

The Development of HyperDocs on Chemistry Learning for High School Students' Collaborative Skills

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Article History

Received 05 July 2022

Revised 11 August 2022

Accepted 18 September 2022

Keywords:

Hyperdocs, Collaborative Skills, Chemistry Learning

Abstract

This research aims to produce valid, practical and effective Hyperdocs chemistry learning. This type of research is Research and Development (R&D), with One-Group pretest-posttest design. The results of this study are that the Hyperdocs product developed has a validity value of 75% with valid criteria, lesson plans, implementation of learning, collaborative skills, and student responses each obtaining an average score of 89.82%, 94.45%, 95%, and 94.17%. The developed Hyperdocs has a practical value in the implementation of learning meetings 1 and 2 of 88.89% and 87.59% with very practical criteria, and student responses of 81.11% with very practical criteria. The Hyperdocs that were developed are effective in teaching chemistry as seen from the Cohen Effect average value obtained at 0.78 which is included in the medium criteria. The Cohen Class effect size value is 6.74 which is included in the big criteria. There are several aspects of collaborative skills, namely: 1) despair among group members, 2) despair in teamwork and 3) despair in social relations, each of which obtains an average score of 86.46%, 82.29%, and 86, 67%. The average score of individual Leaders is 3.19, Minutes are 3.16, Research is 3.16, and Members are 3.

doi: [10.22487 / j25490192.2022.v6.i2.pp.98-108](https://doi.org/10.22487/j25490192.2022.v6.i2.pp.98-108)

Introduction

In today's modern era, information and communication technology (ICT) has progressed very rapidly, this is indicated by the large number of computers/laptops and internet facilities. This progress has made significant contributions in various fields, one of which is education. In this case, technology is able to contribute its role as a medium in solving educational problems, including the lack of understanding of the material that teachers convey to students (Meitantiwi et al., 2015).

Various media produced by technology including television, VCD, DVD, and computers are an important requirement in learning (Munir, 2010).

Teachers should develop their potential in order to improve the quality of education. In high school learning, chemistry material is still said to be quite difficult because it is abstract, there are a lot of memorization, calculations and requires a higher understanding to study chemistry (Robiyanto et al., 2013). The world of education has started to leave offline learning, now it has started to lead to

learning that leads to online learning (Gunawan, 2018).

At this time, students who take part in the learning process at school are from generation Z. According to (Viridi, 2017) Generation Z generally refers to the generation born in or after 1990 who have become accustomed to internet technology from an early age. In this generation teacher-centered learning is no longer suitable, so it needs to change to a more student-centered approach, especially for students whose abilities are very diverse (Viridi, 2017).

Currently the teacher must be able to create an interesting learning process with existing technological developments, so that students can understand the contents of the learning material taught by the teacher. Existing technological developments such as Google classrooms, Schoology and one of the technologies that can be used to support more interesting education like Hyperdocs .

Hyperdoc is a document digital, multimedia text sets for students consisting of links to visuals, audio, informational text, narrative text, online educational activities, and more (Berg, 2018). Hyperdocs is an interactive development tool for

designing interactive devices. The main purpose of Hyperdocs is to help design and analyze interactive tools and manuals (Thimbleby & Addison, 1995). Hyperdocs is an interactive digital teaching and learning material created, disseminated and remixed by educators (Carpenter et al., 2017). The use of Hyperdocs allows students to freely work independently and collaboratively in exploring content.

Collaborative skill is the ability to participate in every activity to foster relationships with others, respect for relationships and teamwork to achieve the same goals (Le et al., 2017).

Collaboration skills are the ability to interact with others in the form of activities to work together to achieve goals by respecting differences, participating in discussions, brainstorming, listening, and supporting others (Sari et al., 2017). According to Greenstein (2012) explains that in a collaborative classroom, students will work to share goals, learn together, engage in meaningful and constructive tasks. In addition, collaborative learning directs students to acquire and hone social skills and contribute to the development of positive learning attitudes (Law et al., 2017).

Parade et al. (2018), conducted a study on Using Internet Docs. Google Media on the Subject of Class X IPA Redox Reaction at SMAN 4 Bengkulu. The result is that there is a significant difference between student learning outcomes in classes that are not given home study preparation and student learning outcomes in classes that are given home study preparation using the Internet Docs. Google media. Student learning outcomes in classes that were provided with home study preparation using Docs. Google showed an average value of 77.0 while student learning outcomes in classes that were not provided with home study preparation with an average score of 68.6. Student learning outcomes in classes that are provided with home study preparation using Docs. Google can provide better results on the subject of redox reactions. Based on this, the authors developed Hyperdocs on the colligative nature of the solution as a medium for conveying learning material that was increasing and could increase student collaboration. The colligative properties of solution were chosen because they are very close to everyday life.

Based on the description, it can be said that the world of education is now leading to online

learning, which allows learner-centered learning, so it is necessary technology that can be used to support more interesting education, Hyperdocs in improving student collaborative skills. So a research was conducted on the Development of Hyperdocs in Chemistry Learning on Collaboration Skills for High School Students.

Materials and Method

This type of research is development research known as research and development (R&D). This research is research that is used to produce certain products and test the feasibility of these products (Sugiyono, 2019). Research and development steps developed by Sukmadinata and friends, in general has three stages: 1) Preliminary studies, 2) Model Development, and 3) Model Test (Sukmadinata, 2017). The research implementation stage can be seen in Figure 1.

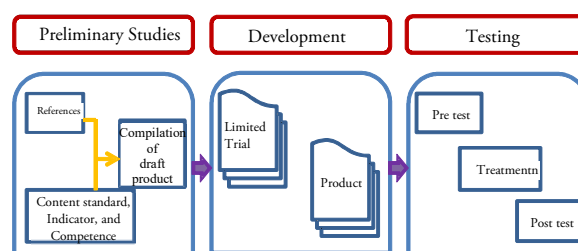


Figure 1. Schematic of research stages (Source: Sukmadinata, 2017)

Preliminary studies

The first stage of study introduction is the initial stage or preparation for development. This study is used to study concepts or theories regarding the product to be developed. In addition, this study is used to review the results of previous research. This is done as a basis for preparing an initial draft of a product development model. Furthermore, the draft is revised / validated by experts in the field of curriculum and media, and then the researchers revise the draft that has been validated by the experts.

Development stage

The second stage is development where in this stage the first thing to do is a limited trial conducted on 15 students who will be divided into 3 groups, then revisions are made to the results of limited trials after that the results of revised improvements in the form of products that will be tested on testing phase.

Testing phase

The product testing phase being developed will be tested in 1 class consisting of 31 students. Product testing is done by design *one-group pretest-posttest* design. In this design, a pretest is given which aims to determine students' initial abilities before treatment and posttest aims to determine the effectiveness of using the products used on students' collaborative skills (Sukmadinata, 2017).

This research was conducted at SMA Negeri 3 Palu. The time of the research was carried out from September to October 2020. The population in this study were all students of class XII at SMA Negeri 3 Palu in the odd semester of the 2020/2021 academic year, with total 253 students.

The sampling technique is purposive sampling technique, which is a technique of sampling data sources with certain considerations (Sugiyono, 2019). Field trial samples consisted of limited trial samples and broad trial samples.

a. Limited trial sample

Limited trial samples in this study involving 15 students.

b. Product

From the results of limited trials, a development product was produced where this product would be tested by taking more samples, which involved 31 students from class XII MIA 2.

Hyperdocs.

Hyperdocs is a digital document, multimedia text sets for students consisting of links to visuals, audio, informational texts, narrative texts, online educational activities, and more. *Hyperdocs* developed in this study contained topics, group names, instructions, URLs, materials, scopes, Cumulative Achievement Index (GPA), questions and conclusions.

Collaboration skills are the ability to participate in every activity to foster relationships with others, respect mutual relationships and teamwork to achieve the same goal (Le et al. 2017).

The data collection technique used in this research is through giving tests. Collaboration skills are obtained by giving essay test questions. The test was given twice, before learning (pretest) and after learning (posttest) in the class used as the research sample is class XII MIA2.

The research instrument used in this study aims to measure the validity, practicality and effectiveness of instructional media. The

instruments used in this research can be described as follows:

The lesson plan that is applied in learning activities is validated by experts using lesson plan validation sheets. The lesson plan validation assessment consists of two aspects, they are; (1) learning objectives, and (2) learning activities. The criteria for the validity of the Lesson Plan were stated by Arikunto (2003) which consisted of four categories: Very poor (score 1), poor (score 2), good (score 3), and very good (score 4). Lesson plan is said to be valid if it is in the good category.

Hyperdocs validated by experts using an assessment sheet. The *Hyperdocs* validity category determination uses the same reference as the lesson plan validation category determination. *Hyperdocs* validation assessment consists of three aspects; (1) instructions, (2) objectives, and (3) content. The criteria for the validity of *Hyperdocs* were stated by Arikunto (2013) which consisted of four categories: Very Poor (score 1), poor (score 2), good (score 3), and very good (score 4). *Hyperdocs* is said to be valid if it is in the good category.

The collaborative skills test instrument is measured by the ability of students to complete essay tests that are given through rubric-based learning. The collaboration skills test and rubric are validated by the expert to determine the validity category assessed by giving a check mark (√) if valid and a cross mark (X) if it is not valid on the lines provided. The assessment of the student collaboration skills test instrument validation sheet consists of two aspects; content and language. Validity criteria test instrument Arikunto (2013) argued, which consists of four categories: Very poor (score 1), poor (score 2), good (score 3), and very good (score 4). It is said to be valid if it is in the good category.

Instrument for practicality assessment of learning media

The instrument used to obtain data on the practicality of learning media was to use the observation sheet for the implementation of learning media. The criteria put forward by Arikunto (2013) consist of four categories; very poor (score 1), poor (score 2), good (score 3), and very good (score 4). DI say valid if it is in the good category.

Instrument for assessing the effectiveness of learning media

The instrument for assessing the effectiveness of learning media used in this study consisted of:

a. The data of developed product effectiveness

The product effectiveness data instrument developed was validated by experts. The criteria for the validity of the test instrument were stated by [Arikunto \(2013\)](#) which consisted of four categories: very poor (score 1), poor (score 2), good (score 3), and very good (score 4). It is said to be valid if it is in the good category.

b. The data of collaborative skills

The collaboration skills test instrument is in the form of a rubric which is validated by an expert. The things that are assessed are: (1) Involvement between group members, (2) Involvement of team work, (3) Involvement of social relations. Assessment of collaboration skills is based on a validated rubric using an assessment sheet by the validator. The criteria put forward by [Arikunto \(2013\)](#) consist of four categories: Very poor (score 1), poor (score 2), good (score 3), and very good (score 4). It is said to be valid if it is in the good category.

Data analysis of learning media validity

The steps taken in the process of analyzing the validity of learning media data including lesson plans and Hyperdocs are:

- a. Conduct recapitulation of the assessed aspects and the results of expert assessments
- b. Determine the average percentage value of expert judgment for each of the aspects
- c. Determine the criteria for the validity of each aspect by matching the average percentage of aspects with the established validity criteria. The criteria used to decide that device considered valid if a validity value $\geq 61\%$ was obtained ([Centaury, 2015](#)).

Data analysis of learning media practicality

Assessment of the practicality of learning media uses an assessment sheet. Data on the practicality of learning media were generally carried out by observers. The activities carried out in the analysis process are:

- a. Recapitulating the results of observations on the implementation of the learning media provided by the observer.
- b. Determine the average percentage of each observation aspect of each meeting
- c. Calculate the average percentage of implementation for each aspect of the observation

- d. Determine the criteria for the practicality of each aspect by matching the average percentage of aspects with the defined practicality criteria. The criteria used to decide that device considered practical if a validity value $\geq 61\%$ is obtained ([Centaury, 2015](#)).

Data analysis of learning media effectiveness

The effectiveness test is carried out to determine the effectiveness of the product being developed to increase the collaborative skills of students.

Data analysis of developed product effectiveness

The effectiveness test is seen from the results of the Pretest, Posttest and the Size Cohen Effect. The activities carried out in the analysis process are as follows:

- a. Recapitulate the pretest-posttest results
- b. Determine the average pretest-posttest results
- c. Calculating effectiveness with the Cohen effect size formula
- d. Determines the Cohen effect size category by matching the results with defined criteria. Cohen's effect size category measures include effect sizes as small ($d = 0.2$), medium ($d = 0.5$), and large ($d = 0.8$) ([Kotrlík et al., 2011](#)).

Data analysis of collaborative skills

Collaborative skills data analysis is in the form of a rubric validated by an expert and also a checklist. The things that are assessed are: (1) Involvement between group members, (2) Involvement of team work, (3) Involvement of social relations. The activities carried out in the analysis process are as follows:

- a. Recapitulate the results of the collaborative skills assessment
- b. Calculates the score each student gets on collaborative skills based on the collaborative skills rubric.
- c. Calculating the value obtained by students (N) by dividing each student's score by the maximum score multiplied by 100
- d. Specifies criteria for collaborative skills by matching the results with established criteria. The criteria for collaborative skills are declared good if they are at values $\geq 61\%$ ([Widoyoko, 2012](#)).

This questionnaire is used to determine the attitudes or responses of students to the product. This assessment is carried out after all learning activities have been carried out. This questionnaire is in the form of a Likter with 4 assessment

categories; very good (score 4), good (score 3), Poor (score 2), and very poor (score 1).

Results and Discussion

The results of the development of Hyperdocs research on chemistry learning for high school students' collaborative skills that have been carried out using the research and development (*R&D*) method at SMA Negeri 3 Palu. This development research was carried out in several stages, they are: 1) Preliminary studies, 2) Model development, and 3) Model testing.

Studies introduction is the initial stage or preparation for development. This study is used to study concepts or theories regarding the product to be developed. In addition, this study is used to review the results of previous research. This is done as a basis for preparing an initial draft of a product development model. Furthermore, the draft is revised / validated by experts in the field of curriculum and media, then the researchers revise the draft that has been validated by the experts.

Reference sources in the preparation of this research can be obtained from following relevant sources:

1. The book "Educational Research Methods: Quantitative, Qualitative, and R & D Approaches" by (Sugiyono, 2019).
2. The book "Educational Research etology "By (Sukmadinata, 2017).
3. Journal of Education and Chemistry "Using Internet Media Docs. Google on the Topic of Class X IPA Redox Reaction at SMAN 4 Bengkulu City" by Parade et al. (2018).
4. Thesis "The Effectiveness of Chemistry Learning Devices with the Discovery Learning Model on Critical Thinking Ability and Learning Outcomes of Class X Students of Mia Catholic High School St. Andreas Palu" by (Shinta, 2019).
5. Chemistry books for class XII SMA/MA Publisher Intan Pariwara
6. Website "Hyperdocs "https://Hyperdocs.co/about by (David, 2020).

This stage begins with designing the template, this is to make it easier for researchers to lay out the layout in the designed Hyperdocs . This Hyperdocs contains instructions for filling in, indicators of competency achievement, equalization material for redox reactions, scoopes, URLs, questions, and conclusions. Here are the steps for creating a Hyperdocs :

1. Give color to the page and set the size of the page that will be used
2. Make table columns which will be filled in each column with filling instructions, competency achievement indicators, redox reaction equalization material, scoope, URL, questions, and conclusions
3. Give each column a different color
4. Insert the appropriate picture by inserting the picture
5. Include a supportive learning video for completing the given task by inserting the URL link.

This stage is the stage of assessment (validation) by experts (validators) of all learning media devices and instruments that have been compiled. The validity test of the learning device is the data obtained from the validator which is analyzed descriptively by examining the results of the assessment of the learning device. The results of the study are used as input for revising / improving the learning tools (Harjono, 2012). The purpose of validation is to determine the validity of the product that has been developed and is feasible to be implemented in the learning process. At this stage the validator provides an assessment and input suggestions for improving learning media devices and instruments that the researcher has compiled, after that the researcher made improvements according to the input suggestions given by the validator so that the product developed could be tested. The validation results are then averaged and the results are matched with the predetermined categories. The following are the validation results of the media and devices that have been made:

a. Results of expert assessment of lesson plan

The lesson plan assessment is carried out by the validator by providing an assessment on the lesson plan validation assessment sheet for the redox reaction equalization material. Before the lesson plan is used, first the validator will validate the lesson plan that has been made by assessing the aspects that are in the lesson plan so that it can be determined that the lesson plan has been made feasible or not to be used. The criteria used to decide that device considered valid if a validity value $\geq 61\%$ is obtained (Centaury, 2015). The assessment of the validation of the lesson plan by the validator is briefly shown in Table 1.

Table 1. Validator assessment results and criteria validity of each aspect in the lesson plan

No.	Rated aspect	Average Rating (%)	Criteria
1	Lesson Plan format	95	Very Valid
2	Fill in the lesson plan	83.3	Very Valid
3	Language	83.3	Very Valid
4	Time Allocation	87.5	Very Valid
5	Benefits of lesson plan sheet	100	Very Valid
Average		89.82	Very Valid

Based on the expert judgment in Table 1 above, it shows that all the aspects assessed in the lesson plan have a very valid category, this shows that the lesson plan is valid and worthy of use.

b. Results of expert assessment of Hyperdocs

Hyperdocs assessment is carried out by a validator using a validation score sheet. Before Hyperdocs is used, the validator will first validate the Hyperdocs that has been created by assessing the existing aspects of Hyperdocs so that it can be determined that Hyperdocs has been made fit for use or not. The results of the Hyperdocs assessment were analyzed by calculating the average validator's assessment results for each aspect assessed in Hyperdocs. The Hyperdocs validity category determination uses the same reference as the lesson plan validity category determination. The validator's Hyperdocs validation assessment is briefly displayed in Table 2.

Table 2. Result of validator's assessment of each aspect in Hyperdocs

No.	Rated aspect	Average Rating (%)	Criteria
1	Content material	75	Valid
2	Language	75	Valid
3	Display	75	Valid
Average		75	Valid

Based on the expert judgment in Table 2, it shows that all aspects assessed in Hyperdocs are valid. This shows that all Hyperdocs are valid and suitable for use.

c. Results of expert assessment of the learning implementation questionnaire

The assessment of the learning implementation questionnaire was carried out by a validator using a validation assessment sheet. The validator will assess the aspects contained in the learning implementation questionnaire so that it can be determined that the learning implementation questionnaire has been made feasible or not to be used. The results of the assessment of the learning implementation questionnaire were analyzed by calculating the average results of the validator's

assessment for each aspect assessed in the learning implementation questionnaire. The determination of the validity category of the learning implementation questionnaire uses the same reference as the determination of the lesson plan validity category. The assessment of the validation of the learning implementation questionnaire by the validator is briefly shown in Tables 3 and 4.

Table 3. Results of the validator's assessment of each aspect in the meeting learning implementation questionnaire 1

No.	Rated aspect	Average Rating (%)	Criteria
1	Purpose	100	Very Valid
2	Learning activities and atmosphere	91.67	Very Valid
3	Language	91.67	Very Valid
Average		94.45	Very Valid

Table 4. Results of the validator's assessment of each aspect in the meeting learning implementation questionnaire 2

No.	Rated aspect	Average Rating (%)	Criteria
1	Purpose	100	Very Valid
2	Learning activities and atmosphere	91.67	Very Valid
3	Language	91.67	Very Valid
Average		94.45	Very Valid

Based on the expert judgment in Tables 3 and 4, it shows that all aspects assessed in the learning implementation questionnaire have a very valid category, this shows that the learning implementation questionnaire is valid and feasible to use.

d. Result of expert assessment of collaborative skills observation sheet

Assessment of the collaborative skills observation sheet is carried out by a validator using a validation assessment sheet. The validator will assess the aspects contained in the collaborative skills observation sheet so that it can be determined that the collaborative skills observation sheet that has been made is appropriate or not to be used. The results of the assessment from the collaborative skills observation sheet were analyzed by calculating the average results of the validator's assessment for each aspect assessed in the collaborative skills observation sheet. The determination of the validity category of the collaborative skills observation sheet uses the same reference as the determination of the lesson plan validity category. The assessment of the

validation of the collaborative skills observation sheet by the validator is briefly shown in Table 5.

Table 5. Results of the validator's assessment of each aspect in the collaborative skills observation sheet

No.	Rated aspect	Average Rating (%)	Criteria
1	Purpose	100	Very Valid
2	Construction	85	Very Valid
3	Language	100	Very Valid
Average		95	Very Valid

Based on the expert judgment in Table 5, it shows that all aspects assessed in the collaborative skills observation sheet have a very valid category, this indicates that the student response questionnaire is valid and worthy of use.

e. Results of expert assessment of student response questionnaire

The assessment of the student response questionnaire was carried out by a validator using a validation assessment sheet. The validator will assess the aspects that are in the student response questionnaire so that it can be determined that the student response questionnaire has been made appropriate or not to be used. The results of the assessment of the student response questionnaire were analyzed by calculating the average result of the validator's assessment for each aspect assessed in the student response questionnaire. The determination of the validity category of the student response questionnaire uses the same reference as the determination of the validity category of the lesson plan. The assessment of the validation of the student response questionnaire by the validator is briefly shown in Table 6.

Table 6. Results of the validator's assessment of each aspect in the student response questionnaire

No.	Rated aspect	Average Rating (%)	Criteria
1	Concept	87.5	Very Valid
2	Construction	100	Very Valid
3	Language	95	Very Valid
Average		94.17	Very Valid

Based on the expert's assessment in Table 6 above, it shows that all the aspects assessed in the student response questionnaire have a very valid category, this shows that the student response questionnaire is valid and worthy of use.

Development limited trial

This development stage starts from a limited trial, then revises the results of the limited trial after that the results of the revised revision are products that will be tested at the testing stage.

The developed product that has been validated by the validator and has been declared

valid by the validator is then corrected by the researcher and then in a limited trial, the goal is to find out whether Hyperdocs being developed is suitable for use in learning or vice versa. Limited trials were carried out by providing student response questionnaires. Participants students fill out a questionnaire that the researcher gives the goal to obtain Input suggestions as improvements to the product being developed, after that the researcher revises the product being developed so that it can be tested at the product test stage. The analysis of the results of the limited test data of students' response questionnaires can be seen in Table 7. The following is the recapitulation of the participant response questionnaire shown in Table 7.

Table 7. Recapitulation of student response questionnaire limited trial

Respondents	Average Rating	Criteria
Learners	78.33%	Practical

Based on the student response questionnaire in Table 7 above, it shows that the student response questionnaire has a practical category, this shows that the student response questionnaire is practical and feasible to use.

Trial revision

This stage is the stage for improving the product being developed. This revision stage is based on the assessment of each aspect in the student response questionnaire sheet from the students. The summary of product revisions is shown in Table 8.

Table 8. Recapitulation in the limited trial student response questionnaire

Respondents	Conclusion
Learners	1. The material in Hyperdocs is presented with the steps in equalizing a redox reaction
	2. URL which is presented according to the questions given

Based on Table 8, revisions were made to Hyperdocs .

Testing

This stage aims to determine the effectiveness of the product being developed. Product testing involves 1 experimental class, It is class XII MIA 2 with consisting of 31 students. The trial stage of this stage uses the One-Group Pretest-Posttest Design where O1 is pretest, X is treatment and O2 is posttest. Pretest questions are given to students before learning which aimsto find out students' initial abilities before treatment then provide treatment in the form of Hyperdocs and provide

posttest to students after the learning aims to determine the effectiveness of the use of products used on collaborative skills of students. Furthermore, students fill out the student response questionnaire given after testing the product developed.

Data analysis of the practicality of learning devices

The data on the practicality of learning tools were seen from the questionnaire on the implementation of the lesson plan in the learning process that was observed by the observer and the student response questionnaire that was filled out by the students. Observation of the implementation of the lesson plan in the learning process is carried out in two meetings in class XII MIA 2. Questionnaires are used to collect information about the practicality of learning devices, where a questionnaire on the implementation of the learning process is given to the teacher as an observer and student response questionnaires are given to students at the end of learning activities. Analysis of the results of the practicality test data for students' responses can be seen in Annex 22 and the results of the practicality test data for the implementation of the learning process are briefly shown in Tables 9 & 10.

Table 9. Practical results of lesson plan of meeting 1

No.	Rated aspect	Average Rating (%)	Criteria
1	preliminary	95.83	Very Practical
2	Core	83.33	Very Practical
3	Closing	87.50	Very Practical
	Average	88.89%	Very Practical

Table 10. Results of the practicality of the lesson plan questionnaire in the learning process of meeting 2

No.	Rated aspect	Average Rating (%)	Criteria
1	preliminary	85	Very Practical
2	Core	86.11	Very Practical
3	Closing	91.67	Very Practical
	Average	87.59	Very Practical

Data analysis of learning media effectiveness

Data analysis The instrument used in this study was a collaborative skills test consisting of 5 questions in the form of a description. Each item of test questions has been validated by expert validators. The effectiveness of the products that have been developed is measured through the results of the pretest, posttest, and the size Cohen'd effect. The results obtained are 14 students were on the Large criteria and 17 students were on the Medium criteria. The Cohen effect score of individual collaborative skills of students, on average, is 0.78, which is in the Medium criteria.

Data analysis of collaborative skills

The collaboration skills test instrument is in the form of a rubric that is validated by an expert and also a checklist. The things that are assessed are: (1) collaboration, (2) teamwork, (3) social Relations. Assessment of collaboration skills is based on a validated rubric using an assessment sheet by the validator. The results of group and individual collaborative skills data can be seen in Table 11.

Table 11. Data of group collaborative skills

No.	Aspect	Indicator	Average Rating (%)	Criteria
1.	Involvement between group members	Focus on tasks	87.5	Very good
		Mutual help	83.33	Very good
		Responsibility and reliability	79.17	Good
		Team Leader Performance	95.83	Very good
		Average	86.46	Very good
2.	Involvement of Team work	Accuracy	70.83	Good
		Commitment	79.17	Good
		Communication	87.50	Very good
		Assessment	91.67	Very good
		Average	82.29	Very good
3.	Involvement of Social relations	Respect	91.67	Very good
		Modesty	91.67	Very good
		Altruism	75.00	Good
		Tolerance	83.33	Very good
		Social sensitivity	91.67	Very good
	Average	86.67	Very good	

Based on Table 11, it shows that the average value of aspects of group collaborative skills: 1) Involvement between group members is 86.46%, 2) Team work involvement is 82.29%, and 3) Social relationship involvement is 86.67%. The average individual score is Leader 3.19, Minutes 3.16, Research 3.16, and Member 3. There are 29 individual collaborative skills students who have active collaborative criteria and 2 students who have passive collaborative criteria.

This study aims to produce Hyperdocs development products that can improve high school students' collaborative skills. Where this product development, researchers will see the validity, practicality and effectiveness of the product being developed.

Learning devices validity

The learning device developed has previously been validated by the validator and has been revised before being tested. Validation was carried out on learning tools consisting of lesson plans, Hyperdocs, student response questionnaires, and practicality questionnaires.

The learning device used must be valid so that it is suitable for use in the learning process (Centaury, 2015). The validity of the learning device besides having to meet the validity of the content (content), what is more important is that it must meet the validity of the construct. This means that the preparation of learning tools must be consistently interrelated and logically have a clear theoretical format and basis (Yusuf, 2018).

Based on the results of the validation research conducted by the validator in the form of lesson plan, it was declared very valid with an average of 89.82%, Hyperdocs was declared valid with an average of 75%, the learning implementation questionnaire was declared very valid with an average of 94.45%, Questionnaire Student responses are stated to be very valid with an average of 94.17%. This shows that the learning device has met the validity criteria and is declared fit for use. Learning media considered valid if a validity value $\geq 61\%$ is obtained (Centaury, 2015).

Practical learning devices

Practicality data were obtained from learning implementation questionnaires and also student response questionnaires where the learning implementation questionnaire was assessed by an observer and student response questionnaires were given to students.

The practicality of learning tools is seen from the implementation of learning using revised learning tools based on the evaluation by the validator. The teacher fills out a learning implementation questionnaire and is analyzed so that it can be seen the level of practicality of the learning tools used (Centaury, 2015).

Based on the results of the analysis of the learning implementation questionnaire assessed by the observer, the average percentage for meeting 1 was 88.16% and 2, means that 87.50% with very practical criteria and student response questionnaires that had been filled in by students were obtained on average. the percentage is 81.11% with very practical criteria. This shows that the learning device meets the validity criteria and is declared fit for use. Learning Media considered very practical if a practicality value $\geq 61\%$ is obtained (Centaury, 2015).

Effectiveness of learning devices

The effectiveness test is carried out to determine the effectiveness of the product developed towards increasing the collaborative skills of students. This effectiveness test is carried out after all meetings have been completed at the field test stage (Putri et al., 2020). The effectiveness test is seen from the results of the Pretest, Posttest and the Size Cohen Effect where the average value *Pretest* which was obtained by students was 35.81 and the average posttest score obtained by students was 81.37. This shows that the posttest score is higher than the pretest score. The average value of the individual Cohen effect size obtained is 0.78 with medium criteria. The effect value for the size Cohen class is 6.74 which is included in the large criteria. *Cohen* states that to interpret the effect whether the effect is small, medium is large, the effect size is used, namely the effect size as small ($d = 0.2$), medium ($d = 0.5$), and large ($d = 0.8$) based on the recommended benchmark by Cohen (1988) in (Laken, 2013).

Based on the data that has been obtained, it can be concluded that the development of Hyperdocs in chemistry learning on collaborative skills of high school students has a large effect (Large). This is in accordance with Dini's (2019), which states that Effect Size > 1.00 has a high effect (Strong Effect).

Collaboration skills are the ability to interact with others in the form of activities to work together to achieve goals by respecting differences,

participating in discussions, brainstorming, listening, and supporting others (Sari et al., 2017). Reflecting on the skills of the 21st century, students are encouraged to master some of these skills or abilities. Collaborative skills are a skill that students must have so they are not left behind in today's progress and education (Ananyarta & Sari, 2017).

These 21st century skills include critical thinking and problem solving, creativity and innovation, communication, and collaboration (Redhana, 2019). Collaboration skills are one of the skills needed in the 21st century. Based on the Regulation of the Minister of National Education of the Republic of Indonesia Number 41 of 2007, in an effort to realize educational goals, Competency Standards have been set including attitudes, knowledge and skills, one of the skills that students can develop in learning is collaborative skills (Puspita et al., 2017). Cintamulya (2015), also said that educational institutions must be able to prepare a profile of graduates who have competencies relevant to the new era or the era of information and knowledge in the 21st century, one of which is with skills collaborative.

There are several aspects of group collaborative skills: 1) involvement between group members, 2) involvement of team work, and 3) involvement of social relations, the average value of the three aspects of group collaborative skills respectively are 86.46%, 82, 29%, and 86.67%. The average individual value of Leader is 3.19, Minutes 3.16, Research is 3.16, and Member 3. Individual collaborative skills are 29 students who have active collaborative criteria and 2 students who have passive collaborative criteria.

Based on the description above, it can be concluded that the Hyperdocs product that has been developed has a great effect on collaborative skills. This is in accordance with the research by Puspita et al. (2017) which states that the development of physics worksheets based on CTL (contextual teaching and learning) improves Collaborative Skills students.

Conclusions

The developed Hyperdocs product has a validity value of 75% with valid criteria. Developed *Hyperdocs* has a practical value in the implementation of learning meeting 1 of 88.89% with very practical criteria, the implementation of learning meeting 2 is 87.59% with very practical criteria and the response of students is 81.11% with

very practical criteria. *Hyperdocs* which is developed to be effective in chemistry learning seen from the average value of the effect size *Cohen* Individuals obtained are 0.78 with Medium criteria. The value of the Class *Cohen* effect is 6.74 which included in the Large criteria. There are several aspects of group collaborative skills, they are: 1) involvement between group members, 2) involvement of team work, and 3) involvement of social relations, the average value of the three aspects of group collaborative skills respectively; 86.46%, 82, 29%, and 86.67%. The average individual score is Leader 3.19, Minutes 3.16, Research 3.16, and Member 3.

Acknowledgments

The authors would like to thank the SMA 3 Palu and all those who have supported in the implementation of this research.

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