

ORIGINAL ARTICLE

Web-based Education of Parenteral Medication for Nursing Students: The Validity of Learning Media

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ABSTRACT

Introduction: Digital learning is being developed in nursing education. Web-based education of parenteral medication learning consists of information about intracutaneous, intramuscular, intravenous, and subcutaneous drug administration. This considerable material cannot be mastered only in a laboratory with limited room capacity, tools, and time. For the learning media to be used for research interventions to be declared feasible and valid, a validity test is needed on the media. The purpose of this article is to determine the level of validity of web-based learning media education for parenteral medication. **Materials and methods:** Summary of study setting and participants; the study design; key methods utilized to gather and evaluate data, including the proper name of the instruments employed. The procedural development model shows the steps that need to be followed to produce a product. Learning media creation involves six steps: assessing student needs, formulating learning objectives, providing a detailed content outline, generating assessment instruments, writing media scripts, and conducting assessments and testing. The comments, recommendations, and critiques received provide the basis for future thought for developing a website. **Results:** The major findings three media experts assessed the six components as original and competent, with an average score of 3.7. Five material experts assessed the media's format, content, and color aspects and obtained an average score of 3.5. **Conclusion:** Parenteral medicine education provided online is acknowledged as valid and highly practical for use in digital learning. The utilization of this learning medium is the subject of additional research, according to researchers.

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INTRODUCTION

Content, feed back procedure, internal format, link to other factors, and effect are the five types of validity evidence. Content validity refers to how relevant and representative an assessment instrument's components are for a certain assessment goal. The specific technique used to collect data for psychological assessments, such as questionnaires, is referred to as an assessment instrument. The terms "component of an appraisal instrument" refer to any component of the measuring procedure, such as instructions, response forms, and questionnaire items, that may have an impact on the data collected. The notion, characteristic, domain, or variable that is the subject of appraisal is referred to as the area (1).

An assessment tool's representativeness is the grade to which its elements are proportionate to the facets

of the desired construct, whereas its relevance is the suitability of its elements for the targeted constructions and assessment functions. Although content validity has two components relevance and representativeness of an appraisal tool the relevance of an assessment instrument, as suggested by Davis, has been widely utilized to determine (2).

There have been reports of instruments. The scale of components on an instrument that received a rating of 3 or 4 (valid) from all content experts is one method known as the common CVI (UA-CVI). The majority of research in the literature steers clear of the conservative and 100% agreement-demanding UA-CVI strategy (3). Furthermore, it is challenging to accomplish, particularly as the number of experts rises. The Average-CVI (Ave-CVI), a more adaptable method for calculating the overall instrument-CVI, is described as "the average component of items rated as 3 or 4 (valid) the different experts (4)."

Three ways can be used to appraise the Ave-CVI: counting the total ratings multiplied by the total sum of components rated consistent by all experts combined;

concluding the I-CVIs and parting the result by the total sum of items; and finally dividing the total number of ratings (5,6). The third method is to average the percentage of elements that experts agree are relevant. Notably, each of these methods will consistently produce the same result (Table II) (7,8). Polit and Beck (2006) recommended using the moderate I-CVI value since it is more connected with item quality than expert performance (9). However, if needed, choosing the experts for the second or third rounds could benefit from assessing the expert's conduct using the third technique (10).

Another metric is the average congruency percentage (ACP). This index can be created by calculating the percentage of items that each expert deems relevant, then averaging those percentages across experts (11). The Ave-CVI and this index are the same. According to Davis (1992), the lowest bound of an instrument's CVI acceptability should be set at 0.8. Waltz et al. (2005) suggested, however, that an ACP of 0.90 be used instead of 0.80 to determine acceptability. Nonetheless, Waltz et al. (2005) suggested that, rather than using 0.80 to assess acceptability, an ACP of 0.90 be utilized. Polit and Beck (2006) questioned the specifics of the content validity index and proposed that the I-CVI be computed using Lynn's standards, which state that an Ave-CVI of 0.90 or above indicates outstanding content validity (I-CVI = 1 for three or five experts and a minimum I-CVI of 0.78 for six to ten experts). Note that Polit et al. (2007) suggested that perfect agreement should only be reached in situations involving three or four experts, somewhat changing the standards from before. The CVI is still significant and offers a number of advantages over other estimates, despite index changes (12). The CVI offers content validity for both the individual items and the instrument as a whole, is straightforward to compute, and is simple to comprehend and understand (13). It can also be used to evaluate the experts' performance, and most significantly, it gives the instrument maker the ability to decide which elements to include or remove from an instrument (14).

There are restrictions on the CVI and dimension of understanding indexes. Cohen (1960) called the proportion of agreement a "most primitive approach" and acknowledged its drawbacks. Cohen developed the kappa (κ) coefficient, which is used to evaluate inter-rater understanding. The percentage of understanding that remains after the likelihood of understanding is eliminated is represented by the kappa statistic. The CVI has a benefit over other inter-rater agreement indices, such as kappa, in that it captures the inter-rater understanding of congruity rather than the entire inter-rater understanding, which includes both relevance and non-relevance (15).

As a novel approach to content validity, Polit et al (2007) developed a modified kappa κ^* method that corrects

each I-CVI for chance agreement. This index records the experts' consensus that the item is significant; however, the consensus that it is not relevant is not taken into account (16). In addition, a number of consensus estimates have been put forth as CVI measure substitutes. One consistency metric, the coefficient alpha, was proposed by Waltz et al. (2005) as a means of measuring content validity across numerous raters. Nevertheless, coefficient alpha only tells us a little bit about each item, and most crucially, sometimes poor agreement can still result in a high alpha value. Consistency indices should not be used in content validation along with a large number of inter-rater agreement indices or consensus estimations because they represent the percentage of deviation from the means when different experts rate an item rather than the exact agreement in the judgments made by panel members of expertise (17).

It has been covered in the literature, including the following: Weighted kappa (ordinal data), Gwet's AC1, Cohen Kappa κ , Fleiss Kappa (multi-rater kappa), Kendall's coefficient of concordance (W), Krippendorff's alpha coefficient, Gwet's AC1, T index (Tinnsly and Weiss, 1975); rWG (James, Demaree, and Wolf, 1984); r^*WG (Lindell, Brandt, and Whitney, 1999); Kerppendorff's alpha coefficient, and Gwet's AC1. Although each of these indices has a separate set of assumptions and applications, they all evaluate the raters' exact agreement and modify the chance agreement's risk. Wynd et al. (2003) suggested utilizing both indices to ensure an instrument's content validity and to enhance understanding of inter-rater agreement. They achieved this by validating the content of their osteoporosis opportunity appraisal tool using a kappa statistic in addition to the CVI (18).

The second phase of content validation begins when the construct has been precisely defined, the arising items have been formulated, and the instrument has been massed (19). A group of specialists is invited to the judgment-quantification stage in order to assess the instrument's suitability for measuring a specific concept of interest and the degree to which pertinent content domains have been incorporated into it (20). Even though content validity depends on the subjective opinions of experts, the experts chosen to review and provide commentary on an instrument's content should be chosen using certain criteria, such as the credentials, experience, clinical competence, and relevant training of content experts (21).

A set of guidelines for choosing and utilizing subject matter experts in instrument development is offered by Grant and Davis (22). Regarding the minimum number of content experts needed to review an instrument, there isn't an existing agreement. Lynn et al. (1986) recommended at least three. Others, however, suggest having three to twenty panel members (23). According to Grant and Davis, Ultimately, the expected level of

competence and the panel's broad representation of knowledge will determine how many experts are needed for content validity. Although the maximum number of experts has not been stated, up to ten experts are frequently employed. In addition to reducing the likelihood of a chance agreement, using more specialists may help in instrument development (24).

It is advisable to speak with specialists before starting any investigation. As soon as the instrument builder get an affirmative feedback from the experts to participate, the content validity study can start. Experts with the necessary theoretical background and subject expertise should be able to offer a complete appraisal of the instrument. Thus, an report package or booklet that is provided to experts should contain a cover letter, a copy of the prepared instrument, and a content validity evaluation form (response form). The cover letter should include the goal of the study, an overview of the instrument and its score, and an explanation of the content validity form (25).

In order to rate the items' quality, it is imperative that the expert have both the operational and conceptual definitions of the construct. The experts can evaluate these definitions for clarity and comprehensiveness. The expert may be asked to offer more suggestions or to remove any item during the assessment process. They may also be asked to review how each item is worded and offer any additional feedback. For this reason, during the judgment and quantification phases, a systematic content validity assessment form is important (26).

Digital learning is being developed in nursing education. Limited learning media is an opportunity for educators to always develop media that is easily accessible to nursing students. This learning medium is used to improve knowledge and skills for students in order to achieve competence (27).

Based on several literature, online and offline learning are currently the best combination. Conventional or face-to-face learning is still needed, but the availability of time and space is very limited because it has to share with other classes. Online learning as one of the complements in the implementation of learning must continue to be developed to improve the abilities of nursing students. The advantage of online learning is that it can be accessed by anyone and from anywhere without being limited by space or time (28).

Nursing learning starts with basic nursing, which begins in the first semester. One of the most important courses is basic nursing, which includes topics on oral and parenteral drug administration. Parenteral drug administration is the topic that has the most failing grades. This is because students make many mistakes, such as not disinfecting before action, not calculating the dose of the drug correctly, and not aspirating before

administering the drug to the patient. For this reason, repeated learning is needed so that students can master the material well (29).

Learning that has been carried out face-to-face has weaknesses, so it must be balanced with online learning. According to some literature, the most common online media is the Android application. However, this media has weaknesses; among others, it must be downloaded via an Android-based cellphone and make a payment before downloading. The need for online media that is more easily accessible from a variety of devices is needed so that online media can be accessed easily. One of the online media that can be accessed from various devices is in the form of a web site. Through this website, learning materials are inputted and provided for all forms of devices, such as mobile phones with various types, such as Android, iPhone, personal computers, and laptops (30).

Parenteral medication learning consists of intracutaneous, intramuscular, intravenous, and subcutaneous drug administration. This considerable material cannot be mastered only in a laboratory with limited room capacity, tools, and time. Researchers create online media containing theory and video skills about parenteral medication. In order for the learning media to be used for research interventions to be declared feasible and valid, a validity test is needed on the media. For this reason, researchers will conduct a validity test on learning media in the form of a website containing parenteral medication (31).

MATERIALS AND METHODS

A procedural development model is the one that was employed. The procedural development model illustrates the actions that must be taken in order to create a product. The process of creating learning media has six stages, including analyzing student needs, developing learning objectives, outlining the content in detail, creating evaluation tools, composing media scripts, and conducting testing and evaluations. Before field trials, the expert validation stage is carried out on media prototypes and scripts that have been assembled. The information gathered describes the video's viability as a learning resource and its level of validity as a group parenteral medication tool. The feedback, suggestions, and criticism gathered serve as a foundation for future consideration while creating website parenteral medication. When the validation stage is over, the tested media is then improved based on recommendations, critiques, and inputs made by media professionals and material specialists.

Collection Tools for Data

An open questionnaire was employed to gather data for expert validation. This tool is designed to evaluate video learning resources that are in the development

stage (32). Content validity is the degree to which aspects of an assessment instrument are pertinent to and representational of the desired construct for a specific assessment purpose. The notion, characteristic, domain, or variable that is the object of measurement is referred to as the construct (Saiful & Yusoff, 2019). The validity and reliability content of the Web based education will be examined by a panel of five experts from various fields. By applying the content validity index and giving each item a 2-point score, the expert committee evaluated the instrument's index content validity (CVI). The adequacy of content, appropriateness of Web based education, and intervention procedures for this study were assessed and discussed by an expert group consisting of a nurse practitioner with 5 years of experience and lecturer with more than 5 years of working as nurses educator. The minimum CVI result is 3, so it can be categorized as valid (Yusman, 2020). This tool is used to evaluate web based education that are being developed. The data on the validity of learning media is obtained from material experts and from media experts. The instrument of validation content adopt from Yamasari 2010. Media validation measurements were carried out by media experts.. A media expert questionnaire was employed to gather data for expert validation. This tool is used to evaluate learning video learning material that are being developed (Rosyad & Kora, 2022).

This instrument consists of format, content, and language aspects. The format aspect consists of 4 items; Clarity of instructions for working, Suitability of format as a worksheet, the suitability of the entries on the worksheet with the desired definition., Suitability of the answer on the worksheet with the desired definition .The content aspect consists of 6 items; reparation of material on Web based education programs, the suitability of the material for the Web based education program, the harmony of colors, text, and images on Web based education programs, appropriateness of color, image display, and writing on the material, the suitability of the appearance of images and writing on the exercise questions, the role of Web based education media in making it easier for students work. The language aspect consists of two items; the standardization of the language used and the ease with which students understand the language used. Web based education media validation by media experts using the instrument from (Yusman, 2020). The instrument consist of 5 items; simplicity, cohesiveness, emphasis, balance, and form. The validity of the instrument is calculated using the following formula (Yusman, 2020):

In summary, the CVI test process is carried out using the following steps:

Step 1: The Content Validation Form's preparation

We created a custom content validation form to make sure the review panel was informed of the requirements and that the necessary work was clearly described. A concise synopsis was provided, along with precise

descriptions of each of its components. Individual items were scored according to their relevance using a 4-point grading system (1 being not relevant and 4 being highly relevant).

Step 2: Choosing an Expert Panel

A panel of content specialists who critically and individually assess each suggested item's relevance can conveniently assess the content's validity. Through email invitations, we gathered a purposeful sample of national authorities on nursing practices and the professionalism of education to take part in our research. The specialists who might support the process of content validity were selected based on their background and knowledge in the area of nursing practices and education professionalism in the digital sphere. We chose a panel of renowned experts based on their suitability and availability for the given topic.

Step 3: Validating the content

We scheduled a zoom meeting for September 2023 with the chosen experts to take part in validation process. The validation session started off with a brief professionalism and an acknowledgment of the lack of web based education frameworks to help users navigate the digital world. An overview of the recently created web based education framework was given by showing the progression from ideation to development. Next, an explanation of the web based framework's core constructs—values, behaviors, and identity—was given. Furthermore, it was emphasized how closely the framework structures relate to the professional mission. During the meeting, the experts answered any questions that were raised.

Step 4: Examining the Items and Domains

Before delivering a real-time score for each item, the experts were asked to critically evaluate each construct domain and its components throughout the conference.

Step 5: Giving Each Item a Score

The item-level CVI (I-CVI) form, which was distributed via email to each expert on Google Docs, was to be used by the experts. Using a 4-point grading system (1 being not relevant and 4 being highly relevant), the experts evaluated each item's relevance. The 4-point rating system was selected due to its removal of the neutral response choice, which may significantly mitigate the impact of study results among a limited group of specialists. Each expert gave a single item a relevancy rating and offered free-text commentary. Based on individual items, the analysis of the CVI value for every item was carried out.

Step 6: Item Refinement and CVI Computation

Two methods were used to analyze each expert response: the individual item scores were determined, and the overall idea was calculated based on the ratings of individual items. There are two types of CVI that have

been described: scale-level CVI (S-CVI) and I-CVI (16). The average of the I-CVI scores for each item (S-CVI/Ave) was calculated for the S-CVI. The relevance rating was categorized as 1 (relevance scale of 3 or 4) or 0 (relevance scale of 1 or 2) prior to the CVI computation.

Ethical Clearance

This study was approved by Research Ethics Committee, school of Health Science Wira Husada Yogyakarta No 626/KEPK/STIKES-WH/III/2024.

RESULTS

Validity is a central issue in the instrument development process, especially if it is used to measure ambiguous, abstract, and unobservable concepts or constructs. used to measure concepts or constructs that are still ambiguous and abstract and cannot be observed directly. directly. For example, motivation can be expressed as the process that moves a person to do something.

someone to do something. This concept is still abstract, so it requires further operationalization so that it can be observed and measured. According to Azwar (2012), psychometric specialists have created numerous crucial criteria for determining if a psychological measuring instrument is a good measuring instrument, including the ability to evaluate motivation. to be classified as a good measuring instrument, which means being able to generate data and offer reliable results. The criteria include being valid, dependable, objective, standardized, inexpensive, and practical (33).

The five types of validity evidence include content, response process, internal structure, link to other elements, and consequence (1). Content validity refers to how relevant and representative the components of an assessment instrument are for a certain assessment goal (1, 2). A psychological examination's specific data collection technique, such as the use of questionnaires, is referred to as an assessment instrument. The terms "elements of an assessment instrument" refer to any component of the measuring process, such as instructions, response forms, and questionnaire items, that may have an impact on the data collected (34). Lawshe (1975) proposed the content validity ratio (CVR) to quantify the degree of agreement among experts on an item, which can describe the amount of content validity using single indicators ranging from -1 to 1. Aiken (1980, 1985) presented the content validity coefficient and homogeneity coefficient reliability as another way of measuring each item's validity rating (V value). This investigation used two techniques: Aiken's V content validity coefficient and Lawshe's CVR content validity ratio (35).

Lynn (1986) recommends using a minimum of three experts, but indicates that more than 10 may not be necessary. To prevent neutral and ambivalent

midpoints, use a 4-point ordinal scale. Some often-used labels include 1 (not relevant), 2 (slightly relevant), 3 (moderately relevant), and 4 (extremely relevant). The I-CVI for each item was then computed as the number of experts who gave a favorable rating of 3 or 4 (thereby dichotomizing the ordinal scale into relevant = 1 and irrelevant = 0), divided by the total number of experts (35).

Table I: Characteristic of Expert

Gender	n	%
Female	5	62.5
Male	3	37.5
Total	8	100
Education	n	%
Doctoral	3	5
Master	3	37.5
Bachelor	2	25
Total	8	67.5

Web-based education parenteral medication is a learning media that will be tested on nursing student respondents. Before the learning media is declared suitable for use as a research intervention material, the learning media needs to be tested by the name of the validity test. In this content validity test, researchers used a total of eight experts, consisting of five material experts and three media experts.

Three media experts rated the six components as innovative and competent, with an average score of 3.7. Six components (simplicity, connection, emphasis, balance, shape, and color) were certified valid, while three media experts rated one component (emphasis) as valid enough and extremely practicable to employ with an average score of 3.3. According to the conclusions of three media specialists, web-based education through parenteral medicine learning media is both legitimate and extremely feasible to utilize. This assessment is consistent with the findings of earlier research, which say that if the average value of the validation results is three, the medium is regarded as appropriate for use.

In addition, five material experts assessed the format, content, and color aspects of the media and obtained an average score of 3.5. Of the five material experts, all stated that the learning media was declared relevant with an I-CVI value of 1, which means that all stated that the media was relevant for use. This is in accordance with Lynn's theory, which states that for validation measurements, five experts must get a score of 1 (33).

Table II: Expert Validation

Aspect	Expert 1	Expert 2	Expert 3	Ki	Ai	I-CVI	Category
Simplicity	4	3	4	3.7	3.7	1	relevant
Connect-edness	4	4	4	4.0		1	relevant

CONTINUE

Table II: Expert Validation

Aspect	Expert 1	Expert 2	Expert 3	Ki	Ai	I-CVI	Category
Emphasis	3	3	4	3.3		1	relevant
Balance	4	3	4	3.7	3.7	1	relevant
Shape	4	4	4	4.0		1	relevant
Color	4	4	3	3.7		1	relevant

The findings of this research can be utilized to assess validity because the eight validators are competent individuals. Revision of multimedia-based learning media continues until a valid medium is obtained. According to Sahid, learning media is anything that may be used to channel messages (learning materials) in order to arouse students' attention, interests, ideas, and sentiments in learning activities and achieve learning goals. Learning media is an integral part of the learning system and cannot be separated from the learning process. E-learning enables students to autonomously control the outcome of their learning. Learners have complete discretion over when they begin, when they finish, and which elements of a module to study first. The teaching and learning process cannot occur without the use of learning materials (32).

The content validity index (CVI) is the most commonly used method for determining an instrument's content validity. It can be calculated for each item on the instrument in addition to the content validity index for the entire instrument (instrument level-CVI). The CVI is based on expert judgments, which are typically on 4-point Likert scales ranging from 1 (not relevant or not representative) to 4 (highly relevant or representative).

Table III: Media Expert Validation

Aspect	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Ki	Ai	I-CVI	CATEGORY
Format	4	4	3	4	3	3.6	3.53	1	Relevant
Content	4	3	3	4	3	3.4		1	Relevant
Language	3	4	3	4	4	3.6		1	Relevant

These evaluations are based on the content, relevance, or representativeness of an instrument. One limitation noted in the research about the use of the CVI as a measure of inter-rater agreement is the possibility of agreement inflating caused by random variables. Lynn used the standard error of the proportion to provide parameters for how many experts must agree with the item's or instrument's content to obtain an acceptable CVI. Furthermore, according to Lynne, a 4-point rating scale is better than a 3- or 5-point rating scale since it excludes the ambivalent middle rating and offers enough defined data to produce a credible CVI estimate (34). The method of calculating the CVI suggests that ratings of 1 and 2 are deemed "content invalid," while ratings

of 3 and 4 are deemed "content valid." This makes the use of a 4-point Likert scale controversial, as it reduces the likelihood that experts will agree by chance alone 50% of the time, irrespective of the number of experts consulted. When the original scale is no longer available, there may also be a chance of losing important data. Additionally, a 4-point rating scale forces the rater to indicate a particular propensity without giving them the option to be neutral or unclear.

Hitkin (1995) in Hendryadi concluded that content validity is required at the development stage of a scale. Scale development stage. One typical method involves respondents arranging or ranking items based on their similarities in order to construct a concept definition. This can be accomplished by having specialists evaluate the objects' compatibility with the notion being measured. An appropriate index of agreement should be determined before the items and definitions are administered. Newer approaches were created to conduct content assessments using sorting techniques and component analysis to quantitatively analyze the content appropriateness of a recently developed set of questions. Respondents are asked to rate the extent to which the items meet the construct definition. Responses were then examined using factor analysis, and items that were deemed appropriate were kept for future administration to further groups. The third strategy relies on the analysis of variance technique. This technique is very simple and straightforward and allows statistical tests to test the appropriateness of the content. It can be carried out with a tiny sample size, reducing both the cost and time of collection. However, Hitkin (1997) in Hendryadi also states that none of these strategies will guarantee that the scale has valid content, but they will provide evidence that the item is a suitable measure of the construct under test and lessen the necessity for scale change (33).

In contrast to other types of validity, content validity is test-based rather than score-based. It explains the instrument's content requirements and has nothing to do with the scores calculated from that construct. However, it might be difficult to create a reliable measure of an abstracted theoretical notion; it is not always as straightforward as it appears. Evidence of content validity is critical for the construction and evaluation of any produced instrument, and it should not be confused with less trustworthy evidence known as face validity. Face validity is an empirical evaluation of the construct's soundness, although it cannot be quantified and is given less weight in psychometric testing (36).

DISCUSSION

The Content Validity Index (CVI) applied to this parenteral medication learning media is a method designed to ensure its relevance and significance for educational purposes. CVI plays a crucial role in

verifying that the content meets the needs of nursing education and professionals. The primary goal of conducting CVI on this web-based media is to evaluate whether it comprehensively addresses all essential aspects required by nursing students. Additionally, CVI provides valuable feedback for refining and updating the parenteral medication material by involving both media and nursing experts in the evaluation process. CVI also enhances the confidence of both students and instructors in the material, thereby improving the overall quality of learning. However, CVI has its limitations, including the subjectivity of expert assessments, the demand for significant time and resources, and the potential need for material revisions if expert opinions diverge. "Despite its limitations, the Content Validity Index (CVI) remains a highly valuable tool for evaluating and enhancing the quality of learning media, particularly in web-based education focused on parenteral medication. By ensuring that educational materials are both relevant and thorough, we can contribute to improving the skills of healthcare professionals and, ultimately, enhance patient safety."

CONCLUSION

Parenteral medicine education provided online is acknowledged as valid and highly practical for use in digital learning. The utilization of this learning medium is the subject of additional research, according to researchers. Suggestions for the next author are to develop learning media that are more interesting and interactive for students so that they can do interactive learning.

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