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The Development of Learning Media Based on Autoplay Chemistry to Improve Students' Communicative Characters on Chemistry

Maria Erna[1(*)], Irfandi[2], Rasmiwetti[3]
[1,2,3]Chemistry Education Graduate Study Program, FKIP, Universitas Riau,

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Abstract

The implementation of learning media based on ICT (Information and Communication Technology) on Chemistry was found to be very low. For this reason, ICT-based Chemistry learning media which utilized autoplay application were developed. The validated product of the learning media based by autoplay on Chemistry can be implemented as a learning medium to improve students' communicative character. This research was designed by using the Plomp model in the form of Research and Development (R&D). Data of this research were collected by validation sheets, questionnaire responses (teachers and students), and communicative observation sheets with descriptive statistical analyses and independent sample t test. The validity results showed that the average percentage from media expert and material expert judgment were 88.25% and 91.69% with a category of valid. Moreover, the results of the response of teachers and students respectively obtained an average percentage score of 85% and 81% with a category of very interesting. Then, the results of the independent sample t test for 0,000 <0.05 indicated that there were significant differences in the communicative character of students before and after the use of learning media based on autoplay on chemistry with a percentage of 72.25%.

Keywords: Chemistry, Autoplay, Learning Media, Communicative, Validity

(*) Corresponding Author: mariaerna@lecturer.unri.ac.id

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INTRODUCTION

Learning in the 21st century is changing very quickly and is difficult to predict in all aspects of life such as in the field of knowledge, economics, transportation, technology, communication, education (teachers and students), and others (Abao, *et a*l, 2015). Learning in the 21st century encourages the students to have core skills (Communication, Collaboration, Critical Thinking and Problem Solving and Creation and Innovation) and a special skill that is the use of Technology, Information and Communication (ICT) (Ball, *et al*, 2016). It provides access for students to be more motivated to solve real problems they face (Lombardi, 2007). Learning in the 21st century also refers to the learning in which the students solve problems by designing and completing their own way (Bell, 2010).

Skaggs and Bodenhorn (2006) mention the main purpose of learning in the 21st century is to develop a good character of students. Thus, learning efforts should be more directing students to have a harmony of life, namely living together with others, respecting each other's opinions, respecting people talking, responsibilities, willing to sacrifice, being accommodating, and having a big heart, so they can be the good generation for this country

(Leonard & Nisa, 2020). This kind of learning process can be achieved by improving the communicative character.

Based on the interviews with Chemistry teachers at SMAN 6 and SMAN 2 Pekanbaru, it was found that teachers did not implement ICT-based learning media, which was expected to be implemented in learning in the 21st century. It is known that the materials in chemistry are abstract, so that a visualization is required in order to explain those materials; one of them is acid-base. However, the result of observations revealed that students were lack of the communicative character during the learning process. It was found that there was only one-way interaction in the classroom, which was from teacher to student. This was due to the fact that teachers still applied conventional teaching methods, especially in teaching chemistry which contains abtract materials. As a result, it was difficult for students to understand the materials, and later, learning became unattractive and boring.

Lieshoff, et al (2004) stated that communicative activities include any activities that encourage and require students to talk and listen to each other. To achieve optimal learning outcomes, the students must interact with each other, which means not only talking to someone but also listening to what he says and reacting to it, in order. Communicative in learning emphasizes the aspects of communication, interaction, and developing linguistic competence as well as language skills (listening, reading, writing, speaking), as the goal of language learning. Communiative also means recognizing the connection of communicative activities in daily life.

Based on these problems, it was necessary to design an appropriate learning to facilitate students more easily understand the abstract materials in Chemistry, both in cognitive and psychomotor. The expected strategy was implemeting ICT-based learning media to improve the students' learning activeness through communicative characters as well as the learning quality so the students would be more motivated to learn and could find their own concepts (Wabdillah, W. 2006).

One of the changes that in education is the use of ICT in learning. ICT-based learning is necessary to help the students familiar with the development of digital technology, which is newer, more sophisticated, stable, and unreal, and able to provide new challenges (M. J. Koehler, 2006). Educators are demanded to utilize more technologies in their teaching. Then, learning innovations need to be developed and implemented in order to prepare teachers to be ready to act as educators in the 21st century (Hendripides, 2018). The development of ICT is radically innovating people's life. As ICT expertise becomes essential in work, thus potential to change the way a person learns and obtains information. It also provides the teachers the opportunities to develop instructional techniques in order to get maximum results (Fakhrunnisaa & Munadi, 2019; Roza, et al., 2017). The teacher's position in learning tends to be a facilitator who embraces and provides the latest information related to the development of science to students from various sources to help students understand concepts in digital form. Thus, the teachers must have competences in the field of technology and digital (Bañez, 2016; Risky setiawan, et al., 2019).

The use of instructional media can stimulate and arise interest and motivation, as well as bring psychological influences on the students. The use of can affect the effectiveness of learning (Rusdy, 2010). In addition, the learning process is not only focused at school; students can access learning media through computers (Erwin Januarisman, 2016).

The use of elements such as texts, graphics, images, photographs, audio, video, and animation on ICT-based learning media can describe chemical concepts including aspects of both macroscopic and microscopic studies. Media in learning is also said to help increase student understanding, presentation information is more attractive and reliable, makes it easier to interpret data, and compresses information (Agustiningsih, 2015). The design of

ICT learning media basically refers to the use of technology in learning activities to be use as a guide teaching and learning process (Ariesty et al, 2019) and encourage student activities (Chou, 2017). ICT-based learning media is suitable to be implemented as a learning tool that can access information on learning contents, communications and interactions between teachers and students (Burgess and Ice 2011; Sharma, et al, 2014). According to Davidson and Rasmussen (2006), there are several important aspects that need to be considered in developing ICT-based learning media including content delivery and communication.

Learning media is as a learning component that can enhance the interaction among the teacher, students and learning environments (K. A. Peppler and Y. B. Kafai, 2007). Maran, Selvaraj & Ravikumar (2011) state that use multimedia offers benefits for the students and teachers since multimedia technology provides a great potential to help students learn and visualize the concept of the materials. ICT-based learning will have advantages that can provide flexibility, interactivity, speed, and deeper visualization in learning.

Autoplay Media Studio 8.0 is software used to create learning media that can integrate a variety of media, such as images, sound, film, web pages, files, and text in a project. It can work on Windows XP, Windows 7, Windows Vista, and Windows 8. Acrobat Reader 8 and QuickTime software must be installed in order for PDF and QuickTime features to work properly in Autoplay Media Studio 8.0 (Syaiful Hamzah, 2014). Autoplay includes more than 640 predetermined actions and is a perfect tool for an autorun CD / DVD, which allows storage into a CD-ROM in a single unit, so students can learn anywhere (Kusnari Hernawati, 2009). With its ability, it is expected to be able to transfer abstract chemical concepts into concrete ones in order to increase students' understanding (Inesa Wijaya, 2015).

Research on ICT-based learning media, which was conducted at Wilfrid Laurier University (1998) Canada found that students who utilized ICT-based media in their learning were proven to be twice as fast learning time as classical students; 80% of the students performed well and very well; and 66% of them did not need hard copy (Surjono, 1999). Moreover, research conducted by Supriyono (2014) shows other relevant research shows that the development of ICT-based learning media known as web is effective to be applied in the learning process since it is able to increase the average score of students' learning outcomes from 43% to 86% with a classical mastery level of 4% to 90%.

METHODS

This study was carried out a research and development (R&D) design (Yoshikawa, 2010) by using Plomp model (2013). The design can be seen in Figure 1.

The data were analyzed by calculating the percentage score of validation assessment with the criteria of levels of feasibility analysis of the products resulting from the development of the device. The level of product validity is presented in Table 1.

Table 1. Levels of Product Validity (Dalati, 2018)

Percentage	Criteria
80-100	Very Valid
61-80	Valid
41-60	Quite Valid
21-40	Invalid
< 20	Very Invalid

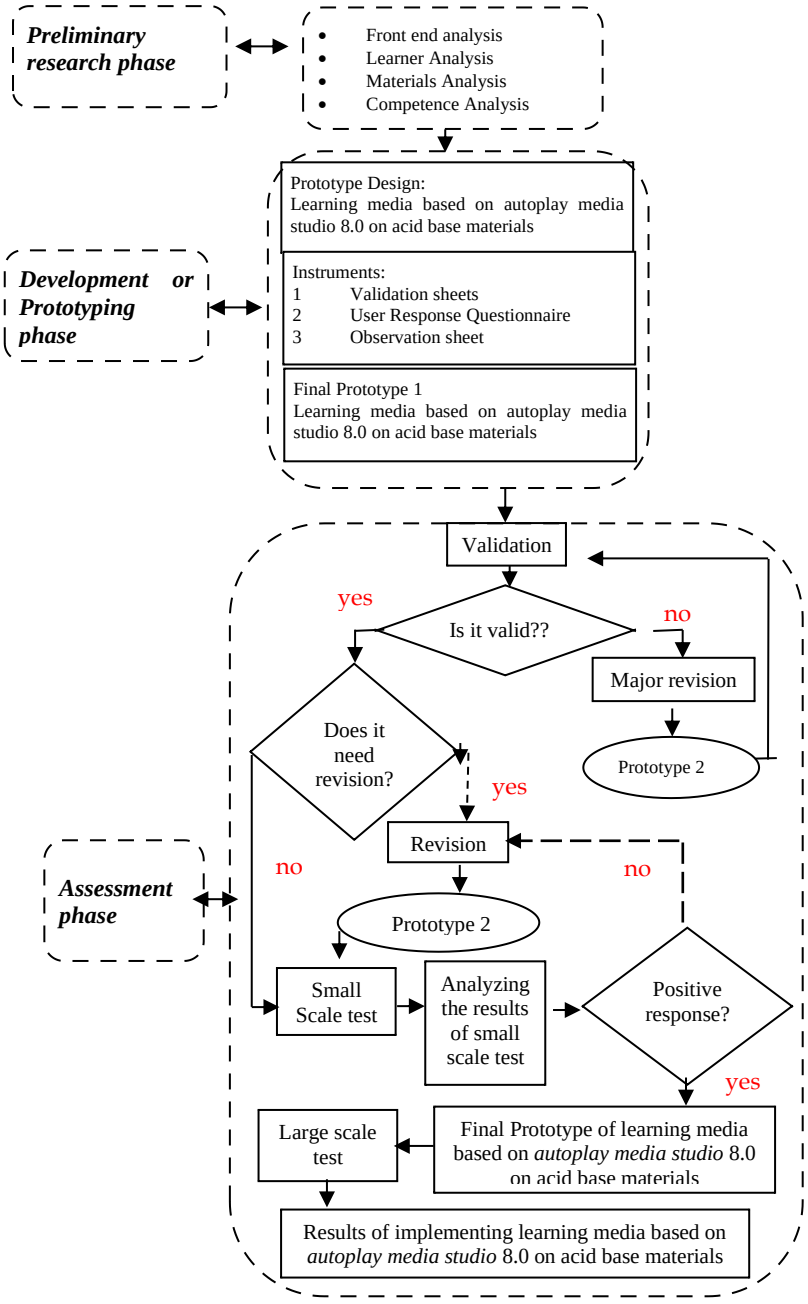

Figure 1. The flows of Plomp Development

The analysis of the chemistry teachers' in high school and the students' response was used to obtain the results of their response to the media used with the criteria (table 2).

Table 2. Criteria of Product Attractiveness (Akbar dan Hadi, 2010)

Percentage	Qualifications
80%-100%	Attractive
60%-79%	Quite attractive
50%-59%	Less attractive
< 49%	Not attractive

The effectiveness of the developed product was determined by the difference before and after using learning media based on autoplay media study 8.0 on chemistry. The significance was tested by t test (Dowdy, Wearden and Chilko, 2004).

RESULTS & DISCUSSION

This learning media development research produced a product in the form of learning media based on Autoplay Media Studio 8.0 on acid-base materials which was packaged in a CD (Compact Disk). The research development methods are as follows:

Preliminary Research

The preliminary stage began with literature analysis, materials analysis, and field studies. The results of the analysis are as follow:

Field Study

The field study was conducted by interviewing chemistry teachers at two schools, namely SMAN 6 Pekanbaru and SMAN 2 Pekanbaru. The results of the interview were 1) during teaching, the teacher only used textbooks and they rarely, even never, used media. 2) the low level of interactions among students in the learning process on acid-base materials.

Based on the results of the interviews, it was obtained that the teachers were still unable to utilize learning tools to support the learning process. As a result, the level of students' understanding was still low because the learning process was very monotonous for it only used books as the media. Meanwhile, learning in the 21st century demands the students to have 4C characters, such as communicative and collaborative characters. Based on the observation, the researchers noticed that students were allowed to use a *notebook* at school. This should be utilized by the teachers to use teaching materials adapted to 21st century learning. Consequently, the students were encouraged to follow the learning process which is expected to be able to develop the students' character and to provide clear understanding of concepts.

One learning tool providing the benefits for students to overcome these problems was the use of learning media based on autoplay media studio 8.0. Autoplay media studio 8.0 is learning media that can be used by teachers and students as a medium in the learning process. It can also be used by students as learning media at any time.

Material Analysis

The material on learning media based on autoplay media studio 8.0 that has been developed is acid-base. Based on the results of interviews with chemistry teachers, it was found that students had difficulty in understanding acid-base materials.

The result of interviews was one of the first steps to obtain information to identify the students' needs for the learning media based on autoplay media studio 8.0. There were three kinds of analysis conducted by the researchers related to the material analysis. They were curriculum analysis, needs analysis, literature analysis.

Curriculum Analysis

Curriculum analysis was carried out by reviewing the curriculum used by schools in order that the preparation and development of learning media based on autoplay media studio 8.0 was in accordance with the curriculum used. In this study, the schools already used K13 curriculum 2017 revision. Curriculum analysis became the basis of the material development.

Needs Analysis

The needs analysis was conducted to determine the learning needs for the learning media based on autoplay media studio 8.0. It had the purpose to adjust the teachers' and students' needs with the learning media based on autoplay media studio 8.0 which was developed. The needs analysis conducted at SMAN 6 Pekanbaru indicated that teachers and students needed the learning media based on autoplay media studio 8.0 which was expected to be used by students in the learning process.

Literature Analysis

Literature analysis was performed by reviewing books and other library sources which were relevant to the research. Literature analysis aimed to analyze and collect scientific data in the form of theories, methods or approaches and to examine the results of previous research.

Prototyping Stage

The prototype stage was the most important stage of the Plomp development design because the initial design of the product developed was compiled at this stage. The product validation and limited trials were also detailed at the prototype stage. The prototype was finished if there was no revision at the limited trial phase, which means that the product could be used for the assessment or implementation phase. The steps at the prototype stage are explained as follow.

Design

The design phase was the initial stage of a product development, in this research, the development of learning media based on autoplay media studio 8.0. The purpose of the design stage was to prepare the design of learning media products based on autoplay media studio 8.0. The stage began by mapping the learning materials, starting from the assessment of KI, KD, learning indicators and learning objectives. After the material mapping, the syllabus and lesson plans were designed; then, the product validation sheet and the framework or storyboard of learning media products based on autoplay media studio 8.0 on acid-base materials were also designed.

Mapping the learning materials

Mapping the learning materials is an important step that needs to be done by the teacher in the process of planning and developing lesson plans. In this study, mapping the learning materials aimed to organize the development of learning media based on autoplay media studio 8.0 on acid-base materials in order to make it and in accordance with the learning objectives on acid-base materials.

Goal Setting

In this research, goal setting means the aim of developing a product in the form of learning media based on autoplay media studio 8.0 on acid-base materials. The learning media based on autoplay media studio 8.0 on acid-base material was designed based on the need for the students' improvement on learning conditions.

Designing the learning media based on *autoplay media studio* 8.0

The next stage was generating a storyboard for the product development of learning media based on *autoplay media studio* 8.0. After determining the materials on the product and the objectives of the product development, the next step was to make the initial product. At this stage, the product was developed according to the materials chosen.

The sequences of the development design conducted are as follows:

1) Designing the front page of the media

The cover page includes:

- The title of the media
- Name of the subjects, class, and semester describing the title of media or subject names. The design of the front page can be seen in Figure 2.

Figure 2. The front page of the media

2) Designing the media identity.

- Foreword
- Table of contents
- Instructions for using media

The design of media identity can be seen in Figure 3.

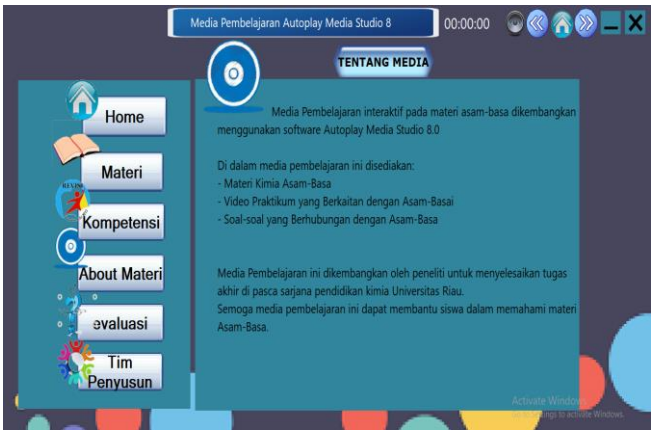

Figure 3. The design of media identity

3) Preliminary Design of media
- Core competencies and basic competencies
- Learning objectives.

4) Designing the content of media
- Materials description
- Sample questions
- LKPD

The design of the media content can be seen in Figure 4.

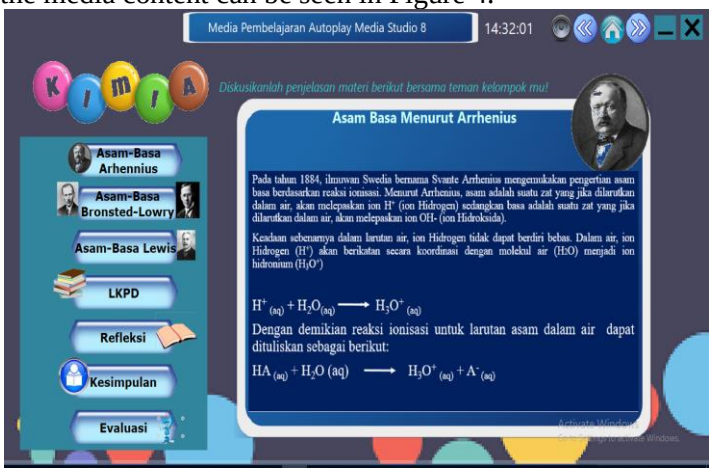

Figure 4. The design of media content

5) Designing the closing
- References
- Compilers' identity

Designing validation sheets

After being designed and developed, the product was validated through a validation sheet. In this research, the validation was conducted by the media experts and the material experts. A communicative character indicator was included in each validation sheet. Greenstein (2012) lays out operational indicators of communicative character are as follows:

a. Use various types of verbal communication (for example in conducting conversations, discussions).
b. Identify various types of written communication.
c. Actively involved in establishing dialogue with others.
d. Apply communication appropriately with the media used.
e. Select information suitable for reading, listening, and listening to the media provided.
f. Read and understand various types of reading.
g. Listen effectively to understand the purpose and content of written and verbal communication.
h. Distinguish the purpose and information of an image and video.
i. Make effective communication with the media used.
j. Communicate thoughts and ideas effectively orally and in written.
k. Communicate clearly and effectively so that it is easily understood by the audience.
l. Communicate for various purposes, for example, providing information or solutions.

Data obtained from the evaluation of validation sheets were in the form of the Likert scale with a score of 1-4. This scale provides flexibility to the validator in assessing the validity of learning media based on autoplay media studio 8.0 that was developed.

Assessment Stage

Expert Validation

The assessment of validation sheet was carried out by 3 media expert lecturers and material experts as validators. Data obtained from the evaluation of validation sheets were in the form of scales. The type of scale applied was the Likert scale with a score of 1-4. This scale provided flexibility to the validator in assessing the validity of learning media based on autoplay media studio 8.0 that was developed. The results obtained from the material expert validator can be seen in Figure 5.

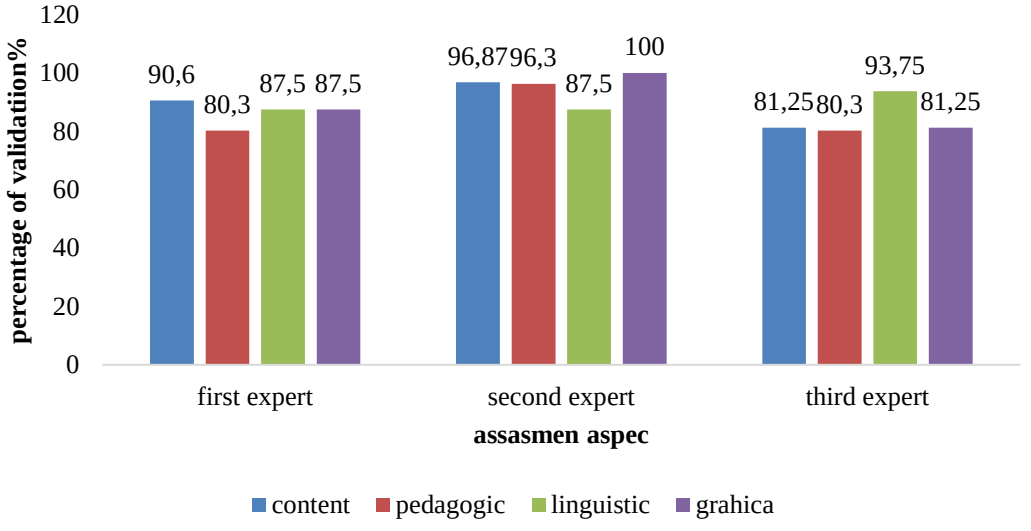

Figure 5. Validation from material experts

The material validation aimed to correct and provide suggestions related to the materials developed at learning media based on autoplay studio studio 8.0, which was acid-base material. The validation process occurred for one month at two stages of validation.

In the first validation for the material experts, it was found that the materials required some revisions and additions appropriate to the students' level of thinking. Thus, the results obtained in the first validation were categorized as invalid. This means that in the first validation, the materials were not feasible to use.

The next validation was media validation which aimed to find out the feasibility assessment of the initial product being developed, whether it fulfilled every component of media feasibility. The assessment and advice form the media experts were used as a basis for revising and improving the product quality in order to produce a valid product. The percentage of media validation results can be seen in Figure 6.

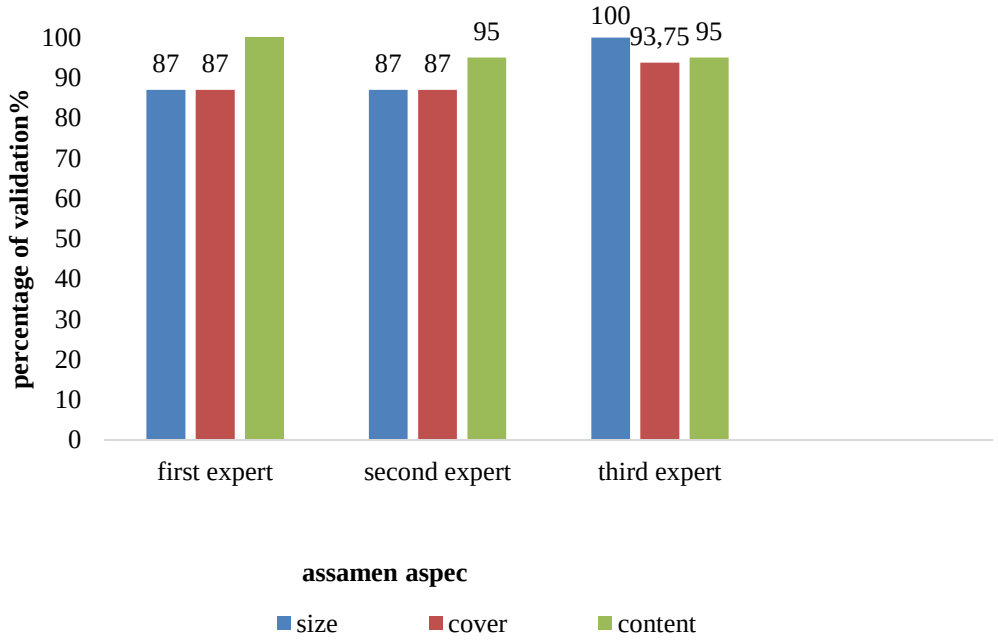

Figure 6. Validation from the media experts

In the validation process, both materials and media, it was obtained that learning media based on autoplay media studio 8.0 on acid-base material was very feasible to use with an average score from material experts was 88.25% and media experts was 91.69% with the category of suitable to use. This is consistent with Tyuzsuz's (2010) statement regarding the learning process using ICT-based media which asserts that the media can include interesting animations that will facilitate students in the learning process. Besides, ICT-based learning media can also facilitate students in understanding learning material (P. Budiastuti, 2011).

Revision

The revision phase is the stage to determine whether the product (the learning media based on autoplay media studio 8.0 on acid-base material) needed a major or minor revision when the validation of the media and material occurred. If it needs a major revision, the validation stage must be repeated and revised according to the suggestions. Some suggestions made at the validation stage can be seen in the picture. In this research, the revisions obtained at the validation stage were minor revisions. After the product was revised and categorized as valid according to the results of validation by the validator. Then, the next stage was the limited trial phase.

Small Scale Test

After the validation data of learning media based on autoplay media studio 8.0 was declared valid, the next step was to conduct a small-scale test. The trial was conducted at 2 schools, namely SMAN 6 Pekanbaru and SMAN 2 Pekanbaru. The data obtained were data in the form of teacher response sheet questionnaire and student response sheet questionnaire.

1. Data of Teacher Response Questionnaire

The limited trial phase obtained results in the form of questionnaire response data from 3 teachers. Table 3 display more details about this result.

Table 3. Results of Teacher Response Questionnaire

Respondents (Teachers)	Results
Teacher 1	80,68%
Teacher 2	87,58%
Teacher 3	88,27%
Average	85,51%

The teachers' response to learning media based on autoplay studio media 8.0 on acid-base material was generally related to see the practicality of the media. Related to the attractiveness aspect, Nieveen's research (2010) explains the attractiveness level of product was observed from the explanation of whether the teacher and other experts considered that the material was easy and could be used by teachers and students.

2. Data of Student Response Questionnaire

The results obtained at the stage of limited trials were data of the student questionnaire response on learning media based on autoplay media studio 8.0. The Likert scale was used in this questionnaire. The categories of answer were from 1 to 5. It was obtained that the average score was 81%. This means that learning media based on autoplay studio 8.0 on acid-base material was interesting for students. The results of the percentage of the average scores of the teachers and students' responses to the media to see the response / user response to chemistry learning media based on *Autoplay Media Studio 8.0* were respectively 85.51% and 81% with the category of positive to use.

Large Scale Test

Large scale test was conducted on the experimental class. The class was given a treatment which was the learning media based on Autoplay media studio 8.0. Meanwhile, the control class was not given any treatment. The mechanism in the experimental class was that each group of students was given at least one medium so that the learning center was not only for the teacher in front of the class.

The results of observations indicated that the communicative character occurred in the experimental class increased from 59% to 89%. Whereas the communicative character in the control class improved from 34% to 49%. The average results of communicative character observations can be seen in Figure 7.

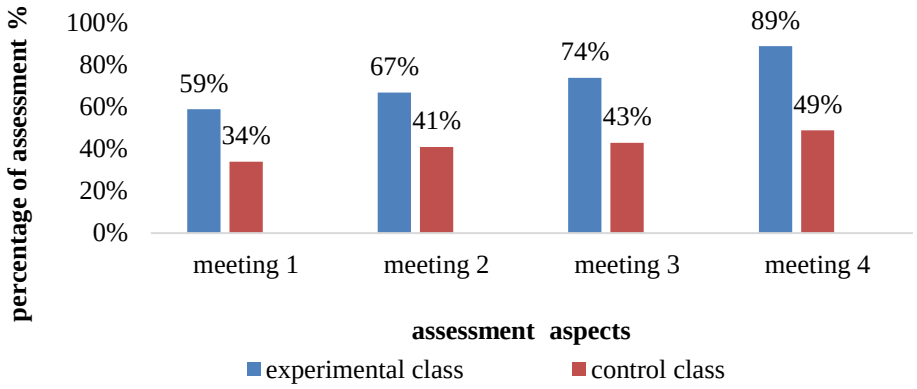

Figure 7. The Graph of the percentage of communicative characters

These results indicated that the use of chemistry learning media based on autoplay media studio 8.0 was effective to improve students' communicative characters on acid-base materials. After that, the t test was performed to see the significance of the character differences.

T-test

The t-test was conducted to see the significance of the difference in characters before and after the use of the product. The test being utilized was the independent sample t test. The results can be seen in table 4.

Table 4. Independent t-test of Communicative

		Levene's Test for Equality of Variances		*t-test for Equality of Means*						
		F	*F*	*T*	*df*	*Sig. (2-tailed)*	*Difference*	*Std. Error Difference*	*95% Confidence Interval of the Difference*	
									Lo	*Upper*
Score	Equal variances assumed	4.088	0.050	16,818	52	0.000	121,852	7,245	107,313	136,391
	Equal variances not assumed			16,818	43,416	0.000	121,852	7,245	107,244	136,459

The results of t test indicated that the significance was 0,000 < 0.005 which implies that there are significant differences in the character of students before and after the use of learning media based on autoplay media studio 8.0. Chemistry learning media based on autoplay media studio 8.0 contains some instructions that direct students to do a series of communication activities. With this guidance, the students were motivated and encouraged to interact and communicate with the teacher and fellow students. This is in line with the role of the learning media which is as a learning component that can improve the interaction among teachers, students and the learning environment. On the other hand, these

instructions were not given to other learning media. As a result, the interaction that occurred was only one-way interaction between teacher and students (K. A. Peppler and Y. B. Kafai, 2007). Chemistry learning media based on autoplay media studio 8.0 can be improve students' high order thinking (Mohammad, et al. 2020).

CONCLUSION

Learning media based on Autoplay Media Studio 8.0 on chemistry material was valid and it is suitable to be implemented for students at grade X SMA/MA. Based on validation assessment and limited trials, the percentage of the overall validation test score was 88.25% from the material experts and 91.69% from the media experts with a category of valid. Learning media also received positive responses to be implemented based on teachers' responses, with an average score of 85.51%, and students' responses, with an average score of 81%. The results of large-scale test revealed that the increase of communicative character occurred in the experimental class was 72.25% while the increase of communicative character in the control class was 41.75%. The t test results showed that the significance was 0,000 <0.005 which indicated that there were significant differences in the character of students before and after the use of learning media based on autoplay media studio 8.0. An ICT skills enhancement program must be developed by the administration of their respective schools to maximize the respondents' utilization of ICT approaches and strengthen their multimedia writing skills especially chemistry learning media.

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