

Validity Of Learning Devices Based On ARCS Model To Improve Mathematical Critical Thinking Ability

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Abstract—The aims of this development is to know the characteristic of mathematics lesson devices with ARCS model based to improve mathematical critical ability in grade X SMA which valid. The learning model is the ARCS model consisting of attention, relevance, confidence, satisfaction. The purpose of the ARCS model is to motivate learners in solving difficult mathematical problems. This development model used in the research is the Plomp's model (preliminary research, prototyping phase, and assessment phase). The product of learning said to be valid if the resultant learning were valid of content and construct. The instrument used in this research was a validation sheet containing aspects of presentation, content and material feasibility, graphics or display and language. Validation results of the RPP and LKPD experts are 0.965 and 0.873 with valid categories.

Keywords— *ARCS Model, Learning Devices, Mathematical Critical Ability, Plomp Model*

I. INTRODUCTION

Critical thinking is the process of searching, obtaining, evaluating, analyzing, synthesizing and conceptualizing information as a guide for developing one's thinking with self-awareness, and the ability to use this information by adding creativity and taking risks.[1] Based on the opinion of some experts, critical thinking skills are essential for learners, as today science and technology are developing very rapidly and allow anyone to obtain information quickly and easily from various sources and all over the world.[2-7].

The study of critical thinking skills developed in California and Malaysia focuses on science education [8-12]. One of the researches of science is the teaching of mathematics. Therefore, critical thinking skills are needed to measure how to develop learner thinking in science lessons. [13,14]. Previous research by researchers shows that low-school students' critical thinking skills are still low [15, 16]. The following problem, when the author conducted preliminary studies at the SMAN 4 Sijunjung, SMAN 9 Sijunjung and SMAN 12 Sijunjung, obtained information that the results of the mathematical aptitude and critical appraisal tests are still weak.

Based on the description of the problems above, there is a need for a learning device that can help teachers and students in the learning process in the classroom.

Implementation of unsuccessful learning cannot be separated from learning resources developed for learners to be motivated to learn mathematics [17,18]. One of the learning resources required is the Student Worksheet (LKPD) and Lesson Plans (RPP).

RPP is a planning program that is adapted to guide the implementation of learning to any learning activity. [19] LKPD is educational material that has been packaged in such a way that learners are expected to learn the teaching material independently.[20] Based on these opinions, the RPP and LKPD can help teacher mathematics and learners in the classroom learning to process. The author is interested in developing learning tools based on the ARCS learning model (Attention, Relevance, Confidence, Satisfaction). The ARCS learning model includes attention, relevance, confidence and satisfaction. In this learning, learners are led to follow a fun learning process. ARCS model to give priority attention to students, by adapting learning materials to the learning experience, which builds student confidence and creates a sense of satisfaction for learners, so as to achieve a result optimal learning. [21] Thus, the steps of the ARCS model can improve the critical thinking skills of mathematics learners.

This ARCS learning model has advantages that are: 1) Provide instructions, active and give directions on what to do by the student, 2) Method of presenting the material with the ARCS model is not only with the theory that its application is less interesting, 3) the design of the student-centered form of learning; 4) the application of the ARCS model increases the motivation to repeat other less attractive materials; 5) an in-depth assessment of abilities rather than student characteristics for strategies. More effective learning. [22]. The ARCS model can increase learners' motivation in learning. [23-25]. Based on the description, the authors conducted research on the development of learning devices based on the ARCS model to mathematically improve critical thinking skills.

II. RESEARCH METHODS

The applied development model is a Plomp model consisting of three phases, namely the preliminary research, the prototyping phase and the evaluation phase.[26] This journal deals only with the prototyping step of RPP and

LKPD validation. In the preliminary study conducted needs analysis, curriculum analysis, analysis of concepts and analysis of learners. Observational data collection techniques, interviews with mathematics teachers, questionnaires and initial tests with class X students SMAN Sijunjung.

The prototype manufacturing phase is realized by designing RPP and LKPD mathematics based on the ARCS model. The learning tools that have been developed are validated by 5 experts composed of 3 experts in mathematical education, an expert in educational technology and an expert in Indonesian language. Validator will provide an assessment and suggestions on the design of learning tools to identify weaknesses and strengths, and to take into account expected product specifications using validation sheets. The valid instrument includes self-assessment instruments and validation tools.

III. RESULT AND DISCUSSION

the preliminary study conducted needs analysis, curriculum analysis, analysis of concepts and analysis of learners. Needs analysis is done to obtain data from learners and teachers in the learning process. The results obtained are conventional learning, the learning tools used so far is a pack book, many learners who consider mathematics difficult and many less active and interested formulas and the critical thinking skills of mathematics learners are not optimal.

The curriculum analysis aims to analyze the program of two supporting aspects, namely KI and KD. At this point, a revision of the 2013 curriculum for high school mathematics subjects is conducted. This analysis was conducted to study the range of materials, learning objectives and materials that can be used in the ARCS model. The results of the formulation of indicators and analysis of mathematics syllabus X class High School organized in accordance with the indicators of achievement of skills so easily understood.

Concept analysis aims to determine the content and subject needed to develop learning tools. The results of the conceptual analysis based on the program used is that there is 1 chapter that is studied in class X of semester II which is trigonometry. Student analysis aims to determine the quality of people who can be used as a guide in designing learning tools. This analysis is taken into account in the design of the LPCPD based on the ARCS model that includes learner learning, student participation, the importance of the LKPD for learners and the description of the LKPD that learners enjoy. In this study, the learners who will serve as subjects are the students of SMA.


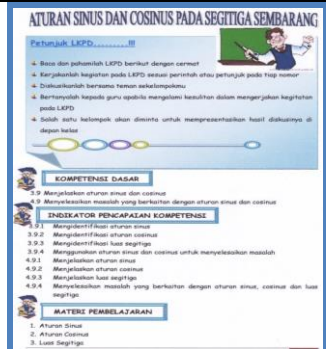

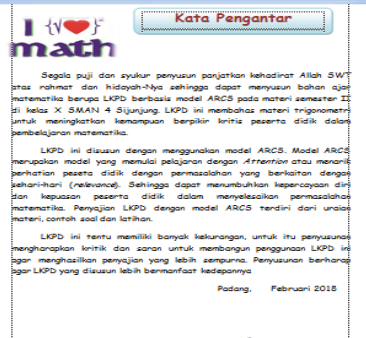
Prototyping phase is the device design stage based on learning features based on the ARCS model in the form of RPP and LKPD. This design is based on the preliminary results of the study that have been made. After generating the ARCS model based on RPP and LKPD, the researcher performed a self-assessment of the validity of the construct and validated with experts the validity of the content. The validity of the construction means conformity between the resulting product and the predetermined development

element and the validity of the content means conformity between the resulting product and certain specified criteria. Self-assessment errors that researchers find on the product include typing errors and punctuation errors. After the self-assessment, products based on ARCS are validated by validators. Based on the results of self-assessment errors and validator suggestions, ARCS-based product enhancements include:

TABLE I. SELF-EVALUATION ERROR AND VALIDATOR COMMENT (BEFORE THE REVIEW)

No.	Before the Review
1.	<p>Pertanyaanya sekarang: Informasi apa yang kamu peroleh dari melihat gambar pembatasan di atas jika kita perhatikan bentuknya. Bagaimana hubungannya dengan materi trigonometri dan aturan sinus, cosinus pada segitiga sembarang? Tentunya untuk menjawab pertanyaan tersebut kita harus tahu terlebih dulu tentang materi tentang aturan sinus dan cosinus pada segitiga sembarang. Pada subbab ini, kamu akan mempelajari aturan sinus dan cosinus. Ayo, pelajari dengan seksama!</p>
2.	<p>KONVERSI SUDUT</p> <p>KEGIATAN!</p> <p>Sumber: www.google.com</p> <p>Perhatikan gambar di atas, benda benda yang ada ke sekitar kita berhubungan dekat dengan sudut. Salah satunya adalah kipas angin dan roda sepeda. Ada dua satuan yang digunakan untuk menentukan ukuran suatu sudut, yaitu derajat, yang disimbolkan dengan "°" dan radian, yang disimbolkan dengan "rad". Sewaktu anda pada masa sekolah dasar, kamu menggunakan busur untuk mengukur besar sudut. Lalu, bagaimana mengukur sudut jika satuan sudut itu adalah radian? Pada subbab ini, akan dipelajari macam macam satuan pengukuran sudut dan bagaimana hubungan. Ayo, pelajari dengan seksama!</p>
3.	<p>ATURAN SINUS DAN ATURAN COSINUS</p> <p>Kompetensi Dasar</p> <p>3.9 Menjelaskan aturan sinus dan cosinus</p> <p>Indikator Pencapaian Kompetensi</p> <ol style="list-style-type: none"> 1. Mengidentifikasi konsep aturan sinus 2. Mengidentifikasi konsep aturan cosinus 3. Mengidentifikasi luas segitiga 4. Menjelaskan konsep aturan sinus 5. Menjelaskan konsep aturan cosinus 6. Menjelaskan luas segitiga 7. Menggunakan konsep aturan sinus dan cosinus untuk menyelesaikan masalah <p>Tujuan Pembelajaran</p> <p>Melalui proses pengamatan, bertanya, berpikir kritis dan diskusi peserta didik dapat:</p> <ol style="list-style-type: none"> 1. Memiliki kepekaan diri untuk mempresentasikan hasil diskusi di depan kelas 2. Menunjukkan sikap kritis dalam belajar trigonometri 3. Memiliki rasa ingin tahu terhadap konsep trigonometri 4. Mengidentifikasi konsep aturan sinus 5. Mengidentifikasi konsep aturan cosinus
4.	<p>LEMBAR KERJA PESERTA DIDIK BERBASIS ARCS MATEMATIKA UNTUK SMA/MA KELAS X</p> <p>Hi Bermanita YIVI AFDARI 14280853</p>
5.	<p>I ♥ math</p> <p>Kata Pengantar</p> <p>Hai Peserta Didik Matematika,</p> <p>Selamat datang di dunia Matematika</p> <p>LKPD ini hadir di tengah-tengah Anda agar Anda bisa menjelajahi dunia Matematika, yang penuh tantangan namun menyenangkan. Dengan membekali Anda dengan kemampuan mengamati, bertanya, mencoba menyimpulkan dan mengomunikasikan. Perjalanan Anda akan diawali dengan sebuah permasalahan. Nantinya, Anda adalah memecahkan permasalahan tersebut sehingga Anda selamat sampai ke tujuan. Di akhir, Anda akan diminta untuk menyimpulkan hasil pembelajaran dengan mengomunikasikan di depan kelas.</p> <p>Jangan sampai ada yang terlupakan ya!</p> <p>Semoga perjalanan Anda berkesan dan tidak terlupakan!</p> <p>Good luck...</p>

TABLE II. SELF-EVALUATION ERROR ERROR AND VALIDATOR COMMENT (AFTER THE REVIEW)

No	After the review
1.	Pertanyaanya sekarang Informasi apa yang kita peroleh dari melihat gambar jembatan di atas jika kita perhatikan bentuknya. Bagaimanakah hubungannya dengan materi trigonometri dan aturan sinus, cosinus pada segitiga sembarang? Tentunya untuk menjawab pertanyaan tersebut kita harus tahu terlebih dulu tentang materi tentang aturan sinus dan cosinus pada segitiga sembarang. Pada subbab ini, kamu akan mempelajari aturan sinus dan cosinus. Ayo, pelajari dengan seksama!!
2.	 <p>Sumber: www.google.com</p> <p>Perhatikan gambar di atas, benda benda yang ada di sekitar kita berhubungan dekat dengan sudut. Salah satunya adalah kipas angin dan roda sepeda. Ada dua satuan yang digunakan untuk menentukan ukuran suatu sudut, yaitu derajat, yang disimbolkan dengan $^{\circ}$ dan radian, yang disimbolkan dengan "rad". Sewaktu anda pada masa sekolah dasar, kamu menggunakan busur untuk mengukur besar sudut. Lalu, bagaimana mengukur sudut jika satuan sudut itu adalah radian? Pada subbab ini, akan dipelajari macam macam satuan pengukuran sudut dan bagaimana hubungan. Ayo, pelajari dengan seksama!!</p>
3.	 <p>ATURAN SINUS DAN COSINUS PADA SEGITIGA SEMBARANG</p> <p>Perhatikan LKPD berikut dengan cermat</p> <ol style="list-style-type: none"> 1. Berdasarkan kegiatan pada LKPD ini, buatlah pernyataan atau pertanyaan pada tiap nomor 2. Diskusikanlah bersama teman sekelompokmu 3. Bertanyalah kepada guru apabila mengalami kesulitan dalam mengerjakan kegiatan pada LKPD 4. Hasil kerja kelompok akan diminta untuk mempresentasikan hasil diskusinya di depan kelas <p>KOMPETENSI DASAR</p> <ol style="list-style-type: none"> 3.9 Menjelaskan aturan sinus dan cosinus 3.10 Menyelesaikan masalah yang berkaitan dengan aturan sinus dan cosinus <p>INDIKATOR PENCAPAIAN KOMPETENSI</p> <ol style="list-style-type: none"> 3.9.1 Mengidentifikasi aturan sinus 3.9.2 Mengidentifikasi aturan cosinus 3.9.3 Mengidentifikasi luas segitiga 3.9.4 Menggunakan aturan sinus dan cosinus untuk menyelesaikan masalah 3.9.5 Menjelaskan aturan sinus 3.9.6 Menjelaskan aturan cosinus 3.9.7 Menjelaskan luas segitiga 3.9.8 Menyelesaikan masalah yang berkaitan dengan aturan sinus, cosinus dan luas segitiga <p>MATERI PEMBELAJARAN</p> <ol style="list-style-type: none"> 1. Aturan Sinus 2. Aturan Cosinus 3. Luas Segitiga
4.	 <p>LEMBAR KERJA PESERTA DIDIK BERBASIS MODEL ARCS</p> <p>(Attention, Relevance, Confidence, Satisfaction)</p> <p>MATEMATIKA</p> <p>UNTUK SMA/MA KELAS X</p> <p>Di Bawah Cipta: WYKARTAMANI 16205053</p> <p>Nama: _____ Kelas: _____ Tanggal: _____</p>
5.	 <p>Kata Pengantar</p> <p>Segala puji dan syukur penyusun panjatkan kehadirat Allah SWT atas rahmat dan hidayah-Nya sehingga dapat menyusun bahan ajar matematika berupa LKPD berbasis model ARCS pada materi semester II di kelas X SMA/MA 4 Sijunjung LKPD ini membahas materi trigonometri untuk meningkatkan kemampuan berpikir kritis peserta didik dalam pembelajaran matematika.</p> <p>LKPD ini disusun dengan menggunakan model ARCS. Model ARCS merupakan model yang memulai pelajaran dengan <i>Attention</i> atau menarik perhatian peserta didik dengan permasalahan yang berkaitan dengan sehari-hari (<i>relevance</i>). Sehingga dapat menumbuhkan kepercayaan diri dan kepuasan peserta didik dalam menyelesaikan permasalahan matematika. Penyajian LKPD dengan model ARCS terdiri dari unsur materi, contoh soal dan latihan.</p> <p>LKPD ini tentu memiliki banyak kekurangan, untuk itu penyusun mengharapkan kritik dan saran untuk membangun penggunaan LKPD ini agar menghasilkan penyajian yang lebih sempurna. Penyusun berharap agar LKPD yang disusun lebih bermanfaat kedepannya.</p> <p>Padang, Februari 2018</p> <p>Penyusun</p>

and writing. The overall result of the RPP validation is 0.965.

LKPD based on the global ARCS validated by mathematical experts met the valid criteria with the validity index on the aspect of the presentation and the aspect of the feasibility of the content is 0.926. This means that the characteristics and relevance of LKPD with ARCS-based learning can help learners improve their critical mathematical thinking skills. Aspects of this graph or display in the validation by a lecturer of educational technology with the results of data analysis obtained 0.723 with valid criteria. In addition, the linguistic aspect in the validation by an Indonesian language lecturer with data analysis obtained 0.917 with valid criteria. The results of the global validation for each aspect can be found in Table 3.

TABLE III. SELF VALIDATION RESULTS OF THE LKPD ARCS MODEL

No	Aspect of Validation	Validity Index	Category
1.	Presentation	0,926	Valid
2.	Didactics and content	0,926	Valid
3.	Challenge (Display)	0,723	Valid
4.	Language	0,917	Valid
Average validity Index		0,873	Valid

Based on Table 3, it can be seen that the average LKPD validation as a whole is 0.873 with valid criteria. Thus, it can be concluded that LKPD with ARCS-based learning has been valid.

IV. CONCLUSION AND SUGGESTION

Based on the results of validation conducted by experts has obtained information that the development process of learning devices based on the ARCS model in the form of RPP and LKPD met the valid product criteria.

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The validation of RPP is seen by the subject's identity, the formulation of learning indicators, the formulation of learning objectives, the selection of learning materials, the selection of learning strategies, the selection of teaching resources, learning stages, assessment, language

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