




Effectiveness of using pen tablets in the form of youtube based videos in basic analytical chemistry courses in the digital era after the pandemic

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ARTICLE INFO	ABSTRACT
<p><i>Article history:</i> Received Oct 03, 2023 Revised Oct 10, 2023 Accepted Oct 14, 2023</p> <p><i>Keywords:</i> Basic_Analytic_Chemistry; Effectiveness; Pen_Tablet; Video; Youtube.</p>	<p>The problem with tablet pens is only done during online learning. For this reason, pen tablets can be used in offline/face-to-face learning with the help of a projector. Not only that, this research also uses the YouTube application to upload recorded classroom learning so that it can be accessed by many people, especially students taking basic analytical chemistry classes. The aim of this research is to determine the effectiveness of using pen tablets in learning basic analytical chemistry courses in the digital era after the pandemic with offline/face-to-face learning and using the YouTube application to help students repeat basic analytical chemistry lessons so as to improve student learning outcomes. The research method in this study is descriptive qualitative and quantitative methods. Student interest according to the questionnaire has an average score of 3.78 in the good category and there is an increase in learning outcomes so that the effectiveness is 79%.</p> <p><i>This is an open access article under the CC BY-NC license.</i></p> 

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1. INTRODUCTION

Industrial revolution 4.0 requires educational actors to be more creative and innovative in implementing education. Educators must use technology to increase their students' learning opportunities by choosing or creating tasks that utilize what technology can be done efficiently and well (Reza et al., 2021). In the current era, after the Covid-19 pandemic has finished, entering a new era, learning has returned to offline/face-to-face (Elareshi et al., 2022). One way to produce an interesting learning process and improve student learning outcomes is to use interesting learning resources and media. and innovative in the classroom (Sanchez et al., 2023).

Pen tablets as learning media allow teachers to include information content such as tables, graphs, chemical symbols and mark slides when explaining in class (Ario et al., 2020). In other words, the Pen tablet is a digital whiteboard used during the pandemic (MAFIDAH, 2021). Pen tablets can be used not only for online learning but offline/face-to-face with the help of a projector (Hassell et al., 2023). The advantages of using a pen tablet not only make it easier for educators to stand in front of the blackboard for a long time, but can also record lessons in class so that learning can be played back and studied by students

(Osman et al., 2022). To make it easier for students to study again, especially learning basic analytical chemistry by playing videos on YouTube which are easily accessible to everyone (Yousaf & Nawaz, 2022). The urgency of research is very important to improve the quality of learning of students (students) in terms of the learning atmosphere in the classroom and the learning outcomes achieved.

The formulation of the problems to be examined are (1) how pen tablet media is considered to have a function that can help students learn in a pleasant atmosphere and make them more motivated so that students can understand concrete to abstract material and in the end the learning objectives are well achieved. (2) how videos from the results of classroom learning meetings uploaded to YouTube can improve student learning outcomes.

The problem-solving approach is (1) Using a pen tablet at offline/face-to-face basic analytical chemistry learning meetings is considered to have a function that can help students learn in a pleasant atmosphere and make them more motivated so that students can understand material from concrete to abstract and in Finally, the learning objectives were achieved well. (2) Recording classroom learning meetings in video form and uploading them to YouTube can improve student learning outcomes.

The theoretical implication is that lecturers in the digital era after the pandemic must use technology to improve and utilize student learning opportunities more creatively and innovatively so as to improve student learning outcomes, while the practical implication is the use of pen tablets in the form of YouTube-based videos in basic analytical chemistry courses in this era. implemented after the pandemic can improve student learning outcomes.

There is no study regarding the effectiveness of using pen tablets in the form of YouTube-based videos in basic analytical chemistry courses in the digital era after the pandemic, all existing research uses pen tablets only in mathematics and online learning (Silaban et al., 2022). The literature study relating to the effectiveness of using pen tablets in the form of YouTube-based videos in basic analytical chemistry courses in the digital era after the pandemic are (1) Analysis of Needs for Pen-Based Video Teaching Materials in Integral Calculus Learning, (2) Use of Pen Tablets with the Google Meet Application to Improve Vocational Mathematics Learning Outcomes (3) Effectiveness of Using Zoom-Based Pen Tablets on Interest in Learning Mathematics and Economics During the Covid-19 Pandemic for Students Department of Development Economics (Environments, 2022)

In the field of education, pen tablets can be used as a tool for teachers in writing material. Usually, material is written on a white board in front of the class, but by using a pen tablet, writing can be done more easily, by sitting and writing like using pen and paper (Rajiman & Samsinar, 2022). Pen tablets also facilitate the selection of various colors, if the teacher wants to highlight certain words/formulas (Isharyadi & Annajmi, 2022). Pen tablets use technology that combines the best features of traditional (e.g. whiteboards) and modern (e.g. electronic slides) as a teaching tool (NURAINI, 2021). Pen tablets also allow teachers to bookmark slides, annotate pictures or leave comments. It can be an excellent method to communicate visually with students and improve their understanding and retention (Wicaksana & Rachman, 2018). Teachers can also save material that has been written at each meeting, so that it can be used as evaluation material or as a reminder and limit for the next meeting (Maharani, 2021). This is of course very different when the teacher uses a conventional teaching board.

Video is a technology, namely the display of moving images through electronic signal processing (Adawiyah et al., 2021). States that learning using videos has several advantages and disadvantages. The advantages of learning using video are: learning objects are presented concretely with real learning, so that it can improve the learning experience; has its own uniqueness and can motivate people who see it, can reduce feelings of boredom and boredom when combined with teaching techniques through lectures and discussion of issues that are broadcast, improves memory for the material being studied; and easy to access anywhere (DeWitt et al., 2013). Meanwhile, the weaknesses of learning using videos are: it requires expensive costs to produce them; very dependent on electrical energy, so it

can only be used in certain places; The nature of communication is unidirectional, so that feedback does not occur (Fischer et al., 2022).

YouTube is a platform for publishing videos, this platform can be accessed by everyone in any country (Wulandari et al., 2019). YouTube is very popular among Indonesian people, occupying the most active social media position (Iga Luhsasi Dwi & Sadjiarto Arief, 2017). YouTube provides a forum for people to connect with each other, provide information, inspire other people around the world (Darmuki, 2020).

2. RESEARCH METHOD

The research method in this study is descriptive qualitative and quantitative methods. Data was collected through a Google Form which was distributed to all students to determine the effectiveness of using pen tablets and YouTube-based videos to improve student learning outcomes. The instrument in this research is a closed questionnaire distributed via Google Form and a written test. Closed questionnaires distributed via Google form using the Likert scale category include the value of feeling interested and happy in learning basic analytical chemistry using pen tablets and YouTube-based videos, the tendency to pay attention and pay more attention in learning basic analytical chemistry using pen tables and YouTube-based videos, Positive feelings and willingness are increasing in learning basic analytical chemistry using pen tables and YouTube-based videos and disciplined attitudes in learning basic analytical chemistry using pen tables and YouTube-based videos.

Table 1. Categories of the Likert Scale

No	Alternative Answers	Score
1	Strongly Agree	5
2	Agree	4
3	Quite agree	3
4	Disagree	2
5	Strongly disagree	1

The written test uses 10 essay questions to test students' knowledge of basic analytical chemistry courses. After the written tests are collected, student learning outcomes are calculated as follows:

Score Analysis

$$\text{Score} = B/N \times 100 \text{ (Scale 0-100)} \quad (1)$$

Information:

B: Score of questions answered correctly

N : Number of perfect/total scores

Furthermore, the score of the test results is calculated on average, and calculates the gain value between the pre-test and post-test. Furthermore, the data processing of the initial test, final test and gain value is carried out using the statistical test formula as follows:

$$Md = \sum \frac{d}{n} \quad (2)$$

Information :

Md: Mean of the difference between pre-test and post-test

d : Total Gain (Difference between pre-test and post-test)

N : Subjects in the Sample

Calculated using the formula:

$$\sum x^2 d = \sum d^2 - \frac{(\sum d)^2}{n} \quad (3)$$

Information :

$\sum x^2d$: Sum of squared deviations

\sum : Total gain (Difference between pre-test and post-test)

n : Subject in the sample

Db : Degrees of freedom (defined by N-1)

The results of the tcount are then ttable with a significant level of $\alpha = 0.05$. Criteria for testing the hypothesis if $t_{count} \geq t_{table}$ then the hypothesis is accepted. The results of the tcount are then compared with the significant level t_{table} $\alpha = 0.05$. To compare tcount with ttable, it is necessary to first find the degrees of freedom (d.b) using the formula

$$d.b = (n-1) \quad (4)$$

Information :

d : degrees of freedom

b : subjects in the sample

Test criteria:

If $t_{count} \geq t_{table}$, then H_0 is accepted

If $t_{count} \leq t_{table}$, then H_1 is rejected

3. RESULTS AND DISCUSSIONS

3.1 Result

Before conducting the research, what was done was to give students a pretest at the start of college. The pretest is used to find out the results of student learning before being given basic analytical chemistry course material on gravimetric analysis. After the pretest, the research began by providing gravimetric analysis material to students by recording ongoing learning videos and explaining the material in power point (ppt) with the help of pen tablets.

After learning is complete, students are given time to work on the questions before the posttest questions are given. The recording of the learning taking place is uploaded to YouTube so that students can study again by accessing the video on YouTube. Next, a closed questionnaire was given via the Google form.

a. Student Responses to YouTube-Based Video Learning Media Using Pen Tablets

The first data presentation includes the value of feelings of interest and enjoyment in learning basic analytical chemistry using pen tablets and YouTube-based videos based on questionnaires via Google Form. The score of each statement item with the criteria of strongly agree, agree, quite agree, disagree, strongly disagree is respectively given a score of 5,4,3,2, and 1. The average score obtained is based on the respondents for each statement from the aspect being assessed.

Table 2. Average Student Responses Regarding Interest in Youtube-Based Videos with the Help of a Pent Tablet

No	Aspects That Are Measured	Average	Category
1	Teaching videos using pen tablets further increase interest and motivation in learning	3,52	good
2	Teaching videos using a pen tablet help me in learning	3,44	good
3	Teaching videos using a pen tablet are easier to understand	3,35	quite good
4	The explanation conveyed through the video is very clear	3,64	good
5	The audio quality in teaching videos using a pen tablet is very clear	3,88	good
6	The visual quality (Resolution, Lighting, Font) in the teaching video is good	3,67	good
7	The learning video length is ideal for one meeting	3,55	good

8	Teaching videos using pen tablets are uploaded to YouTube, easy to access anywhere	4,21	strongly good
9	Learning through YouTube-based videos can be accessed repeatedly (repeatability)	4,30	strongly good
10	Relevant links are available to access the videos	4,25	strongly good
	Average	3,78	good

Based on the table above, student responses to the value of feeling interested and happy in learning basic analytical chemistry using pen tablets and YouTube-based videos get an average score of 3.78 in the good category. According to the results of the question using YouTube, it also helps students access it easily and can be done anywhere, with a score of 4.21 in the very good category, which is important to help students get material to study at home. The presence of YouTube-based teaching videos with the help of pen tablets has a new impression in the midst of offline learning. This is in line with research that the use of pen tablet-based teaching videos makes students not feel bored during lectures.

b. The Effect of Student Learning Outcomes on Youtube-Based Videos Using Pen Tablets

1. Pre-test Data

Before conducting research using pen tablets, students were given a pretest at the beginning of the meeting to compare the results before the treatment was carried out and after the treatment was carried out. The results of the 1st class pretest of chemistry education study program students at HKBP Nommensen Pematangsiantar University are as follows the highest score was 58, the lowest score was 24, with an average (M) = 22.75 and a standard deviation (SD) = 10.90. The distribution of the frequency of pretest data for students taught by learning can be seen in Figure 1 below.

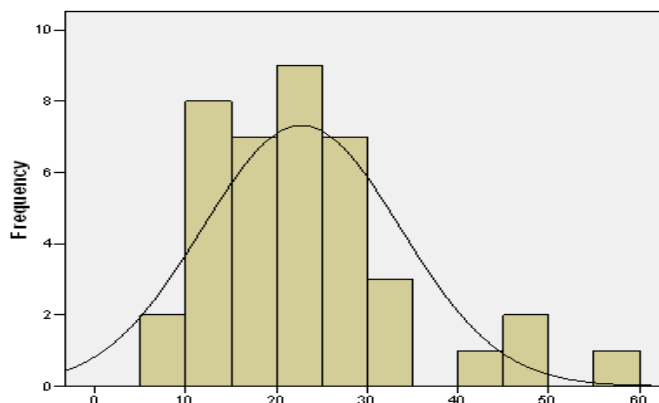


Figure 1. Pre-test Frequency Distribution Histogram

2. Post-test Data

Based on the results of the posttest, the highest score was 100, the lowest score was 46, with an average (M) = 69.17 and a standard deviation (SD) = 0.12. The frequency distribution of posttest data for students taught by learning can be seen in Figure 2 below.

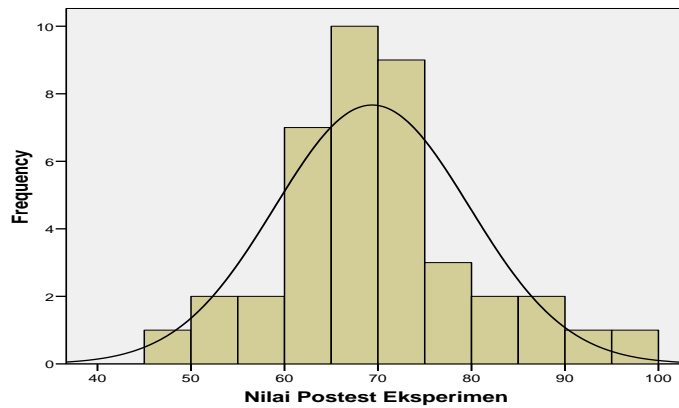


Figure 2. Post-test Frequency Distribution Histogram

3. Gain Data

Based on the gain data, the highest score was 0.93, the lowest score was 0.30, with an average (M) = 0.60 and standard deviation (SD) = 0.123. The frequency distribution of posttest data for students who were taught by learning can be seen in Figure 3 below.

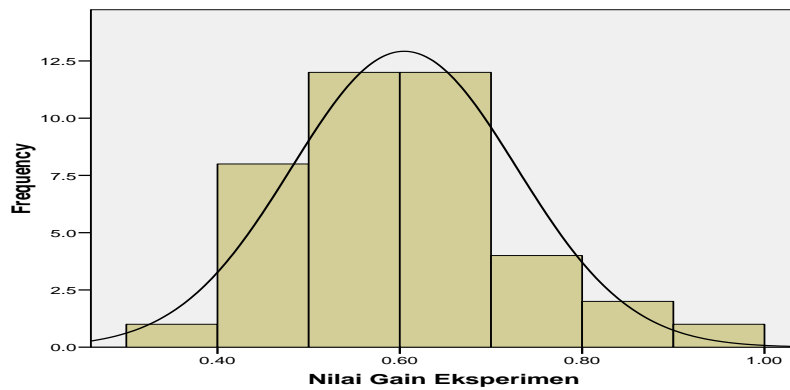


Figure 3. Gain Data Frequency Distribution Histogram

4. Normality Test

The normality test is carried out to determine whether the data is normally distributed or not. The normality test was carried out on pretest and posttest data. The data is declared normally distributed if the probability value or sig. >0.05. The results of the normality test for experimental class student data can be seen in table 3.

Table 3. Normality Test on Pre-test and Post-test

Class	Data	Sig.	α	Keterangan
Experiment	Pre-test	0,153	0,05	Data is normally distributed
	Post-test	0,390	0,05	Data is normally distributed

Based on Table 3, it can be seen that the entire data (pretest and posttest data) is normally distributed with a significance value > α (0.05).

5. Homogeneity Test

Homogeneity testing was carried out on the sample group's pretest data. Data is declared to have the same variance (homogeneous) if the probability or sig. >0.05. The results of the data homogeneity test can be seen in Table 4.

Table 4. Homogeneity Test on Pre-test

Data	Sig	α	Keterangan
Pretest	0,197	0,05	Homogeneity

6. Hypothesis Test

The mean result obtained from the difference in pretest and post test was 0.04 and hypothesis testing was carried out by one party t-test using the Independent sample t-test technique. The results of hypothesis testing are presented in Table 5.

Table 3. Hypotesis Test

Nilai <i>Posttest</i>	Sig.	α	t_{count}	t_{table}
Equal variances assumed	0,018	0,05	2,407	1,99

Based on Table 3 it can be seen that the significance value is 0.018 and the t_{count} is 2.407. H_a is accepted if the value is $sig. < \alpha$ (0.05) and $t_{count} > t_{table}$ and at the same time reject H_0 . Based on data calculations, the sig value is obtained. $(0.018) < \alpha$ (0.05) and $t_{count} > t_{table}$ ($2.407 > 1.99$) which means H_a is accepted, so it can be concluded that there is an increase in student learning outcomes who use YouTube-based videos with the help of pen tablets.

3.2 Discussion

The results of the data that have been obtained regarding student responses to YouTube-based learning videos using the help of a pen tablet as a substitute for a whiteboard when lecturers or teaching staff explain material about gravimetric analysis in basic analytical chemistry courses can be said to have the value of feeling interested and happy in learning chemistry basic analytics (Ramadhani & Silitonga, 2023). This was proven from the results of a closed questionnaire obtained by sharing via Google Form. According to (Iga Luhsasi Dwi & Sadjiarto Arief, 2017), research has shown that the use of pen tablets can attract student interest.

Videos shared via YouTube can be accessed easily so there is no difficulty for students repeating the lessons given in class (Rieder et al., 2023). The video on YouTube is also clearly visible where the researcher uses a pen tablet which can write in PowerPoint which has been converted into PDF (Widiantari et al., 2023). This can be seen when the researcher explains the example questions. The advantages of this research help lecturers not to stand in front of the blackboard for a long time and also help students to repeat lessons and students can focus more in class (Lee Ludvigsen & Petersen-Wagner, 2023).

To find out the effectiveness of using pen tablets in the form of YouTube-based videos in basic analytical chemistry courses in the digital era after the pandemic, it can be calculated by using the increase in student learning outcomes from the gain value in the experimental class (Atkinson et al., n.d.). Based on calculations of the increase in learning outcomes for experimental class students who used pen tablets in the form of YouTube-based videos in basic analytical chemistry courses in the digital era after the pandemic, it was found that the effectiveness was 79%.

From these results, there is the effectiveness of using pen tablets in the form of YouTube-based videos in basic analytical chemistry courses in the digital era after the pandemic. The results obtained are in accordance with research conducted by (Darmuki, 2020) that research on the use of tablets can improve student learning outcomes.

4. CONCLUSION

The conclusion of the research entitled "Effectiveness Of Using Pen Tablets In The Form Of YouTube Based Videos In Basic Analytical Chemistry Courses In The Digital Era After The Pandemic" is (1) Pen tablet media is considered to have a function that can help students (students) learn in a pleasant atmosphere and make them more motivated so that students

can understand concrete to abstract material and in the end the learning objectives are achieved properly according to the data obtained through questionnaires average value of 3.78 with good category. (2) Videos of the results of classroom learning meetings uploaded to YouTube can improve the learning outcomes of students. According to the data obtained, there is an increase in learning outcomes so that the effectiveness is 79%. (3) This research contributes specifically to lecturers or teachers in developing innovative learning media in the classroom and also contributes to students being more enthusiastic about learning. (4) The limitation of the research is that it only knows the effectiveness of using a pen tablet with certain features on learning outcomes. For this reason, it is necessary to develop the use of pen tablet media so that more features can be used in learning.

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