International Conference on Teaching and Learning Proceeding
Faculty of Education and Teacher Training – Universitas Terbuka
UTCC, South Tangerang, Banten, November 18th 2023
Vol. 1, pg. 74 – 84
ISSN: 3046-549X

ICT-BASED MULTIMEDIA OF COOPERATIVE SETTING TO IMPROVE THE QUALITY OF MATHEMATICS LEARNING

Muh. Hamkah[1], Haryanto[2]
[12]Universitas Negeri Yogyakarta, Sleman, Indonesia
email: hamka1502@gmail.com

Abstract: The study was classroom action research conducted in two cycles. The study aimed at examining (1) the process of mathematics learning through the implementation of Information Technology and Communication ICT) based Multimedia in a cooperative setting of XI IPA4 students at SMAN 4 in Watampone, (2) The implementation of ICT-based Multimedia in a cooperative setting to improve the quality Mathematics learning of XI IPA.4 students at SMAN 4 Watampone. The results of the study revealed that (1) the implementation of the mathematics learning process of primary action indicated that teachers were not yet maximal in implementing multimedia to solve the problem, signed by teachers gave direct explanations frequently to the class. From the third meeting of cycle I to the end of cycle II, the learning was implemented well that each meeting could be improved and maximized the implementation process that the implementation of learning was in a highly accomplished category; (2) the implementation of ICT-based Multimedia of cooperative setting could improve the quality of learning indicated by a) students' learning outcomes was achieved based on the criteria of minimal learning mastery that 80% of students achieved minimally 70.00 with the ideal score 100, b) the improvement of students' activity which was in very active category, c) students' response toward the implementation of ICT-based multimedia of cooperative setting was 96,8% which gave positive response.

Keywords: ICT; Mathematics Learning; Multimedia

Accepted: October 1, 2023 Approved: November 10, 2023 Published: March 22, 2024

INTRODUCTION

The education system in Indonesia is very heterogeneous because it is affected by very broad geographical problems, it also has a big influence on the progress and development of ICT. Several innovations in the world of education, especially to improve the quality of mathematics learning, are increasingly emerging, along with developments in ICT in the world of education. Because of its rapid development, ICT-based multimedia is seen as something that can provide both challenges and opportunities. To activate and foster learning stimulation in students and increase students' activities in learning mathematics incorrectly, the method is to involve students in learning groups to solve mathematical problems. The implementation of this cooperative setting will have the impact of growing

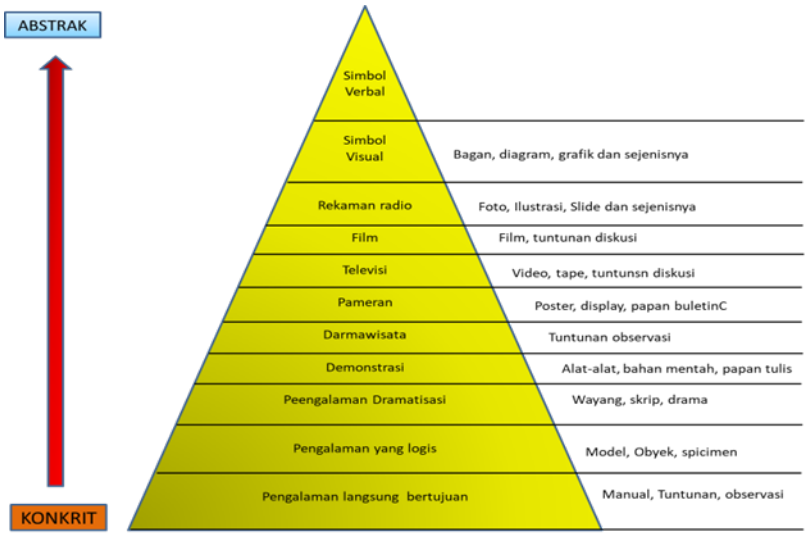
students' self-confidence to solve mathematical problems together.

Hudojo (1990: 1), defines

> "Learning is an activity for everyone. A person's knowledge, skills, habits, preferences and attitudes are formed, modified and developed due to learning. Therefore, a person is said to be learning if it can be assumed that within the person it is a process of activity that results in a change in behavior, this change in behavior can indeed be observed and lasts for a relatively long time. Changes in behavior that occur over a relatively long period of time are accompanied by the person's efforts so that the person goes from being unable to do something to being able to do it. Without effort, even if there is a change in behavior, it is not learning."

Meanwhile, Komalasari (2011: 3) states that learning as "a system or process of teaching students/learners that is planned or designed, implemented and evaluated systematically so that students/learners can achieve learning goals effectively and efficiently."

Edgar Dale in his book entitled " *Audio Visual Method in Teaching* " classifies experiences according to levels from the most concrete to the most abstract. This classification of experiences is better known as *the experience cone* (*Cone of Experience*).



Picture 1 : K cone Edgar's experience

According to Rusman (2011: 78): " *Technology* comes from the Greek word *Technologia, according to the* Webster Dictionary, which means *systematic treatment* or systematic handling of something, while *techne* as the basis of the word Technology means, *skill, science* or expertise, skills, knowledge. The word technology literally *comes* from the Latin word *texere* which means to arrange or build, so the term technology should not be limited to the use of machines, even though in a narrow sense it is often used in everyday life." Whereas Arsyad , (2011: 6) *Technology* is divided into two types, namely: (1) High technology (*sophisticated*), and there is also what is called (2) *Traditional* technology .

International Conference on Teaching and Learning Proceeding
Faculty of Education and Teacher Training – Universitas Terbuka
UTCC, South Tangerang, Banten, November 18th 2023
Vol. 1, pg. 74 – 84
ISSN: 3046-549X

On study What is meant by ICT-based multimedia learning is learning that is carried out by combining several media such as electronic equipment in the form of laptops/notebooks and supporting equipment (*hardware*), the use of *software , namely Microsoft PowerPoint* presentation media *, Macromedia Flash 8* and *GeoGebra* , as well as all one's activities (*Brainware)* .) which is related to conveying messages to students so that they respond, so that students have the ability to master teaching material.
Macromedia Flash 8 is one of the software/application programs used to *design animations* and is the most widely used today. GeoGebra is computer *software* for mathematics education. As the name suggests, GeoGebra can also be used for learning (visualization, computing, exploration and experimentation) and teaching geometry, algebra and calculus material. GeoGebra provides commands related to algebra, geometry and calculus calculations (for example finding derivatives and integrals) and also defines **GeoGebra = Geometry + Algebra!.**

The following is the initial display of the GeoGebra window for forming a circle And cooperative setting multimedia teaching materials .

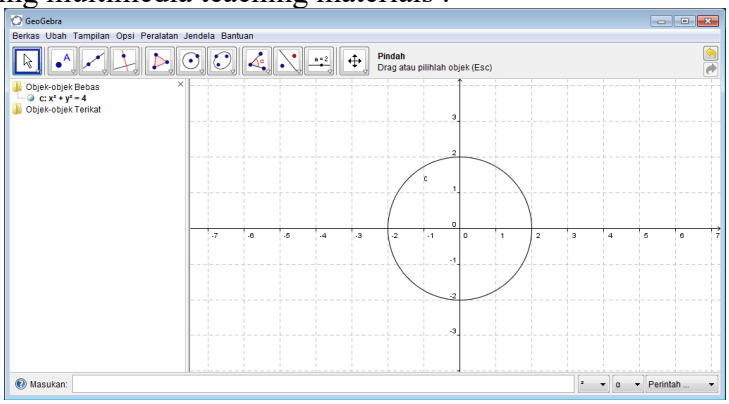


Figure 2: Initial display of the GeoGebra circle equation software

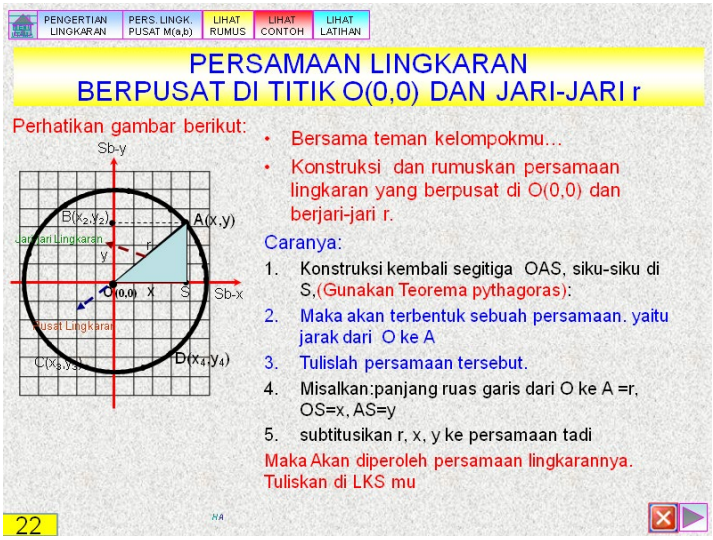


Figure 3 : Display teaching materials for cooperative setting of circle equations

Vol. 1, pg. 74 – 84
ISSN: 3046-549X

According to Smaldino (2008: 37) " *Cooperative learning* is a grouping strategy where students work together to mutually benefit from the learning potential of other members." So learning group walk maximum , the teacher must understand the syntax of the cooperative learning model as follows:

Table 1. Syntax of the cooperative learning model

Phase	Teacher Activities
Phase1: *Present goals and set* Conveying objectives and preparing students	Explain the learning objectives and prepare students to be ready to learn.
Phase 2: *Present information* Presenting information	Present information to students verbally
Phase 3: *Organize students into learning teams.* Organizing students into learning teams	Provide explanations to students about how to form learning teams and help groups make efficient transitions.
Phase 4: *Assist team work and study* Helps teamwork and learning	Helping teams learn while students do their assignments.
Phase 5: *Test on the materials* Evaluate _	Test students' knowledge of various learning materials or groups present the results of their work.
Phase 6: *Provide recognition* Giving recognition or appreciation	Prepare ways to recognize individual and group efforts and achievements.

Source: Suprijono (2012: 65).

The quality of mathematics learning is a description of the level of mastery or ability of students during the mathematics learning process which is viewed from the cognitive, affective and psychomotor aspects so that mathematics learning outcomes are obtained through measurements using evaluation tools in the form of learning results tests, observations, and questionnaires on circle equation material in high school. , with indicators already set .

By implementing ICT-based multimedia in a cooperative setting , it is assumed that it can improve the quality of mathematics learning for students in class XI-IPA 4 at SM A Negeri 4 Watampone.

1. What is the process of learning mathematics through the application of ICT-based multimedia in a cooperative setting for students in class XI-IPA.4 at SMA Negeri 4 Watampone ?
2. Is the application of ICT-based multimedia in a cooperative setting able to improve the quality of mathematics learning in class XI-IPA $_4$ students at SMA Negeri 4 Watampone?

Vol. 1, pg. 74 – 84
ISSN: 3046-549X

METHOD

This is a study action class (*Classroom Action Research*). Which held 2 (two) cycles, with each cycle consisting of 5 (five) meetings, with 4 (four) actions and 1 (one) evaluation. This research was carried out at SMA Negeri 4 Watampone on class XII-IPA.4 students in the 2012/2013 academic year, And subject totaling 40 students. Procedures in this research are (1) planning/preparation, (2) implementation, (3) observation (observation) and (4) reflection.

As for learning tools are ICT-based multimedia teaching materials, student worksheets (LKS) and learning outcomes tests (THB) meanwhile The instruments used in this research include observation sheets (LOAS and LOKP) , student response questionnaires, validated by experts, with criteria:

Table 2: Validation categories of learning tools and learning instruments

Intervals	Category
$3{,}5 \leq V \leq 4$	Very valid
$2{,}5 \leq V < 3{,}5$	Valid
$1{,}5 \leq V < 2{,}5$	Fairly valid
$V < 1{,}5$	Invalid _

The method for collecting data is: (a) Data about students' mathematics learning outcomes before action, collected using documentation data; (b) Data on student activities and learning implementation activities obtained through observation guidelines; (c) Data about student responses to learning were obtained through a questionnaire at the end of Cycle II; (d) Data regarding students' mathematics learning outcomes after taking action is collected using evaluation in the form of tests at the end of each cycle.

The criteria used to state that student activity (AS) and implementation learning (KP) in participating in mathematics learning is if the student's activity score is at least in the "active " category (3.5≤AS<4.5) For activity students, meanwhile For implementation of learning is at " implemented " category (3.5≤KP<4.5), if this has not been achieved in the implemented category, at least it is in the " sufficiently implemented " category. Following categories Activity Students (USA) and Implement ability Learning (KP).

Table 3 . Student activity category interval (US) and Learning Implementation (KP)

Intervals	Category
$AS/KP \geq 4{,}5$	Very Active / Very Done
$3{,}5 \leq AS/KP < 4{,}5$	Active / Implemented
$2{,}5 \leq AS/KP < 3{,}5$	Enough Active / Quite Done
$1{,}5 \leq \mathrm{AS/KP} < 2{,}5$	Not enough active / Less Done
$AS/KP < 1{,}5$	No active / No accomplished

Indicators of success in this research are: (a) The average score of students' mathematics

Vol. 1, pg. 74 – 84
ISSN: 3046-549X

learning outcomes, increasing from each cycle with the minimum learning completeness criteria (KKM) 80% of students achieving a minimum score of 70.00 with an ideal score of 100, (b) Activities students must be at least in the " active " category, (c) Positive student responses are more than 50% of students who responded, giving *positive responses* towards a minimum of 70% of the number of aspects asked. If the three indicators are met, it is said that the quality of mathematics learning has increased.

RESULT AND DISCUSSION

1. Results Data Analysis

a. Cycle I

The results of quantitative analysis show that student responses to the aspects asked were 72.5% to 100% (29 to 40) students responded positively or an average of 96.8%, for each aspect of implementing ICT-based multimedia in cooperative settings.

1) Stage Planning/preparation

At this stage, a learning tool was created consisting of ICT-based multimedia teaching materials, learning implementation plans (RPP) and student worksheets (LKS), which were specifically designed using a cooperative learning model regarding circle equations. In addition, instruments were also created consisting of student activity observation sheets (LOAS), learning implementation observation sheets (LOKP), student response questionnaires (ARS) and learning outcomes tests (THB). Before action is taken, it is first validated by experts and practitioners, then the validator provides suggestions for improvements and comments on the device. Researchers prepare other supporting facilities/equipment, such as *an LCD projector,* availability of electricity, as well as the condition of the classroom where the research is conducted, and a camera to record activities and ask for observers' willingness to make observations.

2) Stage Implementation

Meeting First cycle I was carried out on date, April 25, 2023. At this first meeting, the steps taken as contained in the RPP activities are (i) *Initial activities* (10 minutes), (ii) *Core activities* (70 minutes), (iii) *Final activity* (10 minutes). Likewise, the 2nd, 3rd and 4th meetings.

3) Stage Observation and Evaluation

Overall, at the 1st, 2nd, 3rd and 4th meetings of Cycle I, aspects that were not optimal were able to be improved. The results of observations on 11 (eleven) aspects of student activity obtained an average of 4.05 " *active* ". This means

that based on the specified criteria being in the active category (3.5≤AS<4.5) has been achieved. The results of the observer's observations regarding the implementation of learning assessed in Cycle I obtained an average of 4.25 in the " *implemented* " category. Evaluation held on May 4, 2023. Following results math THB score based on KKM.

Table 4 Frequency data and percentage of pre-action THB scores, Cycle I THB scores based on KKM

Score	Category	Pre-action THB		THB Cycle I	
		Frequency	(%)	Frequency	(%)
<70.00	No Complete	20	50	7	17.5
≥70.00	Complete	20	50	33	82.5

4) Stage reflection

THB results have increased as expected, and activity students are in category active, but there are still students who have not reached the minimum completion criteria (KKM) set, namely 7 students (17.5%), so need next on cycle II

b. Cycle II

1) Stage Planning / Preparation

In Cycle II planning, revisions and improvements were made based on the recommendations in Cycle I. Apart from the tools above, instruments were also created consisting of student activity observation sheets (LOAS) and learning implementation observation sheets (LOKP). At this stage, researchers provide improvements to ICT-based multimedia teaching materials and remind them how to operate GeoGebra software.

2) Stage Implementation

The results show implementation of the learning process is capable of being maximized. That thing showed with increasing ability to understand and draft every student for finish problem.

3) Stage Observation / Evaluation

Analysis of student activity observation data shows that all student activity criteria have reached an average of 4.52 " *very active* ". then this has been declared good. The learning implementation process has experienced improvements in Cycle II. After analyzing the aspects of the learning implementation component that were not optimal and needed to be improved, in Cycle II it reached an average of 4.71 " *very successful* ". This means that it

has exceeded the specified criteria. Evaluation held on May 18, 2013. Following results math THB score based on KKM.

Table 5: Data on frequency and percentage of pre-action THB scores, Cycle I THB scores and Cycle II THB scores based on KKM

Score	Category	Pre-action THB		THB Cycle I		THB Cycle II	
		Freq.	(%)	Freq.	(%)	Freq .	(%)
<70.00	No Complete	20	50	7	17.5	3	7.5
≥70.00	Complete	20	50	33	82.5	37	92.5

4) Stage reflection

Based on THB, LOAS, and LOKP fulfilled under indicators specified above, then _ _ study stopped and collected response data from students.

CONCLUSION

The mathematics learning process through the application of ICT-based multimedia is carried out in cooperative learning, using 3 (three) Microsoft PowerPoint, GeoGebra and Macromedia Flash 8 software. After the software is installed on students' laptops/NBs and the worksheets are distributed to each student, each group pays attention multimedia on the group's laptop/NB and collaborate to solve each problem raised on the LKS. Microsoft Powerpoint multimedia/teaching materials are used to help students work on worksheets, by following the steps instructed. To check the results of student work, GeoGebra software is used. Next, students present the results of their group's LKS work, while other groups provide corrections, questions, and feedback on the work of the group working in front of the class. The application of Macromedia Flash 8 software is in the form of interactive multiple choice practice questions, to be answered individually by each group member. Students in the group who raise their hands first are given the opportunity to answer and are given certain awards/mementos from the teacher if their answer is correct. The results show that after carrying out 2 (two) cycles of action, the mathematics learning process through the application of ICT-based multimedia as mentioned above has been carried out well, even at each meeting the implementation process can be maximized. This is shown in the implementation of learning which was generally in the "implemented" category in Cycle I, and there was an increase in Cycle II to the "very implemented" category.

There is increasing quality learning mathematics , which shows:

1) The increase in student activity, which generally in Cycle I was in the "active" category, increased in Cycle II to the "very active" category.
2) Student mathematics learning outcomes tests (THB) increase in each cycle. The average THB score in Pre-action was 67.4 in the "medium" category with a standard deviation of 12.87, then in Cycle I it increased to 77.6 in the "high" category with a standard deviation of 10.64 and increased again in Cycle II to 82. 5 "high" categories with a standard deviation of 10.22. The percentage of completeness increases, if the

Pre-action reaches 50% then it increases to 82.5% in Cycle I and increases again to 92.5% in Cycle II with a KKM of 80% of students achieving a minimum score of 70.00 with an ideal score of 100.

3) Student responses were in the range of 72.5% to 100% and an average of 96.8% expressed positive responses to the aspects asked including: (i) ICT-based multimedia teaching materials in cooperative settings; (ii) Student worksheets (LKS); (iii) The atmosphere for group formation; (iv) How the teacher teaches.

Based on the results, several suggestions are put forward as follows: (a) For students, learning that utilizes ICT-based multimedia in cooperative settings can be considered, especially to increase understanding of concepts. (b) It is recommended that teachers be able to master the use of ICT-based multimedia which continues to develop, especially in mathematics learning, in order to increase their professionalism. (c) For schools that have supporting facilities and infrastructure, learning can be implemented using ICT-based multimedia teaching materials in cooperative settings as part of improving the quality of learning. (d) further research and interest in developing ICT-based multimedia teaching materials in cooperative settings.

REFERENCES

Arikunto, S. 2007. *Penelitian Tindakan Kelas* : Jakarta : Bumi Aksara.

Arsyad, A. 2011. *Media Pembelajaran*. Jakarta: PT. RajaGrafindo Persada.

Asyhar, H. R. 2011. *Kreatif Mengembangkan Media Pembelajaran*. Jakarta: Gaung Persada.

Daryanto. 2010. *Media Pembelajaran: Peranannya Sangat Penting dalam Mencapai Tujuan Pembelajaran*. Yogyakarta: Penerbit Gava Media.

Departemen Pendidikan Nasional Republik Indonesia. 2005. *Peraturan Pemerintah Nomor 19 Tahun 2005: Tentang Standar Nasional Pendidikan*. Jakarta: Badan Standar Nasional Pendidikan (BNSP).

_____. 2006. *Peraturan Menteri Pendidikan Nasional Republik Indonesia Nomor 22 Tahun 2006: Tentang Standar Isi untuk Satuan Pendidikan Dasar dan Menengah*. Jakarta: Badan Standar Nasional Pendidikan (BNSP).

_____. 2006b. *Kurikulum Tingkat Satuan Pendidikan.* Jakarta: Badan Standar Nasional Pendidikan (BNSP).

_____. 2007. *Peraturan Menteri Pendidikan Nasional Republik Indonesia Nomor 41 Tahun 2007: Tentang Standar Proses untuk Satuan Pendidikan Dasar dan Menengah*. Jakarta: Badan Standar Nasional Pendidikan (BNSP).

_____. 2008. *Kamus Besar Bahasa Indonesia Edisi Keempat*. Jakarta: PT.Gramedia Pustaka Utama.

Firmansyah &Umi, S. & Raehana. 2011.*Tugas Problematika Matematika*. Makalah. Tidak diterbitkan. Makassar: Program Pascasarjana UNM.

Muhsetyo, G. 2010. *Pembelajaran Matematika SD*. Jakarta: Universitas Terbuka.

Hudojo, H. 1990. *Strategi Mengajar Belajar Matematika*. Malang: IKIP Malang.

http://id.wikipedia.org/wiki/Ren%C3%A9_Descartes. Diakses tanggal 9 September 2012.

Indriana, D. 2011. *Ragam alat Bantu Media Pengajaran: Mengenal, Merancang dan Mempraktikkannya*. Jogjakarta: Diva Press.

Johanes & Kastolan & Sulasimin. 2006. *Kompetensi Matematika SMA Kelas XI Program IPA 2A*. Jakarta: Yusdistira

Komalasari, K. 2011. Pembelajaran *Kontekstual: Konsep dan aplikasi*. Bandung: PT. Refika Aditama.

Mainali, B.Raj & Key, M.Beth. 2012. Using Dynamic Geometry Software GeoGebra in Developing Countries: A Case Study of Impressions of Mathematics Teachers in Nepal. *International Journal for Mathematics Teaching and Learning (IJTML)*. (Online). ISSN 1473–0111 No.204 (http:// http://www.cimt.plymouth.ac.uk/journal/mainali.pdf, Diakses 20 September 2012).

Muharram. 2012. *Peningkatan Kualitas Pembelajaran Matematika melalui Penggunaan Multimedia Berbasis TIK pada Siswa Kelas VIIIa SMP Negeri 1 Lappariaja*. *Tesis* perpustakaan PPs UNM Makassar.

Musfiqon, HM. 2012. *Pengembagan Media & Sumber Pembelajaran.* Jakarta: Prestai Pustaka Publisher.

Nugroho Sudyarto & Maryanto. 2008. *Matematika 2 untuk SMA atau MA Kelas XI Program IPA (bse)*. Jakarta: Pusat Perbukuan, Departemen Pendidikan Nasional.

Nurdin. 2007. *Model Pembelajaran Matematika yang Menumbuhkan Kemampuan Metakognitif untuk Menguasai Bahan Ajar*. Disertasi tidak diterbitkan. PPs Universitas Negeri Surabaya.

Nuryadi. 2010. *Pengembangan Multimedia Model VIRTUAL CLASSROOM TOUR (VCT) pada Pembelajaran Pecahan di SD*. Tesis. Tidak diterbitkan. Makassar: Program Pascasarjana UNM.

Pribadi, B.A. 2011. *Model Desain Sistem Pembelajaran*. Jakarta: PT. Dian Rakyat.

Program Pascasarjana Universitas Negeri Makassar. 2010. *Pedoman Penulisan Tesis dan Disertasi Program Pascasarjana Universitas Negeri Makassar*. Makassar: PPs UNM.

Purnomo, C.H. 2012. *250 Tip & Trik Microsoft Office Powerpoint 2007 & 2010*. Jakarta: Mediakita.

Rahyubi, H. 2012. *Teori-Teori Belajar dan Aplikasi Pembelajaran Motorik: Deskripsi dan Tinjauan.* Bandung: Nusa Media.

Rusman, Kurniawan, D., & Riyana, C. 2011. *Pembelajaran Berbasis Teknologi Informasi dan Komunikasi: Mengembangkan Profesionalitas Guru*. Bandung: Rajawali Pers.

Sahid, 2012. *Aktivitas Belajar Persamaan Lingkaran dan Garis Singgungnya dengan Software GeoGebra.* Makalah tidak diterbitkan. Yogyakarta: Laboratorium Komputer Matematika FMIPA Universitas Yogyakarta.

Santosa, M. H. 2008. Pemanfaatan Blog. Makalah disajikan pada *Simposium Hasil Penelitian Kebijakan Dan Inovasi Pendidikan.* Puslitjaknov Pendidikan Balitbang Departemen Pendidikan Nasional, Jakarta 11-14 Agustus 2008.

Sartono Wirodikromio. 2007. *Matematika 2 untuk SMA Kelas XI Program Ilmu Alam*. Jakarta: Penerbit Erlangga.

Sharan, S. 1999. *The Handbook of Cooperative Learning*. Terjemah oleh Sigit Prawoto. 2012. Yogyakarta: Familia.

Skemp, R. R. 1971. *The Psychology of Learning Mathematics*. Terjemah oleh Suryo Widodo. 2009. Kediri: Universitas Nusantara PGRI Kediri. Tidak diterbitkan.

Smaldino, S. E., Lowther, D. L., & Russell, J. D. 2008. *Instructional Technology & Media for Learning : Teknologi Pembelajaran dan Media untuk Belajar*. Terjemah Arif Rahman. 2011. Jakarta: Prenada Media Group.

Sobirin. 2008. *Fokus Matematika Siap Ujian nasional untuk SMA/MA*. Jakarta: Penerbit Erlangga

Soedjadi, R. 2000. *Kiat Pendidikan Matematika di Indonesia:Konstalasi Keadaan Masa Kini Menuju Masa Depan*. Jakarta: Dirjen Dikti Depdiknas.

Soedyarto,N. dan Maryanto. 2008. *Matematika Jilid 2 untuk SMA dan MA Kelas XI-IPA (bse)*. Jakarta. Pusat Perbukuan Departemen Pendidikan Nasional.

Stols, G. 2011. *GeoGebra in 10 Lessons.* Terjemahan oleh Syaiful Hamzah Nasution. (http://syaifulhamzah.files.wordpress.com/2011/12/tutorial-geogebra.pdf, Diakses tanggal 12 Desember 2012).

Suherman, H.E.& Turmudi & Suryadi, D. & Herman, T. & Suhendra & Prabawanto, S. & Nurjannah & Rohayati, Hj.A. 2003. *Strategi Pembelajaran Matematika Kontenporer*. Bandung: Jurusan Pendidikan Matematika FPMIPA UPI.

Suprijono, A. 2012. *Cooperative Learning: Teori & Aplikasi PAIKEM*. Yogyakarta: Pustaka Pelajar.