THE ENHANCEMENT OF LEARNING QUALITY BASED ON VIRTUAL REALITY TECHNOLOGY AT SANTA URSULA SENIOR HIGH SCHOOL JAKARTA

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ABSTRACT

Learning media is one of the keys to successful learning in the classroom by improving learning activities to be more effective and efficient. Now the development of learning media is increasingly advanced thanks to advances in information technology. One of the information technology-based learning media that is currently widely used is Virtual Reality. The utilization of Virtual Reality learning media is very appropriate to use in classroom learning that needs to present real examples so that students can understand the material, so as to improve the quality of learning. The purpose of this study is to analyze how to improve the quality of learning based on Virtual Reality technology at Santa Ursula Senior High School Jakarta. The method used is descriptive quantitative research method with data collection techniques in the form of questionnaires, interviews, observations, and documentation studies. The results showed that the use of Virtual Reality can improve the quality of learning in several subjects. The use of Virtual Reality has a positive impact on learning activities, such as learning to be more varied, fun, and interesting. In addition, students' interest in learning in class also increases, because they want to be actively involved in the learning process. However, the use of Virtual Reality at Santa Ursula Senior High School Jakarta is still not optimal. This is because there are still many teachers who are not mature in preparing the use of Virtual Reality media in learning, so the use of Virtual Reality has not been evenly distributed in all classes.

Introduction

Every human being needs knowledge as a basis or reference for living everyday life. We can gain knowledge through various ways, one of which is through the learning process. According to the Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System, learning is a process of student interaction with teachers and learning resources that take place in a learning environment. In addition, according to Setiawan (2017) learning is a collaborative process between teachers and students together to achieve the specified learning objectives. In other words, learning is an activity that is deliberately planned

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and designed in such a way as to provide assistance for the learning process. In order to provide learning assistance to students, teachers are required to be able to master various learning media.

Learning media is one of the keys to success in the classroom by improving learning activities to be more effective and efficient (Portanata et al., 2017). This learning media can help facilitate student learning and also facilitate teaching for teachers, provide more real experiences, attract students' attention or in other words learning becomes not boring, all students' senses can be activated, and can evoke the world of theory with its reality (Umar, 2017). Miarso (2011) also states that through learning media teachers can stimulate the thoughts, feelings, attention, and willingness of students so as to encourage a deliberate, purposeful, and controlled learning process. In addition, messages in the form of knowledge, skills, and attitudes can be channeled with learning media. Now the development of learning media is increasingly advanced thanks to advances in information technology (Raja & Nagasubramani, 2018). One of the information technology-based learning media that is currently widely used is Virtual Reality (VR).

Virtual Reality is the appearance of three-dimensional/3D images made by computers so that they look real with the help of a number of certain equipment that makes users as if they are physically involved in the environment (Saurik et al., 2018). The utilization of Virtual Reality learning media is very appropriate for use in classroom learning that needs to present real examples so that students can understand the material (Tsaaqib et al., 2022). According to the results of research conducted by Lee et al., (2010) related to investigating the effectiveness of using Virtual Reality as a learning medium to support the improvement of student learning outcomes shows the final result that by using Virtual Reality technology, this will make an important contribution and a very positive impact in efforts to improve student learning outcomes in the process of teaching and learning activities. Therefore, it can be said that the use of Virtual Reality can be used as an effort to improve the quality of learning in the classroom.

The benefits of Virtual Reality to improve the quality of learning, making this technology increasingly widespread in schools (Nurrizqa et al., 2021). One of the schools that has used Virtual Reality technology is Santa Ursula High School Jakarta. Santa Ursula High School Jakarta is a Catholic High School that was founded in 1859 and is located at Jalan Pos No. 2, Central Jakarta. One of the goals of Santa Ursula Senior High School Jakarta is to equip students with 21st century skills (4C) as well as adaptation and technology. In order to realize this goal, Santa Ursula Senior High School Jakarta began to apply Virtual Reality technology in several subjects, such as Biology, Mathematics, Chemistry, Civics, and Cultural Arts. The use of Virtual Reality as a means of supporting the learning process has brought impact or change, such as learning to be more varied, interesting, and fun. The positive impact or change makes students more eager to learn, so as to improve the quality of learning (Campos et al., 2022).

Method

The method used in this research is quantitative descriptive method with data collection techniques using questionnaires, interviews, observations, and documentation studies. Questionnaires are used to find out how students perceive the use of Virtual Reality in the learning process, while interviews are used to find out how teachers perceive Virtual Reality and its use in teaching. In addition to questionnaires and interviews, to sharpen the analysis of research related to the use of Virtual Reality in several subjects, observation and documentation studies were conducted. Through observation and documentation studies, it can be known the

name of the teacher, the name of the subject, the class, and the time of use of Virtual Reality in the last 1 year.

A total of 70 students consisting of 35 students of class X SOS 1 and 35 students of class X MIPA 1 as well as 6 teachers namely Vice Principal for Facilities and Infrastructure, Biology, Mathematics, Chemistry, Civics, and Cultural Arts teachers were involved in this study. The research subjects were taken by purposive sampling. Purposive sampling is a non-probability sampling technique where the researcher determines the number of samples with certain considerations in accordance with the desired criteria. If done correctly, purposive sampling can filter out respondents who are not in accordance with the research context (Isaac, 2023). In this study, the criteria used are students and teachers who have used Virtual Reality in the classroom learning process.

The instrument used in this study is a closed questionnaire consisting of 12 statement items. Before being disseminated to students, the questionnaire was validated first. The results of validation conducted by 3 teachers showed that the questionnaire is feasible to use to see students' responses to Virtual Reality used in learning. Assessment of student response questionnaire using Likert scale guidelines with 5 alternative answers as listed in Table 1.

Table 1. Assessment Score Guidelines

Assessment	Category	Score
SS	Strongly agree	5
S	Agree	4
CS	Moderately agree	3
CS	Disagree	2
STS	Strongly disagree	1

(Sugiyono, 2018)

Data from student questionnaires were recapitulated and calculations were made for each statement item using the formula according to Hanafiah et al., (2020).

$$\text{Percentage per question item} = \frac{\text{Proportion of students who chose}}{\text{Number of students (respondents)}} \times 100\% \quad (1)$$

After calculating the percentage per question item, the next step is to describe the calculation results that have been obtained and draw conclusions from the results of the research that has been done.

Results

Table 2. Recapitulation of the Use of Virtual Reality Technology at Santa Ursula Jakarta High School in 2022-2023

No.	Teacher Name	Subjects	Class	Execution time		
				Date and Time	Lesson Hours -	Lesson Hours
1.	Berlinda Taroreh	Compulsory Mathematics	X	Wednesday, August 10, 2022	3 – 4	08.30 – 10.25
	Berlinda Taroreh	Compulsory Mathematics	X	Wednesday, August 10, 2022	5 – 6	10.25 – 11.55
2.	Berlinda Taroreh	Compulsory Mathematics	X	Thursday, 11 August 2022	1 – 2	07.00 – 08.30

3.	Berlinda Taroreh	Compulsory Mathematics	X	Friday, 12 August 2022	1 – 2	07.00 – 08.30
4.	Maria Magdalena Melina	Biology	X	Friday, 12 August 2022	3 – 4	08.30 – 10.25
5.	Robertus Dwiyatmoko	Specialization Mathematics	XII	Monday, 12 September 2022	3 - 4	08.30 – 10.25
6.	Robertus Dwiyatmoko	Specialization Mathematics	XII	Tuesday, 13 September 2022	5	10.25 – 11.10
7.	Robertus Dwiyatmoko	Specialization Mathematics	XII	Tuesday, 13 September 2022	8	12.55 – 13.40
8.	Robertus Dwiyatmoko	Specialization Mathematics	XII	Friday, September 16, 2022	5	10.25 – 11.10
9.	Sr. Irene, OSU	PPKn	XI	Monday, 19 September 2022	1 – 2	07.00 – 08.30
10.	Sr. Irene, OSU	PPKn	XI	Monday, 19 September 2022	5 – 6	10.25 – 11.55
11.	Sr. Irene, OSU	PPKn	XI	Monday, 19 September 2022	7 – 8	12.10 – 13.40
12.	Sr. Irene, OSU	PPKn	XI	Tuesday, September 20, 2022	6 – 7	10.25 – 11.55
13.	Reza	Art and Culture	X	Monday, January 30, 2023	1 - 2	07.00 – 08.30
14.	Esther	Chemistry	X	Wednesday, February 1, 2023	3 – 4	08.30 – 10.25
15.	Esther	Chemistry	X	Wednesday, February 1, 2023	t1 - 2	07.00 – 08.30

Table 3. Percentage of Student Questionnaire Analysis Results

No.	Statement	Score					Amount
		Strongly Disagree	Disagree	Moderately Agree	Agree	Strongly Agree	
1.	Virtual Reality is easy to use anywhere and anytime.	1.4	34.3	48.6	14.3	1.4	100
2.	Virtual Reality can increase student interest in learning.	0	12.9	35.7	44.3	7.1	100
3.	Virtual Reality is more interesting and fun than the learning media that teachers usually use in class.	0	17.1	37.1	30	15.8	100

No.	Statement						
4.	Virtual Reality makes it easier for students to understand a concept or subject matter.	1.4	38.6	45.7	14.3	0	100
5.	Virtual Reality can improve student learning outcomes, as evidenced by the test scores obtained above the KKM and satisfying.	5.7	48.6	40	5.7	0	100
6.	Virtual Reality at Santa Ursula Senior High School Jakarta is sufficient and adequate for classroom learning activities.	2.9	15.7	27.1	41.4	12.9	100
7.	The condition of Virtual Reality learning media to support learning activities at Santa Ursula Senior High School Jakarta is good.	1.4	12.9	51.4	32.9	1.4	100
8.	Teachers introduce and use Virtual Reality very well to students.	0	7.1	41.4	45.7	5.8	100
9.	Teachers help students who have difficulty in using Virtual Reality media during learning activities.	0	5.7	42.9	45.7	5.7	100
10.	I am very happy to operate Virtual Reality media. Therefore, I help friends who have difficulty operating VR media during the learning process.	0	4.3	42.8	52.9	0	100

11.	Overall, I feel satisfied and like the use of Virtual Reality in learning.	2.9	8.6	61.4	20	7.1	100
12.	During the learning process, I was actively involved in operating Virtual Reality media.	1.4	7.1	27.1	58.6	5.8	99.9

Discussion

The results of research on improving the quality of learning based on virtual reality technology at Santa Ursula Senior High School Jakarta are obtained from distributing questionnaires to students, interviews with teachers who have used Virtual Reality media in learning activities, observation, and documentation studies. Based on the results of observations and documentation studies obtained a recapitulation of the use of Virtual Reality technology at Santa Ursula Senior High School Jakarta in 2022-2023. Through the recapitulation, the name of the teacher, the name of the subject, the class, and the usage time of Virtual Reality for the last 1 year are obtained. The results of the recapitulation of the use of Virtual Reality can be seen in Table 2.

Based on the data obtained in Table 2, it can be seen that the use of Virtual Reality media in learning activities has not been applied to all subjects at Santa Ursula Senior High School Jakarta. Subjects that have used Virtual Reality media in the learning process are Compulsory Mathematics, Specialization Mathematics, Chemistry, Biology, Civics, and Cultural Arts. The lack of subjects that use Virtual Reality media is due to the preparation of immature subject teachers. Please note that in using Virtual Reality media there are several things that need to be prepared including material design, virtual space design, virtual space creation, and virtual interactions that will be formed in the use of media.

Virtual Reality is one of the educational facilities or infrastructure owned by Santa Ursula Senior High School Jakarta to support learning activities. Before the existence of Virtual Reality, teaching and learning activities at Santa Ursula Senior High School Jakarta used media in the form of video, audio, images, torsos, props, and graphics. With the presence of Virtual Reality as a new learning tool at Santa Ursula Senior High School Jakarta, it will certainly further support learning activities in the classroom. The teaching and learning process will be more effective and quality. But it turns out that in its implementation there are still many teachers who have not matured in preparation for the use of Virtual Reality media.

In addition, the use of Virtual Reality media at Santa Ursula High School has not been evenly distributed in all classes for each level. For each level, the number of classes available is 7 parallel classes with details of 1 Language class, 4 MIPA classes, and 2 Social classes. For example, the use of Virtual Reality media in Biology subjects has only been applied in 1 X MIPA class, Compulsory Mathematics subjects have only been applied in 2 X MIPA classes and 1 X SOS class. The uneven application of Virtual Reality media users is because the subject teachers who teach at each grade level are different. This will be related to the preparation of teachers to prepare Virtual Reality media before being used in learning activities that have been described previously.

The application of Virtual Reality in the learning process carried out by teachers makes the use of learning media more varied. Previously, the learning media used was still conventional, but now it can use digital learning media. In addition, using Virtual Reality media

can facilitate learning activities that are limited by space and time. For example, in art learning, the use of Virtual Reality media can provide a virtual experience for students to see art exhibitions without having to come to the exhibition site directly. Students who have never visited an art exhibition know and can feel the conditions of an art exhibition without having to come to the gallery, because to make learning with direct visitation to the gallery the considerations are quite a lot. In addition, because an art exhibition is a large event and quite complicated to organize, with the help of Virtual Reality teachers can easily hold an art exhibition and change its various elements according to learning needs.

In addition to interviews, observations, and documentation studies, this study also obtained data from the distribution of questionnaires aimed at classes that have used Virtual Reality media in the learning process. The results of the analysis of questionnaire distribution data related to improving the quality of learning based on Virtual Reality technology at Santa Ursula Senior High School Jakarta can be seen in Table 3. The student questionnaire sheet was filled in by 70 respondents consisting of 35 students of class X SOS 1 and 35 students of class X MIPA 1. The data in Table 3 is the result of calculation and processing of questionnaires that have been filled in by a number of students. The following is a description of each statement item in the questionnaire.

1. The first statement, "Virtual Reality is easy to use anywhere and anytime". The data results can be seen in Figure 1.
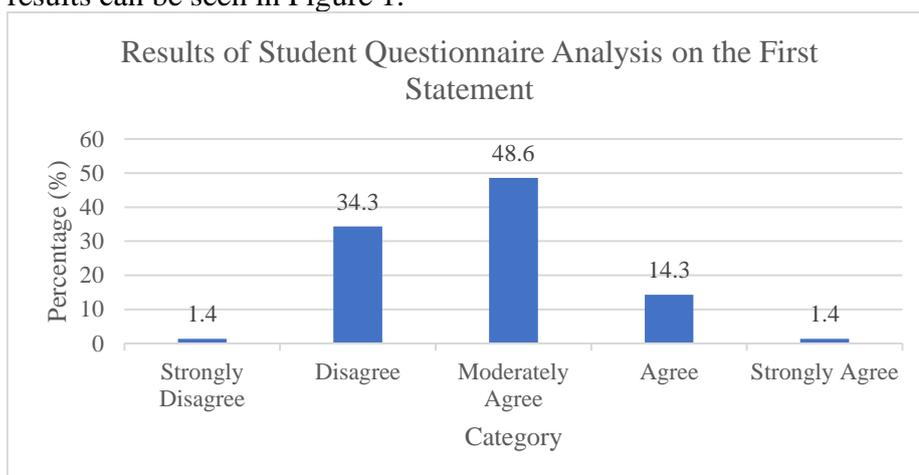

Figure 1. Results of Student Questionnaire Analysis on the First Statement

The number of students who answered strongly disagree and disagree shows that the use of virtual reality learning media has not been effectively used anywhere and anytime. This is because Virtual reality learning media can only be used by students at school and are not allowed to be taken home. In contrast to research conducted by Liu et al., (2019) which states that Virtual Reality media is a new type of educational media with the advantages and potential of distance teaching to convey educational information. Eldiana et al., (2022) also argue that this Virtual Reality learning application makes students easier because it supports e-learning so that students can learn anywhere and anytime.

2. The second statement, "Virtual reality can increase student interest in learning". Results can be seen in Figure 2.
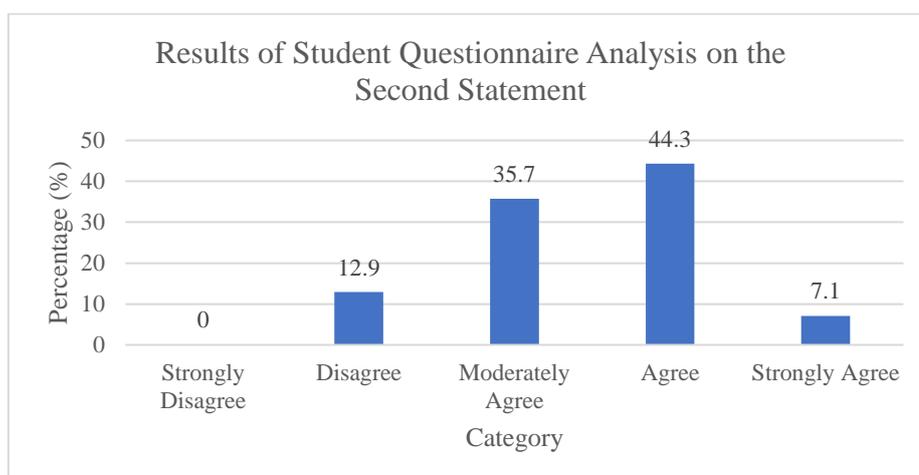
Figure 2. Results of Student Questionnaire Analysis on the Second Statement

The number of respondents who answered moderately agree and agree shows the effectiveness of using Virtual Reality media to increase student interest in learning activities. One of the media that can accommodate students' learning styles is learning using Virtual Reality media (Sunarni & Budiarto, 2014). With new educational facilities, namely Virtual reality at Santa Ursula High School, it is certainly a new breakthrough in the use of technology-based learning media. Before the presence of Virtual Reality, learning media that are often used at Santa Ursula Senior High School Jakarta are video, audio, images, torsos, props, globes and building frames. Classes that use Virtual Reality media offer methods that promise more interesting and interactive academic activities to increase student attention and engagement (Chimakurthi, 2018).

3. The third statement, "Virtual Reality is more interesting and fun than the learning media that teachers usually use in class". The data results show 17.1% of students answered disagree, 37.1% of students answered moderately agree, 30% of students answered agree, and 15.8% of students answered strongly agree. The number of students who answered in the range of moderately agree to strongly agree indicates that the use of Virtual Reality as a learning medium makes the learning atmosphere interesting and enjoyable from conventional learning media that are commonly used. In this case Virtual Reality is considered an important learning tool in this advanced digital learning era (Raja & Priya, 2021).

4. The fourth statement, "Virtual Reality makes it easier for students to understand a concept or subject matter". The data results show 1.4% of students answered strongly disagree, 38.6% of students answered disagree, 45.7% of students answered moderately agree, and 14.3% of students answered agree. These results indicate that the use of Virtual Reality media in the learning process helps make it easier for students to understand the learning material to be achieved. This can be seen from the answers of students who choose in the range of answers moderately agree and agree. Virtual reality helps students understand the material more easily, both in theory and practical learning (Kustandi et al., 2020; Lee & Shvetsova, 2019). In addition, in the opinion of experts, information conveyed using Virtual Reality media will be more easily stored and absorbed by the human brain (Żmigrodzka, 2018).

5. The fifth statement, "Virtual Reality can improve student learning outcomes, as evidenced by the test scores obtained above the KKM and satisfying". The data results show 5.7% of students answered strongly disagree, 48.6% of students answered disagree, 40% of

students answered moderately agree, and 5.7% of students answered agree. Based on the data from the students' answers, it can be seen that the use of Virtual Reality has not been able to improve student learning outcomes, because the test scores obtained by students are still below the KKM. The use of Virtual Reality media in the learning process has not been able to fully improve student learning outcomes. In the learning process, Virtual Reality media is used by teachers to stimulate students at the apperception stage and to explain the concept of material. For example, in learning Biology, Virtual Reality media is used in the apperception stage to increase student motivation and interest in the subject matter being studied, while to obtain scores above the KKM in addition to understanding the concept of material students must also compensate for it with exercises - practice questions that are usually given without using Virtual Reality media. In contrast to the results of previous research showing that Virtual Reality brings positive results to the learning process (Villena-Taranilla et al., 2022).

6. Statement six, "Virtual Reality at Santa Ursula Senior High School Jakarta is sufficient and adequate for classroom learning activities". The data results show 2.9% of students answered strongly disagree, 15.7% of students answered disagree, 27.1% of students answered moderately agree, 41.4% of students answered agree, and 12.9% of students answered strongly agree. The number of students who answered in the range of moderately agree to strongly agree indicates that the Virtual Reality media facilities at Santa Ursula Senior High School Jakarta are sufficient to be used in the learning process in class.

7. Statement seven, "The condition of Virtual Reality learning media to support learning activities at Santa Ursula Senior High School Jakarta is good". The data results show 1.4% of students answered strongly disagree, 12.9% of students answered disagree, 51.4% of students answered moderately agree, 32.9% of students answered agree, and 1.4% of students answered strongly agree. The high percentage of student answers in the range of moderately agree to strongly agree indicates that Virtual Reality learning media is still in good condition and can be used to support learning activities.

8. Statement eight, "Teachers introduce and use Virtual Reality very well to students". The data results show 7.1% of students answered disagree, 41.4% of students answered moderately agree, 45.7% of students answered agree, and 5.8% of students answered strongly agree. This data proves that teachers are proficient in using Virtual Reality media in the classroom learning process. Teacher skills in using learning media are important to create interactive learning and can attract student attention (Saputri et al., 2021). Interactive learning can improve student learning outcomes. Therefore, it can be said that the teacher's skills in using learning media can affect student learning outcomes (Sinaga & Sinaga, 2021).

9. Statement nine, "Teachers help students who have difficulty in using Virtual Reality media during learning activities". The data results show 5.7% of students answered disagree, 42.9% of students answered moderately agree, 45.7% of students answered agree, and 5.7% of students answered strongly agree. From this data shows that the application of Virtual Reality media in the classroom, the teacher guides and helps students who have difficulty using. This is evident from the percentage of student assessment results that answer in the range of moderately agree to strongly agree.

10. Statement ten, "I am very happy to operate Virtual Reality media. Therefore, I help friends who have difficulty operating VR media during the learning process". The data results show 4.3% of students answered disagree, 42.8% of students answered moderately agree, and 52.9% of students answered agree. The large percentage of student answers in the

range of moderately agree to agree shows that there is cooperation and a sense of caring among students. Students who have mastered the use of Virtual Reality media help friends who experience problems in using Virtual Reality media. Caring attitude is important in the learning process and becomes one of the character values that need to be instilled in 21st century science learning (Maisyaroh & Miterianifa, 2023).

11. Statement eleven, "Overall, I feel satisfied and like the use of Virtual Reality in learning". The data results show 2.9% of students answered strongly disagree, 8.6% of students answered disagree, 61.4% of students answered moderately agree, 20% of students answered agree, and 7.1% of students answered strongly agree. Based on these data, it shows that students are satisfied in using Virtual Reality media in the learning activities they participate in. Student satisfaction in the learning process is an important parameter to know, because it can show how their performance and involvement in the classroom (Ponto & Nurlaily, 2020).

12. Statement twelve, "During the learning process, I was actively involved in operating Virtual Reality media". The data results show 1.4% of students answered strongly disagree, 7.1% of students answered disagree, 27.1% of students answered moderately agree, 58.6% of students answered agree, and 5.8% of students answered strongly agree. Based on this data, it can be seen that the use of Virtual Reality media in the learning process makes students become active participants during the learning process. This is in line with research conducted by Jaya et al., (2022) which suggests that the use of Virtual Reality in the learning process can make students more active and learning is not teacher-centered.

Conclusion

Based on the results of the distribution of questionnaires, interviews, observations, and documentation studies on the use of Virtual Reality at Santa Ursula Senior High School Jakarta, it can be concluded that Virtual Reality as a means of supporting learning is able to improve the quality of learning. Before the existence of Virtual Reality, learning tends to be monotonous. Students only listen to lectures from teachers or limited to discussions. But after the existence of Virtual Reality, learning becomes more varied, fun, and interesting. In addition, Virtual Reality is able to increase student interest and motivation to learn, improve student understanding of concepts, and expand the scope of learning through realistic simulation experiences, making it easier for students to understand material in a subject.

However, the use of Virtual Reality at Santa Ursula Senior High School Jakarta is still not optimal. This is because some teachers are not ready to use Virtual Reality in their learning process. The unpreparedness of some teachers causes the use of Virtual Reality to be uneven in all classes. Only a few teachers have used Virtual Reality in the classroom such as Biology, Mathematics, Chemistry, Civics, and Cultural Arts Teachers, while other subject teachers still use conventional learning media such as modules, printed books, teaching aids, and others.

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