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The YouTube-assisted discovery learning model: Improving students' cognitive learning outcomes and critical thinking

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Article Info

ABSTRACT

The quality improvement of human resources in the society 5.0 era in the 21st century is closely related to technology, and one of the ways this can be achieved is by using YouTube. Therefore, this research determined the differences in student cognitive learning outcomes and critical thinking before and after applying the YouTube-assisted discovery model in German Language Education Study Program at Pattimura University, Indonesia. A pseudo-experiment a pretest and posttest unequal control group design was used to obtain 20 2nd semester students who took the course Strukturen und Wortschatz zur Aufbaustufe A2.1. Furthermore, the sample determination used a proportional sampling technique. Data collection was done using the instrument in the form of essays tests to determine the cognitive learning and critical thinking outcomes, questionnaire sheets, and interviews. The paired T-test showed a value of $p=0.000<\alpha=0.05$, indicating significant differences in cognitive learning outcomes and critical thinking skills before and after applying the YouTube-assisted discovery learning model. This was confirmed by an increase in the cognitive test scores and critical thinking of students after applying the learning model. Therefore, the results can be applied to other concepts in German language learning.

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1. INTRODUCTION

The role of education in the society 5.0 era is important for improving the quality of technical human resources. Therefore, to prepare students for the 21st century, it is essential to impart life skills [1], [2], including creativity, critical thinking, communication, and collaboration [3], [4], improving the quality of human resources in the society 5.0 era of the 21st century is closely related to technology. The connection allows for unlimited access to information in cyberspace. As a result, teachers can utilize more varied digital teaching media to connect students' knowledge with their experiences while adding insights related to the material [5], [6]. It is vital for teachers to possess digital literacy skills and create a conducive learning environment using these media.

The COVID-19 pandemic accelerated the concept of society 5.0 in education, shifting from face-to-face classes to online learning. Teachers should be able to use integrated systems with cyberspace and physical space to innovate with technology and adapt to rapid changes [7]. During the pandemic, face-to-face activities were eliminated and replaced with online learning [8]. This situation forces teachers to immediately learn and use learning platforms or models that suit their needs and connect with digital media. Asynchronous learning activities allow students to access the material at their own pace, and virtual interaction allows students

to express ideas and receive feedback. Virtual interaction through certain applications provides opportunities to express ideas through feedback in the discussion room available in the virtual world. Information can be accessed anywhere and anytime, including through popular platforms such as YouTube.

Youtube is a video-sharing content application growing rapidly and a media website sharing videos online. It is very popular among internet users worldwide, ranging from young people and children to adults [9]. Burke et al. [10] stated that educational institutions could utilize YouTube as students' favorite teaching medium. Meanwhile, students easily understand the information in the form of knowledge through media related to technology, such as YouTube. Learning media using this platform allows them to understand material faster than textbooks. Research conducted by Daryono et al. [11] explained that video as learning media makes learning activities in students more directed. In the learning process, this can encourage students to learn and provide new experiences [9]. Video learning presents students with visual and audio representations of classroom ideas and events [12], and the learning atmosphere is getting better [13].

Learning outcomes are the measurement results of the efforts assessment expressed in symbols, letters, and sentences, which relate to the achievement of students in a certain period [14]. According to Kulieke et al. [15], learning outcomes are not limited to just tests and exams, they are very broad. They can be recognized by: i) Changes in the child's behavior; ii) Changes in the child's thinking; and iii) The development of new concepts [16]. Achieving maximum cognitive learning outcomes requires the commitment of teachers and students. It takes the ability of the teacher to manage learning in the classroom. The lecture method is no longer suitable for the current situation. Students are not trained to think critically; hence, their cognitive learning outcomes are not maximized. To achieve this goal, the teacher must choose a learning model suitable for achieving the results. Meanwhile, students should also be able to think critically to process the material for thorough understanding. For this reason, an appropriate learning model appropriate to the pandemic situation is needed.

Various learning models have been developed to obtain maximum cognitive learning outcomes. These learning models keep students active in classroom activities and strengthen their reasoning to think systematically. These models can also be combined with the right media to improve cognitive learning outcomes. The discovery learning model helps students understand a concept actively and independently as well as develop their reasoning in analyzing situations [17], [18]. Described by Khabibah et al. [19] that the use of discovery learning-based modules in the learning process is very effective for improving generic science skills. The characteristic of this discovery learning model is that students actively solve problems and produce good results on their initiative. In this case, they can think critically using inductive reasoning. According to Styron [20], critical thinking is the intellectual discipline process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and evaluating information gleaned from observation, experience, reflection, reasoning, and communication that serves as a guide to beliefs and actions. In this era, using digital media can increase insight and deepen understanding. Active participation in the learning process can increase intellectual potential in solving problems.

The discovery learning model enables students to follow their interests in achieving competence. Teachers should encourage them to solve these problems rather than provide the answers. Meanwhile, the discovery learning model is useful in: i) Increasing students' intellectual potential; ii) Moving from extrinsic to intrinsic rewards; iii) Thorough learning through the process of discovery; and iv) A tool to train memory [16]. The advantages of the discovery learning model are strengthening understanding, memory, and knowledge transfer. The strengthening of performance, memory, and transfer is about the learning material learned. This ability makes it easier for students to master the subject [21]. Furthermore, the discovery learning model applied can arouse curiosity by motivating students to continue working until the correct answers are obtained [22]. Setiawati and Sari [18] stated that the discovery learning model could improve learning outcomes. Moreover, Rahman [23] reported that lecturers must design the learning process to develop creative thinking skills in higher education using the YouTube-assisted discovery learning model.

2.   RESEARCH METHOD

This is a pseudo-experimental research to determine the differences in cognitive learning outcomes and critical thinking of students before and after the application of the YouTube-assisted discovery learning model. It used a pretest-posttest nonequivalent control group design and was conducted in the German Language Education Study Program, Faculty of Teacher Training and Educational Sciences at Pattimura University, Indonesia from April 4 to June 30, 2022. The sample was 20 2nd semester students who took the course Strukturen und Wortschatz zur Aufbaustufe A2.1. Furthermore, the sample determination used a proportional sampling technique. The research aimed to assess cognitive learning and critical thinking outcomes, for which data was collected using essay tests, questionnaire sheets, and interviews. At the beginning of the study, students were given a pre-test. Subsequently, the learning stages were carried out as: i) Stimulation, where questions were given to guide students toward the desired results after taking the pre-

test; ii) Problem statement and grammatical process were identified in this stage; iii) Data collection involved the students collecting relevant materials through watching videos on YouTube; iv) Data processing, where the collected data were processed to obtain results; v) Verification, in this stage, the students presented the results to their peers through manual presentations or videos; and vi) Concluding, where the students were given a post-test, questionnaire, and interview.

Data were analyzed using descriptive and inferential statistics. Descriptive statistics were used to group the cognitive learning outcomes and critical thinking skills into class intervals using the Sturges formula (K=1+3.3 log n) as well as to calculate the frequency and percentage. Inferential statistics, in the form of a paired t-test, were used to determine the difference in students' cognitive learning outcomes and critical thinking before and after using YouTube-assisted discovery learning model. Concerning the criteria for the paired t-test, there was a difference between the independent and dependent variables when the probability or significance was less than 0.05 ($p<0.05$). However, when the significance was greater than 0.05 ($p>0.05$), there was no significant difference between the independent and dependent variables. Before the paired t-test analysis was conducted, data were tested for normality and homogeneity as prerequisites. Subsequently, data analysis was performed using SPSS software.

3. RESULTS AND DISCUSSION
3.1. Cognitive learning outcomes and critical thinking of students

The results show that the distribution of the initial and final cognitive test results was in the range of 20-67 and 56-91, respectively as seen in Table 1. This suggests an improvement in the cognitive learning outcomes before and after being taught using the YouTube-assisted discovery learning model. Additionally, the distribution of the initial and critical thinking scores was in the range of 16-30 and 70-93, showing an improvement as seen in Table 2. This is consistent with previous research findings, which have reported increased results when learning through these models [24], [25]. Therefore, students must develop critical thinking skills before completing assignments and participating in lectures. Critical thinking can increase intelligence, facilitate task completion, and promote exploring alternative solutions to problems [26], [27].

Tabel 1. Students' cognitive learning outcomes

| Research class | Cognitive learning outcomes | | | | | |
| | Initial test | | | Final test | | |
	Interval	F	FR (%)	Interval	F	FR (%)
Strukturen und Wortschatz zur Aufbaustufe A2.1	20-27	4	20	56-62	4	20
	28-35	3	15	63-69	4	20
	36-43	10	50	70-76	6	30
	44-51	0	0	77-83	2	10
	52-59	2	10	84-90	1	5
	60-67	1	5	91-97	3	15
Total		20	100		20	100

Tabel 2. Critical thinking of students

| Research class | Critical thinking | | | | | |
| | Initial test | | | Final test | | |
	Interval	F	FR (%)	Interval	F	FR (%)
Strukturen und Wortschatz zur Aufbaustufe A2.1	16-18	3	15	70-73	2	10
	19-21	1	5	74-77	4	20
	22-24	8	40	78-81	5	25
	25-27	5	25	82-85	4	20
	28-30	3	15	86-89	4	20
				90-93	1	5
Total		20	100		20	100

Research by Bahtiar *et al*. [28] also showed that discovery model-based learning with a cognitive conflict approach improved problem-solving skills. The average and final scores before treatment were 16.54 and 17.25. In addition, research by Al Khadzir and Sumarmi [29] revealed that by applying the model united nations (MUT) learning model, students scored a critical thinking ability of 82.58. Saptarini *et al*. [30] found that individuals given an inappropriate learning model will not be learn actively, and their metacognitive abilities are not fully explored, leading to decreased learning outcomes. Therefore, the discovery learning model was used to determine its effect on metacognitive abilities. This is different from the research conducted by Ristanto *et al*. [31], where the application of the guided discovery learning model with

argument mapping can improve ability of critical thinking. The results suggest that the YouTube-assisted discovery learning model can improve cognitive learning outcomes and critical thinking in German grammatical material. This is because the syntax provides a unique aspect that distinguishes this learning model from other combinations.

3.2. Differences in cognitive learning outcomes and critical thinking of students

After knowing students' cognitive and critical thinking scores, the statisctics normality test was conducted using the Shapiro-Wilk test, as shown in Table 3. The data were normally distributed and the Levene's test indicateded that the data came from a homogeneous population, as shown in Table 4. The paired t-test was conducted to statistically test the differences in students' cognitive learning outcomes and critical thinking before and after applying the YouTube-assisted discovery learning model, as shown in Table 5.

Tabel 3. Data normality test results

Variable	Shapiro-Wilk			
	Statistic	df	Sig.	Description
Pre-test cognitive	.940	20	.237	
Post-test cognitive	.926	20	.130	Normal
Pre-critical thinking	.957	20	.479	
Post- critical thinking	.960	20	.551	

Tabel 4. Data homogeneity test results

Variable	Levene statistic			
	Statistic	df	Sig.	Description
Pre-test cognitive	.015	20	.904	
Post-test cognitive	.394	20	.538	Homogen
Pre-critical thinking	.028	20	.870	
Post- critical thinking	4.264	20	.054	

Tabel 5. Paired t-test results

Treatment	Mean	t	df	Sig. (2-tailed) (p)
Cognitive learning outcomes	-34.56500	-30.615	19	.000
Critical thinking	-56.80000	-41.402	19	.000

The paired t-test results show a significance value of $p=0.000<\alpha=0.05$, as shown in Table 5. This shows differences in cognitive learning outcomes and critical thinking before and after applying the YouTube-assisted discovery learning model to German grammatical material. Therefore, the YouTube-assisted that discovery learning model can improve students' cognitive learning outcomes and critical thinking skills. Similar results have been shown by Bahtiar et al. [28] that the discovery learning model with a cognitive conflict approach could improve problem skills. In addition, the discovery learning model with the realistic mathematics education (RME) approach has a better effect on learning achievement Permatasari et al. [32]. According to Martaida et al. [33], the learning outcomes and critical thinking skills of students using discovery learning are better than those taught conventionally. The YouTube-assisted discovery learning model can provoke students to think more critically and achieve better outcomes.

The results showed that teachers are required to create a good environment for improved knowledge and experience during the learning process. Therefore, the YouTube-assisted discovery learning model activates the way of thinking, making students more critical. According to Warlinda et al. [34], applying a discovery learning model using the science, environment, technology, and society (SETS) approach supported by the Chemistry E module significantly affects scientific abilities. The application of the discovery method and YouTube digital media makes learning more interesting and fun. Therefore, improve learning outcomes 6.3 in the experimental class [35]. Loizou [36] applies the flipped classroom approach with an online learning platform. This approach is able to increase students' active learning in class. Furthermore, Mardi et al. [37] found differences in the effectiveness of applying problem-based cooperative models and guided discovery learning with conventional methods in improving critical thinking skills. This finding shows that the guided discovery model significantly affects conceptual understanding and critical thinking skills [24], [38]. Therefore, the model can improve students' cognitive learning outcomes and critical thinking in combination with learning media.

4. CONCLUSION

The results concluded that students' cognitive learning outcomes and critical thinking skills improved before and after using the YouTube-assisted discovery model. This is indicated by the distribution of initial and final cognitive test scores in the range of 20-67 and 56-91, respectively. The distribution of the initial and final values of critical thinking is in the range of 16-30 and 70-93. On the other hand, the paired t-test found a difference in cognitive learning outcomes and critical thinking before and after applying the YouTube-assisted discovery model to German grammatical material ($p=0.000<\alpha=0.05$). The result is that the model syntax can be applied to other concepts as well in German language learning.

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