. 2007.
8. Accreditation Council for Pharmacy Education. Accreditation standards and key elements for the professional program in pharmacy leading to the doctor of pharmacy degree. 2015.
9. Accreditation Council for Pharmacy Education. Guidance for the accreditation standards and key elements for the professional program in pharmacy leading to the doctor of pharmacy degree. 2015.
10. Skrabal MZ, Turner PD, Jones RM, Tilleman JA, Coover KL. Portfolio use and practices in US colleges and schools of pharmacy. Am J Pharm Educ. 2012;76(3):Article 46.
11. Barr J, Cerosnio R, Copeland D, Kirwin J, Matthews SJ. 104th Annual Meeting, July 20-23, 2003, Minneapolis, Minnesota, Meeting Abstracts. Am J Pharm Educ. 2003;67(3):Article 100.
12. Ashcroft DM, Hall J. Pharmacy students’ attitudes and views about portfolio-based learning: a questionnaire survey. Pharm Educ. 2006;6:1-5.
13. Hobson EH, Johnston PE, Spinelli AJ. Staging a reflective capstone course to transition PharmD graduates to professional life. Am J Pharm Educ. 2015;79(1):Article 14.
14. McDuffie CH, Sheffield MC, Miller MS, Duke LJ, Rogers SP. Web-based portfolios for pharmaceutical care plans during advanced pharmacy practice experiences. Am J Pharm Educ. 2010;74(4):Article 59.
15. Briceland LL, Hamilton RA. Electronic reflective student portfolios to demonstrate achievement of ability-based outcomes during advanced pharmacy practice experiences. Am J Pharm Educ. 2010;74(5):Article 79.
16. Lopez TC, Trang DD, Farrell NC, De Leon MA, Villarreal CC, Maize DF. Development and implementation of a curricular-wide electronic portfolio system in a school of pharmacy. Am J Pharm Educ. 2011;75(5):Article 89.
17. Kalata LR, Abate MA. A mentor-based portfolio program to evaluate pharmacy students’ self-assessment skills. Am J Pharm Educ. 2013;77(4):Article 81.
18. Murphy JE, Airey TC, Bisso AM, Slack MK. Student evaluations of the portfolio process. Am J Pharm Educ. 2011;75(7):Article 132.
19. Brown C. Design, development, and evaluation of electronic portfolios for advanced degree programs in technology and school media. In: Illinois, ed. 27th Annual Meeting of The National Convention of the Association for Educational Communications and Technology. Chicago, Illinois, 2004.
20. Friedman BDM, Davis MH, Harden RM, Howie PW, Ker J, Pippard MJ. AMEE Medical Education Guide No. 24: portfolios as Web-based tools. Med Teach. 2001;23(6):535-551.
21. Driessen E, van Tartwijk J, van der Vleuten C, Wess V. Portfolios in medical education: why do they meet with mixed success? A systematic review. Med Educ. 2007;41(12):1224-1233.
Survey focused on student perceptions on the process they had not completed. Majority indicated "moderate" benefit to all variables except four variables on both the pre- and post-data was assessed except for improvements in responses to manageability of process and likelihood of continuing to develop documentation skills. Pre- and post-test design; 16-question survey to assess P1 student attitudes toward a PDP prior to and following roundtable discussions; no significant differences in responses except for improvements in responses to manageability of process and likelihood of continuing to develop documentation skills. A portfolio was developed a prescribing portfolio that directed students to gather, document, and reflect on evidence that demonstrated they understood areas linked with prescribing. Students during their final year of undergraduate pharmacy were used for the study. Students completed a questionnaire about submission of their prescribing portfolio. Questionnaire had four sections: (a) impact of the portfolio on their learning, experience of building the portfolio, attitudes toward use of portfolios as means of assessment, and attitudes toward use of portfolios to support continued professional development. A five-point scale was used. No data was provided on how the portfolio was assessed or what type of information required to be included in the portfolio. Portfolios were available for evaluation in 138 out of 141 students. All portfolios contained work products that demonstrated achievement of the first three outcomes. No tally was kept on the number of times a student was asked to resubmit due to failure to meet the outcome. 135 reflections were available for assessment. The two evaluator rankings concurred on 78 students. For the 57 who differed, the rankings were averaged. The average score for domain 1 was 2.9 and domain 2 was 2.3.

Preparation: A portfolio was submitted via email. Students chose work products from any APPE that demonstrated achievement of specified ability-based outcomes. Three of the outcomes required uploading examples that showed the student had met the outcome. These were reviewed to determine if the submission met the outcome. The fourth outcome required a reflection. Two authors used a rubric to evaluate the outcome. The rubric contained two domains: domain 1 (assessment of what was learned and its applicability to future practice) and domain 2 (assessment of continuing professional development). Each domain was scored on a scale from 1 (not proficient) to 4 (exemplary). Completion of the portfolio was a graduation requirement.

Results: Portfolios were submitted via email. Students chose work products from any APPE that demonstrated achievement of specified ability-based outcomes. Three of the outcomes required uploading examples that showed the student had met the outcome. These were reviewed to determine if the submission met the outcome. The fourth outcome required a reflection. Two authors used a rubric to evaluate the outcome. The rubric contained two domains: domain 1 (assessment of what was learned and its applicability to future practice) and domain 2 (assessment of continuing professional development). Each domain was scored on a scale from 1 (not proficient) to 4 (exemplary). Completion of the portfolio was a graduation requirement.

Conclusions: Portfolios were submitted via email. Students chose work products from any APPE that demonstrated achievement of specified ability-based outcomes. Three of the outcomes required uploading examples that showed the student had met the outcome. These were reviewed to determine if the submission met the outcome. The fourth outcome required a reflection. Two authors used a rubric to evaluate the outcome. The rubric contained two domains: domain 1 (assessment of what was learned and its applicability to future practice) and domain 2 (assessment of continuing professional development). Each domain was scored on a scale from 1 (not proficient) to 4 (exemplary). Completion of the portfolio was a graduation requirement.
Appendix 1. (Continued)

| Authors                        | Purpose                                           | Methods                                                                                                                                                                                                 | Results                                                                                                                                                                                                 | Limitations                                                                                     |
|-------------------------------|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Plaza4                         | Examine a variety of abstracts                    | Some abstracts described use of portfolios during APPEs. Three abstracts discussed the use of portfolios in the didactic curriculum. Most of the experiential abstracts did not contain information on whether the portfolios used a reflective component or not. | Abstracts were not specific nor did they contain information on how the portfolios were assessed.                                                                                                     | No details were given on the template or the rubric used for grading.                           |
| Hobson EH and colleagues13     | Develop and implement a capstone course that allows students to reflect on their development as professionals, assess/ share their achievement of college outcomes, complete a portfolio, establish a professional development plan, and prepare to enter the profession. | Students completed a hybrid course built around four online and in-class projects during the final semester of the curriculum. Course had a 14-week online component and a 2-week in-person component. Project 1 was a portfolio, project 2 was an educational outcome self-assessment, project 3 documented transition of the student from student to professional and required preparation of a professional development plan, and project 4 was a significant learning event oral presentation. The portfolio was set-up to record the development of the student from student to independent practitioner using a predetermined, restrictive presentation template. Faculty reviewed the portfolio to ensure it was up to date and included all required elements. Faculty also mentored students on items to include. The grading rubric was on a 3-point scale (excellent, acceptable, and unacceptable). Faculty read the student portfolios and outcome reflections, evaluated the development plans, and observed a student video presentation. All items were assessed using rubrics. | 67 students completed portfolios in 2013 and 72 in 2014; In 2013, 87% received a passing grade with 13% being acceptable and 87% being excellent (0% unacceptable). In 2014, 79% received a passing grade with 38% being acceptable and 63% being excellent (0% unacceptable). | The reflective components of this study were separate from the student portfolio creation.       |
| Kalata LR and Abate MA17        | Evaluate pharmacy students' self-assessment skills with an electronic portfolio program using mentor evaluators. | P1 and P2 students completed online portfolios. Students self-assessed specific graded class assessments. Faculty and alumni mentors evaluated the students' self-assessments and provided feedback using a rubric. No formal grade was given but it was a curricular requirement to complete. Only the student self-assessments were required on a 3-point scale (3= outstanding, 2 = satisfactory, and 1 = unacceptable); Mentors and students were also asked to complete a 5-point Likert scale survey providing feedback on the portfolio program and ideas for improvement. Students were instructed on what assignments to include in the portfolio. Assignments include three self-assessments (provided rubric) of course-related assignments per semester (two pre-chosen and one chosen by the student from a list) and one professionalism submission per semester. Self-assessment questions include the following: Q1: Describe those aspects of the assignment you were most satisfied with. Q2: Briefly describe how this assignment helped develop your knowledge and skills for two educational outcomes or abilities that were listed. Q3: Describe the aspects of this assignment that you need to further develop or improve. Q 4: Give specific examples for how you will achieve the development or improvement you indicated in question 3. | 75 P2s and 84 P1s participated; P1s had significant improvements in the self-assessment scores of questions 1 (p = .002) and 3 between fall and spring semester whereas P2 students did not have any significant improvements in these questions. Scores on the self-assessment questions 2 and 4 were not statistically different for either P1 or P2 students between fall and spring semester. At the end of the spring semester, P1 scores were higher on 3 of the 4 questions (questions 1, 3, and 4) compared to P2 students. P2s felt more strongly that mentors provided helpful feedback than P1s. Identical or similar percentages of students and mentors agreed (77%/74%) with the statement that students put forward best efforts on the self-assessments. | Portfolios were a combination of student-chosen items and items required by the program.         |
| Authors                          | Purpose                                                                 | Methods                                                                                                                                                                                                 | Results                                                                                                                                                                                                 | Limitations                                                                                           |
|---------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Lopez TC and colleagues¹⁶       | Describe the creation and implementation of an e-portfolio program for documenting PharmD students’ achievement of learning outcomes throughout the curriculum. | School created a web-based e-portfolio platform. First part of the paper discussed the different pieces of the portfolio. Students received a course-embedded assessment checklist to assist them in identifying which assignments should be posted for which curricular outcome. To document the grade achieved on the assessment, students selected a rating of 1 (not competent) or 5 (competent) when they uploaded the assignment. Deadline was given for submission of each assignment. An e-portfolio manager reviewed the portfolios each semester to monitor student progress in uploading. Completion of the portfolio was a graduation requirement. Each class had a different % of uploads that had to be completed (1st class=50%, 2nd class=70%, and future= 90%). | 85 students in each class; 100% of students successfully met the upload requirement. No student uploaded 100% of the assessments. 19% of students failed at least one outcome and 7% failed two or more outcomes. | Only assessed portfolio for completeness. No reflection on the pieces students upload; more of a repository of assessments that matched the outcomes. |
| McDuffie CH and colleagues¹⁴     | Implement and assess a Web-based patient care portfolio system for development of care plans by students while on APPEs throughout a statewide preceptor network. | Students documented six patient cases within five disease state categories using an online database while on APPEs. Students may choose four of the disease state categories and one was mandatory (substance abuse). Once a disease state was chosen, student was given a form to complete to help guide them through writing a care plan. The patient’s problem list was to be developed in conjunction with the patient, preceptor, and other health care personnel to learn an interdisciplinary approach to care. After submitting 1 of 5, faculty reviewers from the experiential department reviewed the work and provided feedback on appropriateness and completeness. If significant improvements were needed, the student was asked to resubmit. Student interventions were compared to assess continuity of patient care activities across the state and students were surveyed to gain feedback on the portfolio process. | 48% of students chose to document a diabetes case; 721 cases were documented; 322 times students documented therapeutic duplications and 250 times documented interactions; 48% of the submitted cases were done during students’ acute medicine APPE; 67% of students (80/120) completed the perception survey; 71% agreed the portfolio helped them develop a logical process for care plan development; 75% felt the process helped them develop their communication and documentation skills. | No assessment provided on student’s documentation. Perception data only. |
| Murphy JE and colleagues¹⁸      | Evaluate pharmacy students’ perceived benefits of the portfolio process and gather suggestions for improving the process. | Survey administered to 250 P1, P2 and P3 students; paper-based portfolios required of all students annually; course coordinators provided guidance on the reflections by placing in their syllabi the outcomes covered; goal of the portfolio was for the student to provide reflection on their growth as a student on the college’s educational outcomes; Students may choose the elements to support their reflections (course assignments, co-curricular, or experiential activities); portfolio had three domains (patient care, professionalism/management in health systems, and health improvement/wellness/disease prevention); portfolios were read by the student’s advisor and were graded using a 50-point rubric. | Survey response rate 85% to 90% depending on class year. Ratings were not significantly different among the classes except for three items; P3 students believed they spent more time on portfolio preparation (4.4/5) than P1 (2.1/5) and P2 (3.1/5) students; P1 class (3.1/5) thought portfolio process helped them understand contribution of extracurricular activities more than P3 (2.6/5); P1 (3.3/5) believed that additional information would help them in the portfolio process (P3 2.8/5); all students thought the portfolio process provided less than moderate amount of benefit (mean 2.3/5); lowest ratings were given to “modification of their approach to learning” (1.9/5); Regression model should increase perception in overall benefit among those who thought: increased understanding of expected outcomes, helped them examine impact of extracurricular activities, helped them identify what should be learned, helped them identify strengths and weaknesses, and modified approach to learning. | Perception data only; no data provided on the assessment of the portfolio. Study was completed 5 months after completion of the portfolio so timing may have been an issue. |
| Authors | Purpose | Methods | Results | Limitations |
|---------|---------|---------|---------|-------------|
| Skrabal MZ and colleagues<sup>10</sup> | Identify the prevalence of portfolio use in US pharmacy programs, common components of portfolios, and advantages of and limitations to using portfolios. | Cross-sectional 17-item electronic survey sent to 109 experiential coordinators at US pharmacy schools to collect data on portfolio content, methods, training and resource requirements, and benefits and challenges of portfolio use. | Survey response rate of 73%; 70 of the responding institutions were using student portfolios; 91% of the programs using portfolios provided an institution-specific purpose statement of portfolio use and assessment; 80% of the institutions indicated portfolios should be used beyond the experiential portions of the program and 21% suggested student self-reflections should be primary focus of such a system; Majority of respondents implied having behavioral and rubric-based approaches to assessment and a few said to include more reflective approaches; programs using portfolios have been doing so for a mean of 4.5 years; 61% used portfolios exclusively in the experiential portion of their programs; 23 of the 70 programs did not formally assess the documents; of the 47 who assessed, 34% had a specific person assigned to assess the portfolios, 45% used open-ended feedback or group consensus to assessment, 21% used a combination of non-graded and grading with a standardized rubric; Assessment conducted in various places in the curriculum (23% at end of each experience, 34% at end of each semester, and 17% annually); 92% of programs provided feedback to students; most common benefit cited was portfolios were a useful tool for student self-assessment and reflection; most common challenge was workload and time associated with implementation and maintenance. | Survey of use of portfolios. Only surveyed experiential personnel and not assessment directors/deans. Respondents may have answered the way they think they should given the political nature of this topic. |