

THE DEVELOPMENT OF SABC (SOLVE ACID BASE CASE) GAME ORIENTED ANDROID AS INTRUCTIONAL MEDIA ACID BASE FOR ELEVENTH GRADE SENIOR HIGH SCHOOL

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Abstract

This research aims to discover the advisability of an android game called SABC (Solve Acid Base Case) as instructional media acid based for eleventh grade senior high school in term of validity, practicality and effectiveness. This research is a Research and Development Cycle type, according to Borg and Gall the steps included as: (1) Research and Information Collecting, (2) Planning, (3) Develop Preliminary of Product, and (4) Preliminary Field Testing. Assessment Instruments that used were game review sheet as media, game validation sheet, student activity observation sheet, test result sheet of student learning result and student's questionnaire response. The SABC game reviewed by two chemistry lecturers and validated by three chemistry lecturers and one chemistry high school teacher and tested to twenty students in XI MIPA, SMAN 1 Mojokerto. The result showed that the android based game Solve Acid Base Case is appropriate to be applied as an Acid Base media learning for eleventh grade High School student. From the validation assessment, It is shown each aspect gets excellent assessment with the percentage of 82%-94% in terms of the quality of the content, the aspects of science, appearance quality, software engineering, language quality, and game requirements. Student learning shows 100% classical completeness. Result of student responses shows very good response with percentage 93.04%.

Keywords: solve acid base case game, android, instructional media, acid bases

INTRODUCTION

Recently, technology and information develop very rapidly. The development of this technology has also led educational sector. Good education is education which able to adapt to technology development and can apply them in the educational sector. According to the minister of education's regulation and culture of the Republic of Indonesia number 22 year 2016 about standard process of primary and secondary education, the principles used in learning one of them is with the use of information and communication technologies to improve the efficiency and effectiveness of learning [1].

The use of technology in educational sector will be effective and efficient if supported by active learning. Based on the education of the minister of education and culture of the Republic Indonesia number 103 year 2014 about learning in primary and secondary education stated that the characteristics of active learning is fun, challenging and motivating student to participate actively [2].

Based on the result of pre research, there were 92.59% student SMAN 1 Sidoarjo consider chemistry lesson is difficult and more than 50% of the student stated that acid bases is difficult to

understand and lead the student consider chemistry learning is boring (more than 50%). The same this experienced by student of SMAN 1 Mojokerto-Mojokerto about 70.37% of students say that chemistry is difficult, and 77.78% say that acid bases material is difficult, while 74.07% students said learning chemistry is not boring as long as learning is fun, learning by doing, and teachers effect on the subject. One of the factors that cause chemistry not interesting is the learning process that not interesting (61.11%) due to the media used in learning chemistry were power point, worksheets, internet and guidebook with practical methods. Thus, the development of technology such as smartphone not yet used maximally in the education system in SMAN 1 Sidoarjo as an instructional media. No wonder if 77.78% student said playing games on smartphone are more interesting than learning chemistry.

One effort that can be done is to create a technology based on instructional media that is fun, challenging and motivating students. One of it is the Android-based games as a learning medium. Sadiman stated, as publisher and distributor of media messages may represent teachers convey information more accurate, clear and attractive [3]. Media education / learning is

defined as learning tools to deliver learning materials. So it is clear, according to the 2013 curriculum, instructional media must exist in the course outline.

Android technology development should be able to be used as a medium of learning for students, even in the learning process many students are more interested in playing the game with their smartphone compared to study chemistry. The advantage of this technological development should be used decently by students in the learning process.

Games are applications that are favored by the students, so it is needed to make chemistry games as a learning media. The versatility of the Android smartphone is expected to make students feel interested in active learning. As a media that can be used independently, chemistry game can motivate student and improve them to mastery the subject. Utilization of Android-based media can increase motivation and cognitive achievement of students as claimed by Furio that mobile-based media is flexible, can be used repeatedly in accordance with the readiness and willingness of students. Use or learning repeatedly with high frequency can improve the achievement of students [4].

The advantages of games as an instructional media are game is fun and entertaining, game allows the active participation of students, games or give feedback directly, applying the concepts of the game, the game is flexible and easily created and propagated [3]. The advantages of Android as a learning medium by Valk, Rashid, & Elder mobile phone is easy to use, anywhere and everywhere, can be used to learn individually. So it is necessary to develop games based on Android as use of learning technologies effectively and efficiently [5].

Based on the results pre-research in SMAN 1 Sidoarjo, as much as 96.30% of students reported to have never used game as instructional media acid-base, and also reported never used game in android Smartphone. In fact, all of the students already have a good smartphone android (81.48%) or a windows phone (18.52%). In SMAN 1 Mojokerto as much as 81.48% of students want to study chemistry by game, on the grounds that learning becomes more varied not rely book alone, learning through the game becomes easier, the balance between learning and playing, not easily bored, and learning becomes fun. An occurred similarity between the two schools and the possibility of the same problem occurs in other schools. Therefore, should the

smartphone can be used as an instructional media to study chemistry.

METHOD

The type of research is a research and development (R & D cycle). There are 10 steps of the development according to Borg and Gall such as (1) Research and Information Collecting, (2) Planning, (3) Develop Preliminary of Product, (4) Preliminary Field Testing, (5) Main Product Revision, (6) Main Field Testing, (7) Operational Product Revision, (8) Operational Field Testing, (9) Final Product Revision (10) Dissemination and Implementation [6]. The implementation of research in this study is only at the preliminary field testing. Assessment feasibility as instructional media in this research uses questionnaire, observation, and test method. Instruments used in this research are as follows:

1. Review Sheet

Review sheet filled by the material expert competent in their field. Review of instructional media is needed to give advice of quality of content, aspect of science, display quality, software engineering, language quality, and requirement game being review by competent chemistry lecturer. The result of review used by researchers is used as input for the revision.

2. Validation sheet

The validation result of game as instructional media analyzed using descriptive quantitative. The percentage data obtained using Likert scale present in table 1

Table 1 Likert Scale

Criteria	Score
Not appropriate	1
Less appropriate	2
Enough appropriate	3
Appropriate	4
Very appropriate	5

Average data validator obtained percentage are calculate by the formula

$$\text{percentage} = \frac{\text{total score}}{\text{criteria score}} \times 100\%$$

Score criteria = highest score x number of respondents

The score that obtained interpreted in terms of the criteria

Table 2 Likert Scale Score Interpretation

Percentage (%)	Criteria
0 – 20	Not appropriate

Percentage (%)	Criteria
21 – 40	Less appropriate
41 – 60	Enough appropriate
61 – 80	Appropriate
81 – 100	Very appropriate

Adaptation [7]

The game said to be valid if the average of each component of the aspects scored at least 4 that these percentage $\geq 61\%$ so, SABC game is valid used as instructional media.

3. Response student questionnaire

This analysis was conducted on practically media criteria developed include the interest of students to the media, the ease of media, and the enthusiasm of students using the Android-based SABC game. Questionnaire student response using Guttman scale.

Tabel 3 Skala Guttman

Statement	question	Score
positive	Yes	1
	No	0
negative	Yes	0
	No	1

Adaptation [7]

The data obtained is interpreted in the criteria contained in the Table 3

Based on the criteria in Table 3 SABC game is said to be practical if the percentage score of the students' response $\geq 61\%$ with good and very good criteria.

4. Test cognitive sheet

Students complete individually when reaching the average score at least 80. Classical completeness is achieved when 75% of student in class achieve completeness.

RESULTS AND DISCUSSIONS

Before the validation of material experts and media experts. Solve Acid Base Case game reviewed by two lecturer of chemistry. Media study conducted to obtain advice from chemistry lecturer as an expert media and subject experts of Solve Acid Base Case as instructional media.

Validity

After the review and revision of the media, validation on media was done to determine the results of the assessment Solve Acid Base Case game by three lecturers of chemistry and one teacher from SMAN 1 Mojokerto. The game developed as instructional media validated based on aspects of quality of content, aspects

science, display quality, software engineering, quality language and requirements of the game. Here are the results of the Solve Acid Base Case game validation as an instructional media Acid Base showed at Table 4.

Table 4 Result of validation SABC game

No.	Criteria	Percentage (%)	Category
1.	Content quality	88.33	Very appropriate
2.	Aspect of science	86.67	Very appropriate
3.	Display quality	90.00	Very appropriate
4.	Software engineering	91.67	Very appropriate
5.	Language quality	82.50	Very appropriate
6.	Requirement game	94.44	Very appropriate

Based on Table 4, SABC game has a percentage range of 82.50% -94.44% so it is valid to be used as a media game with the interpretation of the score of $\geq 61\%$.

Quality of content that includes the truth of the concept of acid-base theory, the correctness of the concept of acid-base indicator, and the suitability of the curriculum. Sugar stated the game can introduce new material [8]. SABC games can be used as an attractive learning media alternative.

The Aspects of Science assessed are acid-base test using litmus paper, classifying acid-base and acid-base samples in everyday life showed at Figure 1.

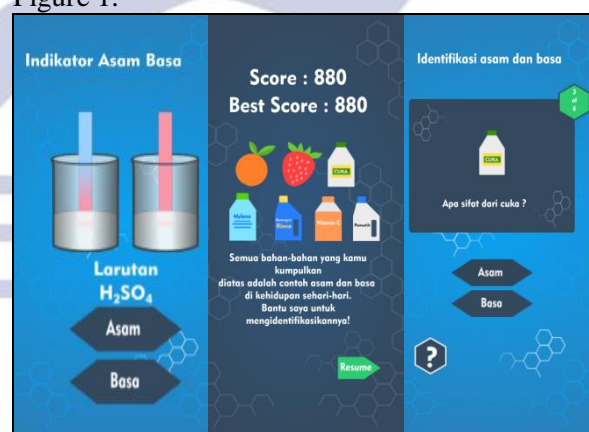


Figure 1 Aspect of Science

Based from Figure 1, aspect of science consists of simulation of litmus paper and acid base in everyday life. One of the main aspects of science is the set of methods / processes which include observing, predicting, measuring, estimating, clarifying, analyzing, and experimenting [9].

The game quality is observed to see SABC reflects on chemistry, colors and fonts used in accordance with the needs of students.

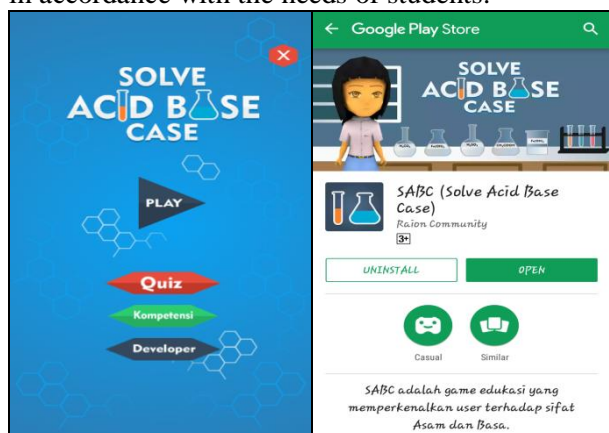


Figure 2 Display of SABC Game

Figure 2 showed display of SABC game in front page of game. There were script acid base that use test tube and Erlenmeyer and SABC software can download in playstore easy to install. Software engineering assessed is an maintained (Maintanable) media program, easy to use and operate (Usability) program, and easy to install on device (Compability).

The contents of Indonesian language and english experience get an assessment of 82.5% it happens when the validation is still on going. That has not been true subscript and superscript.

Game requirements that being assessed are direct feedback, games reinforce learning, games are easy to reproduce; Easy to obtain and affordable price, flexible game, interplay between instrumental and narrative music (audio visual), games allow one-on-one learning, game challenging students actively playing and learning, Games can be used anywhere and anytime, and the game demands completion problem.

After the SABC game was validated, it was tested to 20 students of SMAN 1 Mojosari-mojokerto. Trial data obtained is the result of student activity observation, student responses and student learning outcomes.

Practicability

Practicality in reviewed from the response of students and student activities. Result of the students' response obtained obtained by spreading the questionnaire of students' responses to 20 students of SMAN 1 Mojosari-Mojokerto after learning by using the SABC game as instructional media

The observation result shows that the enforceability of the student activity using the whole SABC game 98.95% with the criteria very

well. Once the activity is observed by the observer, student fill out responses student questionnaire.

Table 5 Result of Student Response Questionnaire

No.	Objective	Percentage (%)	category
1.	Interest in the game as instructional media	97,5	Very good
2.	New game	100	Very good
3.	Usefulness games	96,0	Very good
4.	Ease in using game	96,7	Very good
5.	Language in the game	87,5	Very good
Average percentage		95,54	Very good

Table 5 shows the average yield of 95.54% student response with very good category. Solve Acid Base Case very interesting for the student, not only formal classroom learning but students declared that they want to play SABC even though they are not not in formal learning. Students happy to use the SABC game, even among the 20 students who tested no one says that SABC is a boring game. Games like SABC have never been played by previous Students (100%). This proves that the SABC game is a new game for students and there has never been encountered similar games before.

Students stated that learn with the game makes them better understood, can take advantage of android to learn, make motivated learning, and very helpful in understanding acidic base material.SABC game is very easy to install for smartphone based android, Students do not have difficulty in operating the game SABC.Solve Acid Base Case game, using Indonesian and English.

Based on the responses of students and student activity with the interpretation of a score of $\geq 61\%$, so the game SABC practically used as instructional media.

Effectiveness

Effectiveness reviewed from students' learning outcomes. The test results of learning which used were the test results learning outcome. The cognitive test aims to understand the purpose of learning achievement by using SABC game. Students' learning outcomes obtained from a test given before (pretest) and test given after (posttest) learning by using game SABC.

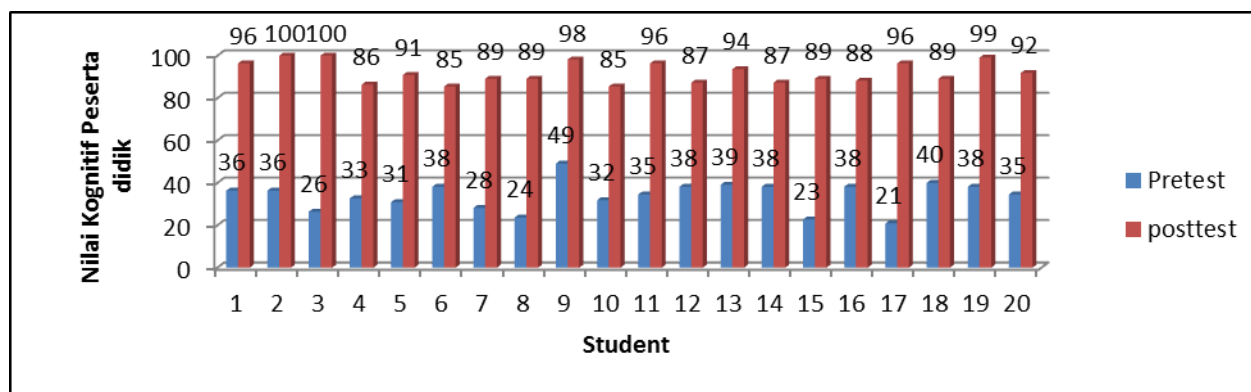


Figure 3 Results of Pretest and Posttest Students (Student Learning Outcomes)

Based on Figure 3, pretest given before the trial, 0% students completed gets the KKM 80. And after the posttest 100% students completed with a value of ≥ 85 . Thus, the SABC game effectively used as instructional media.

The Solve Acid Base Case game is not only designed for fun entertainment but also emphasizes on learning content that is acidic base material. Schunk says the game is designed to create a fun learning context by linking the material [10]. The Solve Acid Base Case game also features Solve Acid Base Case game play and worksheets to make it easier for students to play and understand learning materials. In classroom teaching, participants not only play, but are also required to recall or record on the worksheet as the part of the game. The part of Solve Acid Base Case game consists of garden, laboratory, litmus acid base (acid-base indicator) and quiz.

Solve Acid Base Case game in improving students' learning outcomes through cognitive thinking process in completing SABC game. Students are required as active students through active interaction to play SABC with solve obstacles and problems by using their knowledge. Student expected to build their knowledge with the help of scaffolding in the form of learning materials in the game. Students learn as active students construct their own knowledge through solve the game Solve Acid Base Case by connecting the knowledge that once students get. New information (new material) on the game compared to initial knowledge [11].

The flexibility of a smartphone / mobile phone that can be used anywhere and any time allows students to easily play it even when not in classroom learning. The repetitive process of

playing SABC games will make students faster in gaining knowledge into their own [12]. as in information processing theory, repetition is a way of making knowledge transferred from short-term memory to long-term memory [11]. The process of repetition in running the game SABC called Trial and Error. According to Thorndike in behaviorism theory, Trial and Error learning occurs gradually (gradually) in which successful responses are formed and which are not successfully ignored and mechanically repetitive [10]. The students' behavior who try to retrieve the game until they find out how to solve the problem in the game is the process of gaining knowledge, when the answer is correct and succeeds to the next level, then the right knowledge will be strengthened while the wrong one is ignored. The existence of reinforcement if when the answer is wrong then the material will appear and if true will get reward and symbolic survivors will strengthen the behavior of students in learning actively. In litmus paper simulation using image visualization. The theory states that, information is stored in long-term memory in verbal and visual forms [11]. SABC is supported with instrumental music that can improve memory in learning. However, it also relates to the learning style of each student. As repetitions continue, when recalling from long-term memory students can get the lesson's information in short-term memory, so it can rewrite the information in the form of a test that has been given in posttest. recalling information to short-term memory is very useful because our working memory is short-term memory so that the Solve Acid Base Case game can improve student learning outcomes.

CLOSURE

Conclusion

Based on the research that has been done and the discussion, Solve Acid Base Case game on android is proper to be used as instructional media acid base for eleventh grade senior high school

1. Solve Acid Base case game oriented android as instructional media acid base have score 4-5 to a category good and excellent at each of component aspects that comprise the content validity (the truth concept) and construct validity with the percentage 82%-94% valid as instructional media.
2. Solve Acid Base Case game oriented android acid base material for eleventh grade senior high school is practical uses as instructional media in term of the students and supported the activity of student. The responses students are very good with percentage 93.04%.
3. Solve Acid Base Case oriented android acid base material for eleventh grade senior high school is effective as instructional media in term of cognitive test show classical completeness is 100%.

Suggestion

Based on the research result obtained, the researcher gives the following suggestions:

1. This research only limited Preliminary Field Testing; further researches needed main field testing and revise until dissemination.
2. This research is only can do for students have mobile phone android and provide 40 MB empty capacity, at least 1 GB of RAM to easily operate.

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