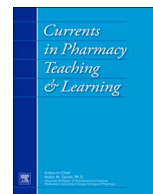




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## Methodology Matters

## Validation of learning assessments: A primer

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## ABSTRACT

The Accreditation Council for Pharmacy Education's Standards 2016 has placed greater emphasis on validating educational assessments. In this paper, we describe validity, reliability, and validation principles, drawing attention to the conceptual change that highlights one validity with multiple evidence sources; to this end, we recommend abandoning historical (confusing) terminology associated with the term validity. Further, we describe and apply Kane's framework (scoring, generalization, extrapolation, and implications) for the process of validation, with its inferences and conclusions from varied uses of assessment instruments by different colleges and schools of pharmacy. We then offer five practical recommendations that can improve reporting of validation evidence in pharmacy education literature. We describe application of these recommendations, including examples of validation evidence in the context of pharmacy education. After reading this article, the reader should be able to understand the current concept of validation, and use a framework as they validate and communicate their own institution's learning assessments.

## Our issue

Along with others in the pharmacy academy, we have been working to help our colleges/schools of pharmacy transition toward the Accreditation Council for Pharmacy Education (ACPE) Standards 2016.<sup>1</sup> One such challenge within these new doctor of pharmacy (PharmD) Standards is recurring language of *validity*, *reliability*, and *validating*. While these terms may have benign lay language uses, within educational psychometrics they are foundational and thick with meaning. In pharmacy education, what evidence do educators have that they are accurately educating and developing competent pharmacists for the future? Much like clinical medicine has progressed to emphasize evidence-based medicine (instead of basing medicine on anecdotes, eminence, vehemence, eloquence, providence, nervousness, or confidence),<sup>2</sup> calls have been made for medical<sup>3,4</sup> and pharmacy<sup>5,6</sup> education to progress towards evidence-based scholarly teaching. The purpose of this Methodology Matters article is to elaborate on these terms, provide recommendations for their applications, as well as discuss implications such as pharmacy academia's continued evolution towards evidence-based decision-making using data generated from their own local contexts. Of note, this article applies to classroom-level as well as program-level assessments.

## Methodological literature review

While validity is central to educational testing and measurement, it appears to often be misunderstood.<sup>7</sup> To progress, it is recommended to alter our oral and written communications to align with the evolution toward the current validity understanding,<sup>7</sup> one

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**Table 1**  
Validity Nomenclature, categories, and brief examples.

| Kane's framework for validation <sup>8,9</sup> | Current Testing Standards Validity Evidence <sup>10,11</sup>                  | Examples of reporting  | Historical Validity terminology <sup>12,13</sup>  |
|--|---|--|---|
| Scoring  | Content;<br>Response process  | Items, skills, scoring process, <sup>14,15</sup><br>Test developer training/experience, <sup>16</sup><br>Exam administration, <sup>14,15,17</sup><br>Rater training <sup>14,15</sup> | Content validity  |
| Generalizability                               | Internal structure  | Reliability indices, <sup>14-18</sup><br>Item difficulty and discrimination, <sup>16,17</sup><br>Theories/models, <sup>14,15,18</sup><br>Factor analysis domains <sup>18</sup>       | Construct validity  |
| Extrapolation                                  | Relation to other variables; also Content (from external/expert verification) | Comparison to standardized assessments, <sup>16</sup><br>Expert panel validation <sup>16</sup>   | Criterion validity<br>Discriminant validity<br>Convergent validity<br>Predictive validity<br>Content validity |
| Implications                                   | Consequences  | Standard setting, <sup>17</sup><br>Impact on student practice behaviors, <sup>17</sup><br>Instructor development <sup>17</sup>   |   |

that focuses on use and interpretation of a learning assessment rather than as a characteristic of tests or test scores. Table 1 provides an alignment of validity concepts; using this, we hope to help readers keep these technical terms straight.

Previously, Harpe<sup>19</sup> provided a succinct history of educational and psychological measurement. Subsequently, Cor<sup>20</sup> described four types of validity: measurement, internal study design, external study validity (generalizability), and statistical conclusions. This article focuses only on measurement validity. In the practice of education (as opposed to research design), measurement validity (hereafter simply referred to as *validity*) is “the most fundamental consideration in developing tests and evaluating tests.”<sup>10,11</sup>

#### Validity and reliability

For the past 15 years, validity has been conceptualized as a unitary entity within the last two editions of the *Standards for Educational and Psychological Testing*<sup>10,11</sup> (hereafter referred to as *Testing Standards*); consensus has formed around the concept that there is only one validity for assessment use and interpretation.<sup>12,13,21-23</sup> This unified validity was no longer a test characteristic as previous validity concepts were; now it is validity for test use and interpretation. The Testing Standards define validity as “the degree to which accumulated evidence and theory support a specific interpretation of test scores for a given test. If the multiple interpretations of a test score for different uses are intended, validity evidence for each interpretation is needed.”<sup>11</sup> Importantly, there are multiple types of evidence towards interpretation from that single validity.

The Testing Standards provide a framework for these evidence sources of *content*, *response process*, *internal structure* (which includes reliability), *relations to other variables*, and *consequences*.<sup>10-13,22</sup> Table 1 details an alignment of older validity language with this new framework. The traditional concept of *content validity* aligns with evidence for *content*, *criterion validity* aligns with evidence for *relations to other variables*, while traditional concepts of *construct validity* and *reliability* align with *internal structure*.<sup>12,13</sup> Note that while indirectly related to other sources, evidence for *response process* (e.g., details of test administration and test setting, students interpretations/misinterpretations of certain questions, raters' interpretations/misinterpretations using scoring rubrics, or how students respond/answer within the test format such as close-ended multiple-choice or open-ended short-answer) and *consequences* (e.g., practical end-decision rules and impact, false-positives for competence, false-negatives for remediation) have been added into this validity framework.<sup>12,13</sup>

Valid interpretations and conclusions can vary with the same learning assessment used for differing purposes, which could involve, for example, administering the same assessment to different groups of learners such as first-year and third-year PharmD students. The process of building an argument and collecting evidence supporting that interpretation and its decision-making conclusions, with each different learning assessment use and among different test-takers, is termed *validation*.

#### Validation

Pharmacy education has historically focused classroom instruction in physical sciences, such as chemistry, biology, and physics. As opposed to these physical sciences where chemicals, medications, and physiological reactions to substances are relatively similar among humans, people's social interactions are complex and can vary widely including rationally and irrationally. Education takes place in a social environment. As well, healthcare has a plethora of social environs, in which student pharmacists may collaborate with preceptors, patients, caregivers, interprofessional clinicians, and students from other professions. When dealing with less predictable social environments, any educational intervention may have different outcomes in one setting as compared to another—because the people, their reactions, and their responses with one another can vary among different environments. To that end and within a paradigm of evidence-based decision-making, educators should assure that in their local setting, their educational processes are helpful towards development of their students' learning.

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