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Model of Cocoaer as alternative learning to prevent the potential misconceptions of high school students

Zainuddin¹, Mujakir², M Ibrahim³, B Jatmiko³, A Halim¹ and Yusrizal¹

¹Department of Physics Education, Universitas Syiah Kuala, Banda Aceh, 23111, Indonesia

²Department of Chemistry Education, Universitas Islam Negeri Ar-Raniry, Banda Aceh, 23111, Indonesia

³Department of Physics Education, Universitas Negeri Surabaya, 70231, Indonesia

E-mail: zainuddin@unsyiah.ac.id

Abstract. The Cocoaer learning model was developed to prevent the emergence of Misconception Potential (FMD) of high school students (SMA). This study aims to develop a valid, practical cocoaer learning model to prevent the emergence of high school students' PMK. Development of a cocoaer learning model based on needs analysis. R and D development research (Research and Development) refers to the Borg & Gall's (1997) model, namely the development of models carried out through repetitive activities from starting to design to limited test models. The data was analyzed descriptively. The results of the study show that: (1) the cocoaer model and the supporting model are classified as valid and reliable, (2) the syntax implementation of the model and the observations of student activities in accordance with the design of the cocoaer model.

1. Introduction

Physics as a natural science involves a number of concepts and relationships between concepts with each other [1]. The importance of understanding concepts for teachers is to help students understand new concepts and apply them in solving their problems in everyday life [2]. Physics learning can only be achieved when the relationships between established concepts and concepts taught are well understood [3]. Meaningful learning involves scientific inquiry [4] and Information Technology and Communication (ICT) [5] presentation of phenomena in everyday life [6]. Learning means helping to identify and prevent misconceptions. Misconception (MK) is an erroneous idea or view of a concept that someone has that is different from the concept agreed upon and considered right by experts, is resistant, even after the learning process takes place. Teachers and students interact in developing new concepts that cannot be separated from the pre-concept learning [7]. Pre-concepts tend to cause PMK. The Cocoaer learning model is supported by two main theories, namely: (1) Bandura's Social Learning Theory [8] that acknowledges learning occurs from observing the behavior of others and the environment (where information processing involves attention, retention, production, motivation), and (2) Vigotsky's Social Constructivism Theory which involves social learning and scaffolding, especially for students in their Zone of Proximal Development. Thus, one alternative learning model can prevent the onset of FMD through cocoaer learning models with syntax: (1) Committee and Expose beliefs, (2) Confront beliefs, (3) Assimilate and Accommodate the concept, (4) Extend the concept, and (5) Reflect beliefs.



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Various literatures have explained that teachers have PMK when teaching in class [9,10], MD problems become the main problem in physics learning. Meanwhile, the results of the investigation by Zainuddin et al [11] found that more than 50% of students of SMAN in Banda Aceh experienced PMK. The same problems were experienced by students in other parts of Indonesia, namely: Indralaya 50% of SMAN-1 PMK students [12,13], Palembang (73-86)% of SMAN-1 students [14], Palu City 49% of SMAN students [15], Banjarmasin 50% of students of SMAN-7 [16], Purworejo 64% of Muhammadiyah High School Students [17], Medan City 46.6% of SMAN students [18] and Palembang 54.7% of students in Ilir Barat sub-district. To understand the concept of physics in dynamic direct current electrical matter [19,20,21], students are often introduced to physics concepts that conflict with everyday life. An example of PMK about electric current, namely "batteries as a constant current source" [22]. PMK is generally caused by associative thinking (80%), humanistic thinking (83%), incomplete reasons (12%), wrong intuition (86%), cognitive development stage (85%), and student ability (70%); and the use of books, teaching models / methods, and learning environments that are less supportive [23,24]. Based on the above problems, the research seeks to answer how practical the cocoaer learning model is to prevent the emergence of PMK students in Banda Aceh V High School?

2. Method

Pre-experimental research was used in one group pre-test and post-test design, namely: O1 X O2. Before being taught, the students were at first given an initial test of understanding the concept called pre-test (O1) and then taught with the cocoaer model (X). Once the learning process had been complete, they were given a post-test (O2), Implementation Sheet Reliable Learning, Sheet Observation of student activities (3.6: very valid; and 85%: reliable). Evaluation of the validity of the cocoaer model and its learning tools was through the FGD involved 3 (three) education experts. Each has a field of expertise about the development of learning models carried out in two classes of students of the State High School V Banda Aceh, amounting to 64 students. The instruments used are model development needs, state-of-the-art of model development, and learning objectives, theoretical and empirical support, learning syntax, and learning environment management. Data was analyzed using descriptive analysis to determine the validity of the cocoaer model, the validity of the cocoaer learning support device, the validity of the cocoaer model provides a value with a range of values 1-4. The implementation of each phase of learning and student activities is assessed by giving a score of 4 (Very Good), 3 (Good), 2 (Poor), 1 (Not Good). The results of observations of the model implementation and student activities were determined by the average value of each component and its reliability. The observations of student activities were determined using the percentage of agreement formula, namely: $R = [1 - (A - B) / (A + B)] \times 100\%$, R is the reliability coefficient, A is the highest score, and B is the lowest score. The results of the evaluation of validity and observations are reliable if the reliability value is $\geq 75\%$. (Please follow these instructions as carefully as possible in the conference have the same style to the title page.)

3. Result and Discussion

3.1. Content Validity of Cocoaer Learning Model

The evaluation results of the content validity of the cocoaer model are summarized in Table 1. The value of the validity of the content of the model in terms of Model development needs, and State-of-the-art development models that support 21st century skills needs, the cocoaer model meets the validity criteria, and reliability as in Table 1.

Table 1. The Assessment Results of Cocoaer Model in Terms of Content Validity

Component of Content Validity	Mean	Criteria	Reliability (%)	Criteria
Model development needs	8.47	Very Valid	95.24	Reliable
State-of-the-art of model development	8.33	Very Valid	95.12	Reliable

The reliability coefficient of all aspects of the content validity of the cocoaer model is in the range of 93% -100%. The reliability coefficient is above the 75% percentage of agreement.

2. Construct Validity of Model Cocoaer

Construct validity of the internal components of the syntax model is 8.83 and management of the learning environment is 8.67. The average score from the validator is 8.71. The average reliability of the validator's rating is 95.22%. These show that all indicators of the four characteristics of the learning model are constructively valid.

Table 2. The Assessment Results of Cocoaer Model in Terms of Construct Validity

Component of Construct Validity	Mean	Criteria	Reliability (%)	Criteria
Learning objectives	9.00	Highly Valid	94.44	Reliable
Theoretical and empirical support	8.56	Highly Valid	96.08	Reliable
Learning syntax	8.83	Highly Valid	97.14	Reliable
Learning environment management	8.67	Highly Valid	95.65	Reliable

Supporting devices for the cocoaer model are classified as valid and reliable criteria can be used with small revisions, as shown in Table 3.

Table 3. Validity of Supporting Devices for Cocoaer Learning Models

No	Assessment Aspect	Validity				Reliability		
		V1	V1	V1	V	Description	R	Description
1.	Syllabus	3.6	3.5	3.5	3.5	V	89%	Reliable
2.	Student Text Book (BAS)	3.3	3.3	3.7	3.4	V	86%	Reliable
3.	(RPP)	3.5	3.5	3.9	3.6	SV	86%	Reliable
4.	(LKS)	3.7	3.5	3.7	3.6	SV	90%	Reliable
5.	LP	3.5	3.5	3.5	3.5	V	87%	Reliable

Description: V1, V2, V3, and V (Validator 1, Validator 2, Validator 3, Average Validator, R (Coefficient of inter-observer agreement)).

3.3. The Accuracy of the Limited Test of the Cocoaer Model Learning Model

The limited pilot learning activities began with the pre-test, then learning was done with the cocoaer model and after that the implementation of the posttest was completed. Tests were limited to RPP 1, 2, 3, and 4 on the subject of dynamic DC electricity, the feasibility of the cocoaer model at the first meeting in class XII IPA-2 findings, the results of the discussion serve as revised material for improving the supporting devices of the cocoaer model, class I meeting XII IPA-1, and so on. The results of the limited trial implementation are included in the excellent category (SB), for more clarity as shown in Table 4.

Table 4. Implementation of the Cocoaer Model in Preventing FMD from Banda Aceh City High School Students

No	Implementation of Model Cocoaer	Meeting (IPA-1)					RSP	Criteria	Meeting (IPA-2)					RSP	Criteria	Implementation	
		I	II	III	IV				I	II	III	IV				yes	No
A.	Introduction (15 minutes)																
	Phase I. Common and exposing Beliefs	3.6	3.6	3.9	3.7	3.7	VG	3.6	3.6	3.9	4.0	3.8	VG	yes	-		
B.	Core Activities (60 minutes)																
	Phase II. Confront beliefs (25 minutes)	3.2	3.8	3.7	3.8	3.6	VG	3.2	3.6	3.7	3.9	3.6	VG	yes	-		
	Phase III. Accommodate the Concept	3.6	3.67	3.6	3.83	3.66	VG	3.6	3.7	3.6	3.9	3.7	VG	yes	-		
C	(15 minutes) Communicating	3.3	3.7	3.7	4.0	3.7	VG	3.3	3.7	3.7	3.8	3.6	VG	yes	-		
	Phase IV. Extend the concept (20 minutes) Communicating	3.4	3.6	3.7	3.7	3.7	VG	3.4	3.6	3.8	3.9	3.7	VG	yes	-		

Remarks: RSP = Average Observer Score, VG = Very Good and G = Good.

Student activities consist of; (1) expressing pre-conceptual ideas verbally and in writing, the time needed is 15 minutes, (2) formulating problems, making hypotheses, determining variables, and proving through experiments, 25 minutes, (3) analyzing data process and accommodating concepts to find scientific concepts, 15 minutes, (4) expanding the concepts by linking between concepts through examples of problems, and examples of problems in life; this activity takes 20 minutes, (5) answering the problems presented in the book to develop concepts that have been accommodated, illustrations and animations that have been shared by teachers require 15 minutes, and (6) irrelevant activities. The reliable index of student activity is presented of the activity of students of class XII-IPA 2 for meeting I - IV shown above shows that, the results of observations of student activities with a reliable index of meeting I are 0.84%, meeting II is 0.87%, meeting III at 0.87%, and meeting IV is 0.89. While the observations of the activities of students of class XII-IPA1 at the first meeting were 0.86, the second meeting was 0.88, the third meeting was 0.89, and the fourth meeting was 0.91. Observation of student activities in Figure 4.2 shows that the smaller the reliable index obtained; the more active student activities are in accordance with the activities described in the cocoaer syntax.

4. Conclusions

The results of the trial are limited to the cocoaer model. It can be concluded that the limited trial results of the cocoaer learning model can obtain (1) validity and reliability in both the model device and the supporting devices of the cocoaer learning model, (2) practically from the model implementation according to the model syntax, student activities, included in the excellent category.

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