



Balance Nutrition Literature Teaching Materials in Creative Problem Solving Based Multirepresentation Learning Model

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Abstract. Creative problem solving based multirepresentation (CPSBM) learning is one of learning models to solving problems in groups, to training creative thinking skills and critical thinking skills. CPSBM models suitable to use for the complex characteristics and the ever-evolving nutrition and health problems. In order that the CPSBM learning model to be easier to understand, easy to apply, and more meaningful, teaching materials are developed. Teaching materials are arranged according to the four pillars of balanced nutrition. Content validation was carried out by five UNNES Postgraduate lecturers with the Aiken's V test. Construct validity (correlation between components and teaching material variables) and reliability (halved) were tested with *pearson correlation*. The assessment of the components and variables of teaching materials tested with descriptive percentage. The results of the content validity test showed that all components of teaching materials are valid and feasible to use with Aiken' V values between 0.80–0.90 (above 0.79). Teaching materials are considered valid and reliable, feasible to use and measure the results of the construct validity test with high and very significant correlation value, except for the illustration component with moderate correlation. The reliability of teaching materials obtained high and very significant correlation value. Assessment of all components of teaching materials obtained values above 90% in very good level.

Keywords: Creative problem solving based multirepresentation · learning model · balance nutrition · teaching materials

1 Introduction

Creative problem-solving (CPS) learning process is a collective creative effort used by groups to solve problems [1] and to find more solution and new (original) solution [2].

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CPS learning is carried out in stages 1) identifying problems, consisting of problem identification, exploration, construction), 2) finding ideas, 3) finding solutions and 4) finding execution stages which include planning and implementing the specified solution [1]. The CPS stage shows that each stage will begin with divergent thinking (problem identification stage, generating ideas, turning ideas into solutions, and building action plans) to create a large variety of thoughts and generate many alternatives. The next problem-solving process is convergent thinking to decide and choose the most appropriate thinking. Finding solutions to problems can be an interesting challenge and bring about other positive and unexpected changes [3]. CPS was developed based on a dynamic and interactive program development model and not a standard process, but a continuous process [4]. In order to carry out the evaluation of ideas to obtain a deep, comprehensive, creative thinking and more meaningful understanding, the solution will be carried out with multiple representations. Multirepresentation is a way of presenting the same concept in several different forms [5], so that the learning model is called Creative Problem Solving Based Multirepresentation (CPSBM).

The CPS learning model was chosen with considerations: 1) to apply the principles of group work and sharing [6, 7], 2) to obtain mutually beneficial solutions, 3) to obtain the best solutions, and 4) to develop critical thinking skills [1, 8]. The learning model is a topic in learning innovation in the field of educational innovation.

The CPS learning model is suitable with the characteristics of complex and ever-evolving nutrition and health problems [9]. Learning the stages mentioned above requires scientific, active and creative thinking in solving a problem, including nutrition and health problems, as measured by literacy and health skills. A well-executed CPS model will encourage the development of higher-order thinking, including creative thinking skills and critical thinking skills.

To support the success of CPSBM learning, teaching materials are developed [10] which contain complete nutrition and health content. Teaching materials are materials whose content and presentation can be used to obtain in-depth and broad information about science, technology, art, and culture [11]. The prepared teaching materials teach students to practice solving nutrition and health problems with the CPS learning stages. An example of compiling literacy materials for nutrition and health issues is accompanied by questions and answer keys. Improving nutritional and health literacy skills can improve the nutritional quality of food. To make teaching materials easier to understand and interesting to read, they are equipped with photos of food ingredients with colorful illustrations.

The research objectives are to 1) analyze the validity and reliability of balanced nutrition literacy teaching materials and 2) find the characteristics of creative problem solving with multirepresentation-based balanced nutrition literacy teaching materials.

2 Methods

CPS learning activities is measuring student learning activities, which measured by group work activities, carried out in online-zoom application. Learning activities observed in the CPS syntax refer to Nazzal *et al.* [8].

Teaching materials are measured by assessing the components of teaching materials with BNSP guidelines. These components are content components, competency

components, language components and illustration components. To find out whether the teaching material instrument is valid to measure these characteristics, expert validation is carried out. The experts who validating are five UNNES Postgraduate lecturers (2 Professors and 3 Doctors).

Content validation was carried out with Aiken's V. V table test at 5% confidence level, with the rate of 5 and the highest scoring score 5 and the lowest score 1, obtained $V_{table} = 0.79$. If $V_{count} > V_{table}$, then the test is valid [12]. Aiken's V test formula:

$$V = \left(\sum s \right) / \{n(c - 1)\} \quad (1)$$

description:

V: validity score

S: r – lo

r: expert score category

lo: lowest score

n: total expert

c: highest score

Construct validity carried out to test the correlation between the components of teaching materials and the variables of teaching materials. Reliability testing was carried out by splitting the test in two, in the beginning test and the last number of questions. Tests of construct validity and reliability were carried out using the pearson correlation. The assessment of the components of teaching materials and overall teaching materials were analyzed by descriptive percentages [13].

3 Results and Discussion

3.1 Results

The results of the content validity analysis showed V table with 5% confidence level, with the rate of 5 and the highest score 5 and the lowest score 1, obtained $V_{table} = 0.79$. Based on Table 1, it is obtained that the value of V count for all items above the assessment value of 5 validators on teaching materials instruments is suitable to use in the field with small revisions. These revisions were done by changing the language to be more communicative and easier to understand.

To determine the validity of the constructs of teaching materials, a correlation test was conducted between each component of teaching materials and the variables of teaching materials. The results showed the components of content, competence and language were highly correlated (r between 0.609–0.799) with teaching materials, except for the illustration component which had a moderate correlation. The results of the construct validity test are shown in Table 2. Reliability test conducted by splitting test on all variables resulted in a high correlation value (r = 0.709) and very significant (p = 0.000).

Teaching materials have define characteristics as 1) containing four pillars of balanced nutrition as an elaboration of the Ministry of Health of the Republic of Indonesia Regulation Number 41 of 2014 concerning 'Balanced Nutrition Guidelines; 2) equipped with problems solved using the CPS model, 3) nutrition and health literacy according to

Table 1. Aiken’s V Calculation Results on Teaching Material Instruments

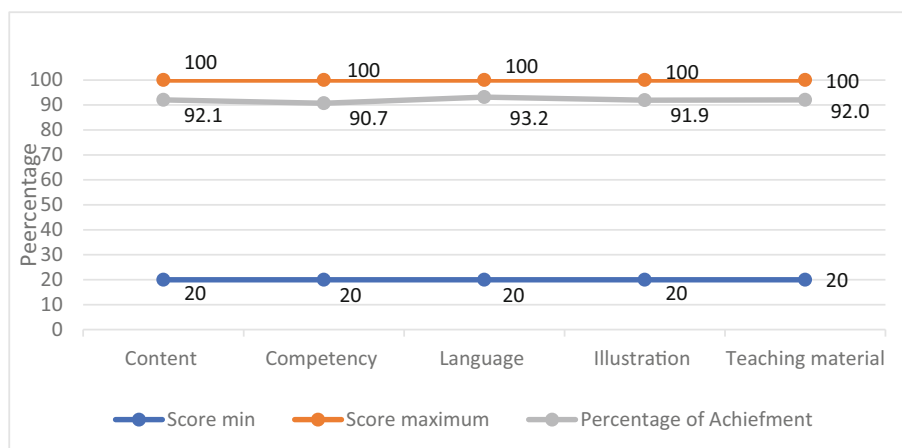
Question Item	Rater 1		Rater 2		Rater 3		Rater 4		Rater 5		ΣS	V
	Score	S	Score	S	Score	S	Score	S	Score	S		
Completeness of course identification	3	2	4	3	5	4	4	3	5	4	16	0.80
Readability of the language used in the 4 assessment components	3	2	5	4	5	4	4	3	5	4	17	0.85
Content according to the assessment component	4	3	4	3	5	4	4	3	5	4	17	0.85
Use of language in accordance with the General Guidelines for Indonesian Spelling	4	3	4	3	5	4	4	3	5	4	17	0.85
The language used is communicative	3	2	5	4	5	4	4	3	5	4	17	0.85
The illustration component is complete	4	3	4	3	5	4	4	3	5	4	17	0.85
The illustration components are written in easy-to-understand language	5	4	5	4	5	4	4	3	5	4	19	0.95
There are instructions for filling out the assessment and it’s clear	5	4	4	3	5	4	4	3	5	4	18	0.90
There is information on how to grade or categorize assessments	5	4	4	3	5	4	5	4	5	4	19	0.95
Space for writing ideas/inputs as an effort to improve the instrument	4	3	4	3	4	3	4	3	5	4	16	0.80
	Mean											0.87

Table 2. Construct Validity Test Results between Teaching Material Components and Teaching Material Variables

Teaching Material Components	R	P
Components Contents	0,778**	0,000
Competence	0,799**	0,000
Language	0,609**	0,000
Illustration	0,536**	0,000

Table 3. Assessment Results of Teaching Material Components

Category	Components Contents		Competence		Language		Illustration		Teaching Materials	
	n	%	n	%	n	%	n	%	n	%
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	1	1.4	0	0	1	1.4	1	0
4	9	12,5	13	18,1	13	18,1	25	34,7	14	12,5
5	63	87,5	58	80,6	59	81,9	46	63,9	57	87,5
Total	72	100	72	100.0	72	100.0	72	100.0	72	100

**Fig. 1.** Percentage of Achievement of Teaching Material Components

the topic and equipped with five questions and answer keys at the end of the material; and 4) research results from the last ten years from reputable national and international journals. The results showed that almost all students chose category 4 and more than 80% rated category five. The illustration component got the lowest score, namely 63.9% who considered very good and 34.7% rated good (Table 3).

If the average score is calculated, the content component value is 27.6 (from a maximum score of 30), and the percentage of achievement is 92.1%. All of the components, content component, competency component, language component, and illustration component, obtained a percentage of over 90%. This shows that the material “Balanced Nutrition Literacy in the Context of Science Learning”, received a very good assessment and deserves to be used as teaching material (Fig. 1).

The book design of the cover and the back page contained the synopsis is presented in Fig. 2. The cover contains the title of the material, author’s and food illustrations. The illustration depicts several food ingredients which, when consumed in accordance with



Fig. 2. Front Cover and Back Cover Design of Balanced Nutrition Literacy Materials in the Context of Science Learning Book.

nutritional adequacy, and support the achievement of balanced nutrition. By implementing balanced nutrition guidelines properly and correctly, we will be able to maintain a normal body weight to prevent nutritional problems.

3.2 Discussion

The results of the content validity and construct validity tests on teaching materials showed a high and very significant value. These results indicated that the teaching materials are valid and worthy of being used as a reference for teaching lecturers and student learning. The components of teaching materials, content, competency, language and illustration components can be described as complete teaching materials. With a high and very significant reliability value in the halves test, the instrument accurately and consistently [14] measures the quality of teaching materials.

Balanced nutrition literacy materials got a very good appreciation (above 90%) from users, that is students. Although the assessors are still limited to students of the Culinary Education Study Program. The results of the research on the teaching materials above show very good acceptance with the value of the four components (content, competence, language and illustrations) between 90.7 to 93.2. This shows that the contents of the material are in accordance with the concept, complete, sequential and with the latest bibliography. Materials are in accordance with student competencies, development thinking, training in higher-order thinking, collaborating, thinking on concept maps and providing opportunities to study more deeply about the material. To solve problems, a student must have a strong basic knowledge as well as structural knowledge, how concepts are connected to each other in scientific disciplines [15]. The language used is clear, easy to understand, with correct grammar and consistent use of terms and symbols.

The illustrations used are in accordance with the substance of the concepts which are correct, clear, and very interesting.

Materials (book) are produced by Deepublish, a member publisher of IKAPI. It is hoped that the materials will be distributed throughout Indonesia. This material can be used as a reference in nutrition education programs for the wider community. The balanced nutrition guidelines contain visualization of recommendations for daily food consumption (Balanced Gizi 'Tumpeng') and visualization of recommended portions of food and drink at each meal (My Food Plate), 4 pillars, 10 nutritional messages and the slogan 'Gizi Seimbang Bangsa Sehat Berprestasi' [16]. Balanced nutrition is a daily in-take food that contains nutrients in the type and amount according to the body's needs, considering the principles of food diversity, physical activity, clean living behavior and monitoring body weight regularly in order to maintain a normal weight to prevent nutritional problems [17].

Materials play an important and strategic role in efforts to improve the quality of education. One form of material is teaching materials. Educators can use educator guide materials, enrichment materials, and teaching materials in the learning process, to increase knowledge and insight. Teaching materials are materials whose content and presentation can be used to obtain deep and broad information about science, technology, art, and culture [11]. Students are expected to develop the intellectual capacity needed to accurately describe the development of knowledge. Based on this, the preparation of teaching materials needs to adjust and include the results of the latest research. The latest research results can be obtained from reputable and national and international journals.

Graphic representation of the main concepts can help readers understand the content of text materials easily [18]. The photos that decorate many pages add to the pleasure of reading [9]. The content of the materials is simple and practical, increases the amount of content, becomes lively and easy to read [19]. The development of teaching materials for Sports Nutrition in 4 stages are Define, Design, Development, and Disseminate can improve critical thinking skills of students of Physical Education, Health, and Recreation, IKIP Budi Utomo Malang [20]. The development of android-based Sports Psychology teaching materials can increase learning motivation (N-gain 0.55) and critical thinking skills (N-gain 0.68) students of the Budi Utomo Teacher Training Institute Malang [21].

4 Conclusion

Balanced nutrition literacy teaching materials in creative problem solving based multi-representation learning model was declared valid, suitable to be used as a reference for teaching and learning. Teaching materials are precise and consistent in measuring their quality. The characteristics of the teaching materials are 1) containing the four pillars of balanced nutrition as an elaboration of the Ministry of Health of the Republic of Indonesia Regulation Number 41 of 2014 concerning 'Balanced Nutrition Guidelines'; 2) equipped with problems solved using the CPS model, 3) nutrition and health literacy according to the topic and equipped with five questions and answer keys at the end of the book; and 4) research results from the last ten years from reputable national and international journals. Assessment of teaching materials includes four components, namely content, competence, language, and illustrations, including a very good level with a score between 90.7 to 93.2.

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