THE DEVELOPMENT OF INSTRUCTIONAL MATERIAL NATURAL SCIENCE THROUGH SIMULATION METHOD FOR 5th GRADE ISLAMIC ELEMENTARY SCHOOL STATE 2nd OF MALANG

THESIS

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THE DEVELOPMENT OF INSTRUCTIONAL MATERIAL NATURAL SCIENCE THROUGH SIMULATION METHOD FOR 5th GRADE ISLAMIC ELEMENTARY SCHOOL STATE 2nd OF MALANG

Presented to Faculty of Tarbiyah of State Islamic Universuty Maulana Manlik Ibrahin Malang in partial fulfillment of the requirement for the degree of Sarjana Pendidikan Islam (S. Pd. I)

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June, 2014

DEDICATION SHEET

Thank You to the People Who Have Always Give Me the Spirit

My Father and Mother

And Thanks for all of my family and my friends that could not mention one by one

MOTTO

بِسْمِ ٱللَّهِ ٱلرَّحْمَٰنِ ٱلرَّحِيمِ ﴿١﴾

ٱقْرَأْ بِٱسْمِ رَبِّكَ ٱلَّذِى خَلَقَ ﴿١﴾ خَلَقَ ٱلْإِنسَٰنَ مِنْ عَلَقٍ ﴿٢﴾ ٱقْرَأْ

وَرَبُّكَ ٱلْأَكْرَمُ ﴿٣﴾ ٱلَّذِى عَلَّمَ بِٱلْقَلَمِ ﴿٤﴾ عَلَّمَ ٱلْإِنسَٰنَ مَا لَمْ

يَعْلَمْ ﴿٥﴾

Artinya: bacalah dengan (menyebut) nama Tuhanmu yang Menciptakan, Dia telah menciptakan manusia dari segumpal darah. Bacalah, dan Tuhanmulah yang Maha pemurah, yang mengajar (manusia) dengan perantaran kalam, Dia mengajar kepada manusia apa yang tidak diketahuinya.

Q.S.: al-Alaq 1-5

APPROVAL SHEET

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ADVISOR OFFICIAL NOTE

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Appendixes : 4 (four) Exemplar

Dear,

Dean of Tarbiyah and Teaching Sciences Faculty

The State Islamic University of Maulana Malik Ibrahim Malang

At Malang

Assalamualaikum Wr. Wb.

After carrying out at several times for guidance, both in terms of content, language and writing techniques, and after reading the following thesis:

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As the advisor, we argue that this thesis has been proposed and tested decent.

So, please tolerate presence.

Wassalamualaikum Wr. Wb

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CERTIFICATE OF THESIS AUTHORSHIP

I certify that thesis I wrote to fulfill the requirement for Sarjana Pendidikan Islam (S.Pd.I) entitled Developing Of Instructional Materials Natural Science through Simulation Methods for 5th Grade Islamic Elementary School State 2nd of Malang is truly my original work. It does not incorporate any materials previously written or published by another person, except those indicated in quotations and bibliography. Due to fact, I am the only person who responsible for the thesis if there is any objection or claim from others.

Malang, June 27th 2014

Khoiril Anam

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بسم الله الرحمن الرحيم

All praise due to Allah, the Cheriser and Sustainer of all the worlds. There is neither might nor power but with Allah the Great, the Exalted. With only His Grace and Guide, this thesis entitled "**Developing Of Instructional Materials Natural Science through Simulation Methods for 5th Grade Islamic Elementary School State 2nd of Malang"** could be done, and also with His benevolence and love, peace of the soul. Peace from upon the Prophet Muhammad (SAW) who had brought us from darkness into the brightness, in this life. May we be together with those who believe and receive intercession from Him in the day of after day Amen.

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Hopefully, by imparting what has been learned during the course of study in Faculty of Tarbiyah and Teaching Sciences, State Islamic University Maulana Malik Ibrahim of Malang it will benefit all readers and the author.

Realizing the fact that error and weakness is impartial to being human, and this thesis is still far from perfection, the author appreciates constructivism and suggestions for the improvement and betterment of this thesis.

Malang, 12 June 2014

Author,

Khoiril Anam

10140098

TRANSLITERATION GUIDLINES OF ARAB LATIN

The written of Arabic-latin in this thesis use directive transliteration base on the collective decision between the Minister of Religion Republic of Indonesia and the Minister of Education and Culture Republic of Indonesia number 158/1987 and number 0543 b/U/1987 that in broad outline can be described as bellow:

A. Hijaiyah Letters

ا	=	**a**	ز	=	**z**	ق	=	**q**
ب	=	**b**	س	=	**s**	ك	=	**k**
ث	=	**t**	ش	=	**sy**	ل	=	**l**
ت	=	**ts**	ص	=	**sh**	م	=	**m**
ج	=	**j**	ض	=	**dl**	ن	=	**n**
ح	=	**h**	ط	=	**th**	و	=	**w**
خ	=	**kh**	ظ	=	**zh**	ه	=	**h**
د	=	**d**	ع	=	**‘**	ء	=	**,**
ذ	=	**dz**	غ	=	**gh**	ي	=	**y**
ر	=	**r**	ف	=	**f**			

B. Long Vocal

Vocal (a) panjang = **â**

Vocal (a) panjang = **î**

Vocal (a) panjang = **û**

C. Diphthong Vocal

أ وْ	=	**Aw**
أ يْ	=	**Ay**
أ وْ	=	**û**
إ يْ	=	**î**

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ABSTRAK

Anam, Khoiril. 2014. *Pengembangan Bahan Ajar IPA Melalui Metode Simulasi Kelas V MIN 02 Malang.* Skripsi, Jurusan Pendidikan Guru Madrasah Ibtidaiyyah, Fakultas Ilmu Tarbiyah dan Keguruan, Universitas Islam Negeri (UIN) Maulana Malik Ibrahim Malang. Pembimbing: Dr. H. Nur Ali, M. Pd

Kata Kunci : *Pengembangan, Bahan Ajar, IPA, Metode Simulasi.*

Pengembangan bahan ajar mata pelajaran IPA melalui metode Simulasi bagi siswa kelas V MIN 02 Malang ini didasarkan pada kenyataan bahwa belum tersedianya bahan ajar yang memiliki kriteria sebagai bahan ajar dengan spesifikasi melalui metode simulasi. Penelitian pengembangan ini dimaksudkan untuk dapat memenuhi tersedianya bahan ajar yang berupa buku dan dapat meningkatkan keefektifan pembelajaran IPA di MI/ SD secara umum dan MIN 02 Malang khususnya sebagai sasaran penggunaan bahan ajar.

Tujuan dari penelitian ini diantaranya untuk menghasilkan buku ajar IPA MI kelas V sebagai pegangan guru dan siswa yang dapat dijadikan rujukan untuk pembelajaran IPA yang dikembangkan melalui metode simulasi, untuk mengetahui hasil validitas bahan ajar IPA melalui metode simulasi kelas V MI 02 Malang.

Untuk mencapai tujuan itu, penelitian ini mengguanakan metode penelitian pengembangan. Prosedur penelitian ini dilakukan dalam tiga tahap, yaitu tahap pengembangan, uji kelayakan dan revisi bahan ajar. Peneliti mengadaptasi model pengembangan Walter Dick and Lou Carey (1990) terdapat sepuluh tahapan desain pembelajaran. Sumber uji kelayakan adalah satu orang ahli isi pembelajaran, satu ahli desain pembelajaran, satu guru pengajar IPA. Uji kelayakan ini dilakukan pada 18 siswa kelas V MIN 02 Malang. Meode pengumpulan data dengan mengguanakan angket dan wawancara. Analisis data yang digunakan adalah analisis isi, deskriptif dan uji T.

Hasil penelitian menunjukkan bahwa penilaian para validator yaitu ahli isi sebesar 92,5% dengan kualifikasi baik, ahli desain sebesar 82,5% dengan kualifikasi baik, guru mata pelajaran IPA 80% dengan kualifikasi baik, siswa kelas V 92% dengan kualifikasi baik. Sedangkan hasil belajar yang diukur melalui pretes dan postes terdapat peningkatan hasil belajar yang mencapai 13%. Secara keseluruhan dapat disimpulkan bahwa bahan ajar IPA termasuk dalam kualifikasi baik sehingga layak digunakan dalam pembelajaran IPA di kelas V SD/MI.

Penelitian pengembangan ini hanya terbatas pada materi daur air, oleh sebab itu perlu adanya pengembangan pada materi lain khususnya IPA kelas V MI. Sehingga disarankan kepada guru mata pelajaran IPA agar mencoba mengembangkan bahan ajar IPA yang lebih menarik dan efektif untuk dijadikan sumber belajar bagi guru dan siswa dalam mendukung proses pembelajaran IPA di kelas.

ABSTRACT

Anam, Khoiril. 2014. The Development of Instructional Material Natural Science through Simulation Methods for 5th Grade Islamic Elementary School State 2nd of Malang. Skripsi, Departemen of Education Teacher for Islamic Elementary School, Faculty of Tarbiyah and Teaching Sciences. State Islamic University Maulana Malik Ibrahim of Malang. Advisor: Dr. H. Nur Ali, M. Pd

Key Word: *Development, Instructional Material, Science of Natural, Simulation Method.*

The development of instructional material natural science through simulation method for 5th grade Islamic Elementary School State 2nd of Malang this based on the fact that the unavailability of instructional material which have criteria as instructional material with specification through simulation method. Development research is intended to fulfill of instructional material such as book and can improve effectiveness of science learning in Elementary school (*MI/ SD*) generally and Islamic Elementary School State 2nd of Malang specially as the object user of instructional material.

The purpose of this research is to produce instructional material of science 5th grade Islamic elementary school as guidance the teacher and students that can be used as a reference in science learning that development through simulation method to at 5th grade of Islamic elementary school state 2nd of Malang.

To achieve that purpose, this research use research method of development. The procedure of this study conducted in three stages, namely: the stage of development, feasibility testing and revision of instructional material. Researcher adapted the model of the development of Walter Dick and Lou Carey (1990) there are ten stages of learning design. Feasibility test is a source of expert content of learning, the instructional design expert, a science teacher educators. Feasibility test was conducted on 18 students of 5th grade MIN Malang 2. Data collection method used questionnaires and interviews. Analysis of the data used is content analysis, descriptive and test T.

The results showed that the validator is an assessment of the contents expert of 92.5% with good qualifications, design expert of 82.5% with good qualifications, teachers teaching science of 80% with good qualifications, fifth grade students of 92% with good qualifications. While the learning outcomes as measured by pretest and posttest learning outcomes which there is increased 13%. Overall it can be concluded that science instructional material that qualify as a good feasible for use in a fifth grade science teaching in elementary school (*MI/SD*).

This research is limited to the material recycling of water, therefore need for the development of other materials, especially fifth grade in elementary school (*MI/SD*). So it is advisable to teachers of teaching science in order to try to develop instructional materials of science that more interesting and effective to be used as a learning resource for teachers and students in supporting the learning process of science in the classroom.

CHAPTER I

INTRODUCTION

A. The Background of Study

In the Law of National Education Standards No. 20 of 2003 states that the national education serves to develop skills and character development as well as the nation's civilization in order to achieve a dignified life of the nation. Education ultimately must be filed in an effort to realize a society characterized by magnanimity within the individual, justice in the country and happier life and prosperity of every individual.

The happy live of people that prosperous and intelligent can be achieved in education which cover in the all of society level. One of important part in education process to create superior human resources must focus on the learning process in the classroom. Learning process in the classroom must be important in concerning for each subject. At the school, the subjects of Natural Science hold an important role in creating critical thinking students' capability.

Natural science in Indonesia is *IPA* an abbreviation of the word "*Ilmu Pengetahuan Alam*". Natural means natural, in touch with nature. Science

means knowledge. So "Natural Science literally is the study of events that occur in nature."[1]

Natural Science is the knowledge that has been gotten through the collection data by experimental, observation, and deduction to produce an explanation about phenomenon that can be trusted. The abilities of the natural science are: (i) The ability to know what the observe is. (ii) The ability to predict what has not been observed, and the ability to test the follow-up of experimental results. (iii) The development of scientific attitude.[2]

The scientific learning activities include the development of ability in asking the questions, looking for the answers, understanding the answers, completing the answer about *"what", "why" and "how"* of natural phenomena and the characteristics of the environment in ways that will be applied in a systematic environment and technology.

Besides, *Wahyana* said that natural science is "a set of systematically arrangement, and use it's generally limitation in natural phenomena. IPA is the theory of knowledge which is acquired/organized by special treats such as observation, experiment, conclusion, theory development, and so on that correlated each other.[3]

Therefore, natural science is the branch of the knowledge that studies about events in nature that are formulated in specifically ways related to the material phenomena which is has connection each other. The examples of

[1] Srini M Iskandar, *Pendidikan Ilmu Pengetahuan Alam* (Bandung : CV Maulana, 2001), hlm. 2.

[2] Trianto, *Model Pembelajaan Terpadu* (Jakarta: Prestasi Pustaka, 2007), hlm.102-103

[3] Ibid.

natural science are the facts, concepts, principles and laws, and theories about natural phenomena.

Natural science is needed for the daily life to fulfill the human needs by solving problems that can be identified. The application of science needs to be done judiciously, so that, it could not give a bad affect to the environment. At the *SD/MI* (elementary school) grade, there is expected about "*Salingtemas"* learning or *Sains, lingkungan, teknologi, dan masyarakat* (science, environment, technology, and society) that aimed for studying the experience to design and create a masterpiece through the application of scientific concepts and competencies to work wisely.

Natural science is related with the natural way of finding, about systematically. Therefore, science is not about the mastery of a collection knowledge in the form facts, concepts, or principles, but also a process of discovery. The education of science is expected to be a vehicle for students to learn about themselves and the environment, as well as prospects for further development in applying it in everyday life. The learning process emphasizes to providing direct experience to develop competence in order to explore and understand the universe around scientifically. Science education and inquiry directed to do, thus, can help students to gain a deeper understanding of the nature.

The natural scientific learning should be learn by scientific inquiry *(scientific inquiry)* to develop the thinking ability, work and behave, and communicate science as an important aspect for life skills. Therefore, the

scientific learning in *SD/MI* emphasizes to providing the direct learning experience through the use and development of skills processes and scientific.[4] One of them is using simulation method in scientific teaching.

According to *Ahmadi*, simulation is the teaching method that used presentation and learning experience by mock situations to understanding the concept, principle, or specific skills.[5] Meanwhile, according to Anissatul, simulation is the teaching method that set in the game, which is done by the students. The resulting in teaching and learning process is to gain an understanding about of natural concept of principle or skill, through the activity or exercise stimulation.[6] To reduce the risk of accidents in the lab activities and because we are not able to conduct direct observation of the learning process, the author chose simulation method in the process of water cycle.

Based on interviews and observations in the pre research with one of the teachers of natural science at Islamic Elementary School State of II Malang (MIN II), it could be got that natural science learning process still has several problems, especially in the matter of water cycle. These problems are: (i) The lack of deepening Instructional material in the available book. (ii) Students not interest in the textbook that printed from the school. (iii) The unavailability of the activities for the students in the textbook, so that,

[4] *Standar isi permendiknas No.22 tahun 2006.*

[5] Iif Khoiru Ahmadi dan Sofan Amri, *PAIKEM GEMBROT* (Jakarta: Prestasi Pustakaraya, 2011), hlm. 85.

[6] Anissatul Mufarokah, *Startegi Belajar Mengajar* (Teras), hlm. 83

students have less understanding about learning scientifically concept. (iv) the available textbook deviates from the learning indicators.[7]

In natural scientific learning, it should be experiments which are supposed to make easy understanding about concept of the material that be taught. For the example, in *Hydrology* or it means the learning about water, this subject really need a deep understanding about the concept. And to facilitate the understanding about *Hydrology* subject, in this study will develop textbooks which is accompanied by worksheets to facilitate students understanding.

To facilitate the teaching of learning materials in natural science, it is needed to arrange the materials textbook. Abdul Majid believes that instructional material is any material that used to help teachers or instructors in carrying the learning activities. The material can be written or not.[8] According to the national center for competency based training, materials means that something which is used to help the teachers or instructors in implementing the learning process in the classroom. Meanwhile, according to Pannen, materials are the stuffs or subject matter that arranged systematically, which use by teachers and students in the learning process.[9]

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[7] *Hasil wawancara dengan guru bidang studi IPA MIN 2 Malang, pada tanggal 18 September 2013.*

[8] Abdul Majid, *Perencanaan Pembelajaran*, (Bandung: PT Remaja Rosdakarya, 2012), hlm. 173.

[9] Andi Prastowo, *Panduan Kreatif Membuat Bahan Ajar Inovatif*, (Jogjakarta: DIVA Press, 2012), hlm. 17.

Based on the several understanding above, it can be concluded that materials is any substance (whether information, tools, and text) are arranged systematically, which is depicted the whole of competencies that will be controlled by the students and used in the learning process with the planning purpose and learning review implementation. For example: textbooks, modules, handouts, worksheets, models or mockups, audio materials, interactive Instructional materials, and so forth. The instructional materials will be developed in this study are the form of print media such as the textbook for students and teachers.

Based on background of the study above, it is necessary to create the completion development the product like textbooks through the simulation method to improve the understanding about the concept of scientific materials to the students. Furthermore, the authors conducted this study which entitles "The Development of instructional material natural science through simulation method for 5^{th} grade MIN 2^{nd} at Malang".

B. The Problem of Study

Based on the background of the problems that have been raised, the problem of study could be arranged as follows:

1. How to develop textbook of natural science through the simulation method 5^{th} grade of Elementary School?
2. How the validity results from textbook natural science 5^{th} grade through simulation method of Elementary School to be developed?

3. How is the effectiveness of learning process in using textbook of natural science through the simulation method 5th grade of Elementary School?

C. **The Objectives of Study**

Based on the statement of problem, the purposes of this study are:

1. To know the development of natural science textbooks for the 5th grade elementary school through simulation method.
2. To know the validity of natural science textbooks for the 5th grade elementary school through simulation method.
3. To know the effectiveness of natural science textbooks for the 5th grade elementary school through simulation method.

D. **The Significances of Study**

This study was expected to:

1. Theoretically, the results of this study can be used as information material for developing the Elementary School natural science in generally and especially for the further research.
2. For the researchers, to give the knowledge about the development of Instructional materials.
3. For the school, to considerate the use of instructional materials that support for the scientifically learning, thus simplifying the understanding to the students in learning science. Hence, to increase the teachers motivation in trying to develop learning tools in the

learning process, such as textbooks through the simulation method that facilitate by teachers.

4. For the student, to give interested learning process.

E. **The Specifications Product are Expected**

The products that is produced in the form of textbooks through simulation practice method which consists of matter of understanding the concept and implementation of activities in science teaching 5th grade of Elementary School material of the water cycle will be described as follows:

1. Physical manifestation of the products that produced in this development is textbooks. There is an understanding about concept, the learner activity sheet (simulation experiment), and the evaluation of learning process in the water cycle material.
2. This textbook contains the material and steps in conducting the experiments. This book is intended to support the students' laboratories practice.
3. This textbook was designed by using variations of the layout for the first cover and back cover, which is designed as attractive as possible, so that, the students prefer to learn.
4. The description of textbook content use A4 paper, *Baar metonoia* font style, and 10, 12, and 14 font sizes. The layout of the image are variety motives, preferably in accordance with the learning materials. The language used in this book is communicative language. So that,

the students are not bored in reading. In this case the choice of words (diction) is also very important.

F. The Importance of Development

The importance of the development textbook is helping the natural science teacher in the learning process. In general, the shortage or absence of the textbooks contained experiments and deepening of the material in the textbook of natural science in grade 5th MIN 2nd of Malang.

This textbook also expected can help the Natural Science teachers in learning, and students will be easier to understand the concepts of Natural Science. So that, it can be used to reduce the Natural Sciences learning which apply the memorizing method is. Because of the essentially Natural Sciences learning is a process, learning to observe, collect data, process data, interpret the data, then concluding. Therefore, this textbook is essential to develop.

G. The Assumptions and Limitations of Development

1. Assumptions

Some of the assumptions that underlying the research are:

a. Through the textbook, this simulation method will facilitate by teachers and students in the learning process.

b. Through the preparation of the textbooks the simulation method which are designed interactive as possible with students, so that students will be more interested, motivated, and controlled in learning by using learning tools for make it easy to understand the concept of Natural Sciences learning materials.

c. The result of students' understanding is earnest done and truly reflects the level of understanding of the water cycle of the material.

d. The absence of scientifically materials through the simulation method.

2. **Limitations of Development**

a. Discussion material

The development of Natural Sciences textbook is only limited to the subjects of Natural Science for the 5th grade *SD/MI* second semesters which consists of the following subjects:

1) Recycling process water.
2) The types of water.
3) The human activities that can affect the water.
4) The benefits of water.
5) The saving water measures.
6) The water processing.

b. Subjects Research

The subject of this research is students at the 5th Grade of MIN 2nd of Malang.

c. Place of Research

The Islamic Elementary School State 2 Malang Jl. Kemantren II/ Bendung Rejo Sari Sukun Malang.

H. The Definition of Key Terms

To avoid the misunderstanding in this study, the definitions of key terms that related to the study will be presented as follows:

1. Development

   Development is a systematic process in order to develop textbooks to produce the Natural Science textbooks for 5th grade of Elementary School.

2. Instructional material

   Instructional material is one of the supporting teaching and learning activities. In this study, the Instructional materials of textbooks is the question that grip by teachers and students as tools/media in the scientifically learning process at the 5th grade of Elementary School.

3. Simulation

   Simulation is the teaching method that uses a presentation for their learning experience which is using a mock situation to understand about concept, principle, or specific skills.[10] Because the students can not directly study the learning process to observe the water cycle process, it takes a long time if people study and observe directly of the water cycle process. People have to wait the water evaporated become cloud and rain. Therefore, the author chose to simplify the simulation of learning method.

[10] Iif Khoiru Ahmadi dan Sofan Amri, *loc. cit.*

4. Hydrology

Hydrology is the study about the water. In this case, the hydrology will discuss about: water cycle, water types, kind of rain, things that affect water and water benefits, etc.

I. Systematic of Writing

Systematics of the writing this study is planned to organize into six chapters that Chapter I until Chapter VI, complemented to a bibliography and appendices.

Chapter I is an introduction: (a) the background of the problem, (b) formulation of the problem, (c) the purpose of development, (d) the benefits of development, (e) product specifications are developed, (f) the importance of the development, (g) the assumption and limitations, (h) the definition of key term, and (i) systematic discussion.

Chapter II is review of the literature, that contains: (a) previous study, (b) the study of theory which consists of 1) learning, 2) simulation method, 3) Instructional materials, 4) definition of development, 5) water cycle.

Chapter III is research method that contains, (a) the model development, (b) the development of procedures, (c) test the product.

Chapter IV is the exposure of data describing the results of research that shows the development, (a) a description of the Instructional materials development; and (b) an assessment of the product development of Instructional materials. Validation of the product development of Instructional materials contain the results of the validation of product

development consists of: 1) validation results matter experts; 2) the results of the validation study media expert; 3) the results of validation studies teachers of natural science iv class mi; and 4) the results of field trials.

Chapter V is a discussion that contains: (1) the analysis of the development of Instructional materials, (2) analysis of the level of effectiveness, and attractiveness efficiency instructional material science class V MI through simulation method; and (3) revision of product development.

Chapter VI is Conclusion, this chapter contains: (a) the conclusion of the development; and (c) suggestions.

Bibliography is a list of the books that included several titles, author names, publishers, and etc, which are placed at the end and are arranged based on alphabetically. Bibliography serves to provide the direction for the readers who want to continue the writing for the assessment or re-checking of the papers the relevant.

And the last is the attachment that contains the required documents that support the writer or the reader in the process of development of Instructional materials.

CHAPTER II

STUDY OF LITERATURES

A. The Previous Studies

Some related researches relevant to the instructional development material that made by researchers are:

Research on the instructional development material or textbooks have many done included in subjects the Natural Sciences, such as follows:

"Pengembangan Bahan Ajar Ilmu Pengetahuan Alam Materi Gaya dengan Model Learning Cycle 5 Fase untuk Peserta didik Kelas IV MI Islamiyah Pakis Tumpang I." [1] Written by Ayu Muhayyinah in 2012, this study makes instructional materials natural science learning in the form of printed book that discusses about the matter of energy with learning model of Model Cycle Phase 5 in 4th grade of Islamic primary school.

While the study by Nuril Nuzulia the idea in 2012, entitled: "*Pengembangan Buku Ajar Ilmu Pengetahuan Alam Madrasah Ibtidaiyah Melalui Penambahan Metode Praktikum dan CD Pembelajaran."*[2] In this study discusses about developing instructional materials such as textbooks on the subjects of natural science and the practical method and CD learning in 4th grade Islamic primary school.

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[1] Ayu Muhayyinah, *Pengembangan Bahan Ajar Ilmu Pengetahuan Alam Materi Gaya dengan Model Learning Cycle 5 Fase untuk Peserta didik Kelas IV MI Islamiyah Pakis Tumpang 1,* Sekripsi. Program Studi Pendidikan Guru Madrasah Ibtidaiyah. UIN MALIKI Malang. 2012

[2] Nuril Nuzulia, *Pengembangan Buku Ajar Ilmu Pengetahuan Alam Madrasah Ibtidaiyah Melalui Penambahan Metode Praktikum dan CD Pembelajaran,* Skripsi. Program Studi Pendidikan Guru Madrasah Ibtidaiyah. UIN MALIKI Malang. 2012

"Pengembangan Bahan Ajar Ilmu Pengetahuan Alam Materi Cahaya dengan Pendekatan Keterampilan Proses Peserta didik Kelas V MI Miftakhul Huda Kedung Bunder."[3] Studying was conducted by Ammalia Fitriany in 2013 to develop instructional material such as books on the teaching of natural sciences of light materials with using the process skills approach of students in 5th grade Islamic primary school.

From the several studies that may conclude the research written by three researchers, both develop instructional material in the form of textbooks on the subjects of science nature. And the difference is in the focus of the study site as the place to study for each researcher and the object used as instructional material research and product development resulting from their research.

Research development to be examined in this research is the development of instructional material in material science Hydrology (Water) by using simulation methods in 5th grade Islamic primary school.

B. Study of Literatures

1. Learning

a. Definition of Learning

The understanding of learning proposed by Miarso states is education efforts that undertaken intentionally, with the goals which is set before the process carried out, as well as the implementation of

[3] Ammalia Fitriani, *Pengembangan Bahan Ajar Ilmu Pengetahuan Alam Materi Cahaya dengan Pendekatan Keterampilan Proses Peserta didik Kelas V MI Miftakhul Huda Kedung Bunder,* Sekripsi. Program Studi Pendidikan Guru Madrasah Ibtidaiyah. UIN MALIKI Malang. 2013

control. While Winkell argues that learning is a set of measures designed to support the learning process of students, taking into account extreme events that lead to the chain of events that take place internally experienced students. In another sense Winkel defines learning as the arrangement and creation of external conditions such that support the learning process of students and does not slow him down.

Meanwhile, according to Gagne learning as setting events carefully in order to enable the learning and making it successful. Further Gagne proposed definition of learning that is intended to produce a learning lesson, the external environment has to be designed in such a way as to enable, support and maintain internal processes contained in any learning event.[4]

Some understanding of learning above can be deduced as follows:

1) Learning is a conscious and intentionally effort.
2) Learning to make the students learn.
3) Learning objectives should be set before the learning process implemented.
4) Implementation of learning control, eithers the content, timing, process, and outcome.

Natural science learning, in the learning process emphasizes providing direct experience to develop competence in order to explore and understand about scientific nature. Scientific attitude is limited to

[4] Eveline Siregar dan Hartini Nara, *Teori Belajar dan Pembelajaran, (*Bogor: Ghalia Indonesia, 2011), hlm. 12-13.

the scientific attitude towards the natural surroundings. There are nine basic scientific attitudes that can be developed in the elementary school students, would like to know attitude, an attitude of wanting to get something new, cooperative attitude, an attitude of despair, not speculative attitude, introspective attitude, responsible attitude, free thinking and self-discipline attitude. The ninth aspect of the development of scientific attitude in learning science students expected to establish a more personal responsive and responsive to natural conditions in the surrounding environment.

Natural science learning a whole is learning that includes four nature of natural science. Where the concepts, laws and theories should not be taught to students as knowledge has become the living remembered, but should always be arranged so that the students also learn how to get that knowledge. So the teaching or learning science in elementary school should be modified according to the stage of cognitive development. Natural Science for kids can be defined by: (1) to observe what happens to the subject of observation; (2) try to understand what has been observed; (3) use new knowledge to predict what happens to the subject of observation; (4) test the predictions under conditions to see if the prediction was right.

b. Learning Reference to Islamic Theology

1) Definition of learning Reference to Islamic

Islamic education by ahmad D Marimba is a physical and spiritual guidance based on the laws Islamic religion toward the formation of a major personality according to Islamic criteria.[5] In line with the above opinion, according Chabib Thoha Islamic education is a basic educational philosophy and goals as well as theories that are built to carry pandidikan practices based on basic values of Islam are contained in the Qur'an and Hadith.[6]

So the values of Islamic education are traits or things attached to Islamic education is used as a basic human to achieve the goal of human life is dedicated to God Almighty. These values need to be instilled in children from childhood, because at that time is the right time to instill good habits to her.

2) Foundations and Objectives of Islamic Education Value

a) Foundation Value of Islamic Education

Islamic education is very individualized attention and social arrangement that brings its adherents on the application of the teachings of Islam into everyday behavior. Therefore, the existence of the source and foundation of Islamic education should be the same as the sources of Islam, namely the Quran and As Sunnah.[7]

[5] Ahmad D. Marimba, Pengantar Filsafat Pendidikan (Bandung : Al Ma'arif, 1989) hlm.21

6 HM. Chabib Thoha, Kapita Selekta Pendidikan Islam, (Yogyakarta: Pustaka Pelajar, 1996), hlm.99

7 Abdurrahman An Nahlawi, Pendidikan Islam di Rumah, Sekolah dan masyarakat (Jakarta : Gema Insani Press, 1995), hlm. 28

The underlying philosophy of life throughout the Islamic educational activities is a way of life that Muslims are noble values that are universal ie Qur'an and Sunnah that is authentic also the opinion of the Companions and scholars as an extra. This is in line with the opinion of the Marimba D. Ahmad explained that the foundation or basic education comparable to building so that the contents of Al-Quran and Al-Hadith into pondamen, as a source of strength and determination remain educational establishment.[8]

(1) The Qur'an

The position of the Qur'an as the source can be seen from the content of surah Al Baqarah verse 2:

ذَٰلِكَ ٱلۡكِتَٰبُ لَا رَيۡبَۛ فِيهِۛ هُدٗى لِّلۡمُتَّقِينَ ٢

Meaning: Book (Al-Qur'an) is not any doubt, guidance for those who fear Him. (Surat al-Baqara: 2).

Furthermore, Allah SWT says in the letter Ash Shura verse 17:

أَنۡ أَرۡسِلۡ مَعَنَا بَنِيٓ إِسۡرَٰٓءِيلَ ١٧

Meaning: Allah sent down the Book with the truth and lose the balance of justice. (QS.Asyuura: 17).

In the Qur'an there are teachings which contains the principles relating to the activities or business education. As an

[8] Ahmad D. Marimba, *op. cit.*, hlm.19

example can be read in the story that Luqman taught his son in a luqman verse.[9]

(2) As Sunnah

After the Quran, Sunnah Islamic education makes a base and a source of curriculum. Sunnah literally means path, method and program. In case the term sunnah is described through a saheeh sanad whether it be words, or deeds of the Prophet Muhammad. [10]

As the Qur'an Sunnah contain clues to human welfare in all its aspects that foster human become pious Muslims. In the world of education avail Sunnah has two very large, namely:

- Explaining the Islamic educational system that is contained in the Qur'an or explain things that are not contained therein.
- Summing up the education method of the Prophet's life with her children and planting of faith into the soul does.

c. Standard of Learning Effectiveness

Definition of effectiveness in general shows how far the achievement of a specified goal first. This is in accordance with the definition of effectiveness according to Hidayat which explains that: "Effectiveness is a measure of how far the target states (quantity, quality and time) has been reached. Where the greater percentage of target

[9] Zakiah Daradjat, et. al,Ilmu Pendidikan Islam, (Jakarta : bumi Aksara, 2000), cet. IV, hlm. 20.

10 Abdurrahman An Nahlawwi, *op. cit.*, hlm. 31

achieved, the higher the effectiveness." The definition of the effectiveness by Budi Prasetyo Saksono (1984) is: "Effectiveness is the extent of attachment of output achieved with the expected output of a number of inputs."[11]

Effectiveness of these notions can be concluded that the effectiveness is a measure of how far the target states (quantity, quality, and time) that has been achieved by the management, in which the target is determined in advance.

It can be deduced that, learning effectiveness is a measure that has achieved that result from a conscious effort to make the students learn the teacher, ie the occurrence of behavioral changes in students' self-learning, where change is the acquisition of new skills applicable in a relatively long time and because of the effort. Learning can be said to be effective if the goal of learning can be achieved exactly in accordance with predetermined objectives

b. **Learning Components**

According to Kemp, Morrison & Ross in the learning, there are components related to the process of learning, namely:

1) Students

Students are someone who follows a program of education in schools or other educational institutions, under the guidance of a teacher. However, students do not be considered as a study

[11] Fikri, Muhammad, *Pengertian Efektivitas.* http://dansite.wordpress.com/pengertian-efektifitas,diakses pada tanggal 17 juli Jam 15.00WIB.

object that does not know anything. He has a background, interests, and needs and different abilities. For students, as the impact of accompaniment the form of applied knowledge or in other ability a as a transfer of learning that will help them achieve the development of wholeness and independence.

As a professional teacher should do is create a learning conducive situation so that learning objectives can be achieved and the students feel comfortable and motivated in their learning. Due to several factors influenced students before and during learning such as physical exhaustion, sleepy, bored, or saturated which can reduce concentrations. And mentally exhausted because of too much learning can also reduce the comprehension in understanding the next instructional material.[12]

So as a professional teacher should be a teacher to understand the physical and psychological condition of the students to the learning process so that learning objectives can be achieved.

2) Learning Objectives

Each formulation of learning objectives is always developed on the terms of competence or performance that

[12] Dewi Salma Prawiradilaga, *Prinsip Desain Pembelajaran,* (Jakarta: Prenada Media Group, 2008), hlm. 17-18

must be owned by the learner.[13] According to W. Gulo, the term competence is understood as the ability, skills visible and invisible. Ability looks was called performance (appearance). Performance in the form of behavior that can be demonstrated, so it can be observed, it can be seen, and can be felt. While the ability of so-called competence that does not seem rational, which is known as the Bloom's taxonomy of cognitive abilities, affective, and psychomotor. Both are inter-related competencies.[14]

Each learning activity the teacher must understand the standards of competence, basic competence and objectives of learning activities that will be achieved. In preparing the purpose of learning activities teachers should consider aspects of cognitive, affective, and psychomotor.

Additionally for the purpose of learning science from time to the time changes are the result of the previous period renewal objectives. The purpose of learning science currently includes three aspects, namely developing students' understanding of the nature, to develop the skills necessary to acquire or cultivate new knowledge and develop positive attitudes. Seen from the point of view of the taxonomy

[13] Ibid, hlm. 18

[14] Wina Sanjaya, *Strategi Pembelajaran Berorientasi Standar Proses Pendidkan*, (Jakarta: Prenada Media Group, 2009), hlm. 59-60

educational objectives, learning objectives science that includes three domains are knowledge, skills and attitudes. Realm of knowledge consists of 3 groups: scientific knowledge (principles, laws, theories and concepts network); nature of science (natural science usefulness, limitations of science and the processes of formulating knowledge in the natural sciences); the relationship between natural science with other fields (the role of science in society, social and cultural implications of science and the relationship between science, technology and society).

Natural science subjects in primary school aims to enable students to have the following capabilities: (1) obtain confidence of the greatness of Almighty God based on the existence, beauty, and order of his creation, (2) develop a knowledge and understanding of science concepts that useful and can be applied in everyday life, (3) develop a curiosity, a positive attitude and an awareness of the existence of a relationship of mutual influence between science, the environment, technology and society, (4) develop skills to investigate the nature around, solve problems and make decisions, (5) increase the awareness to participate in maintaining, protecting and preserving the natural environment and all its regularity as one of God's creation, and (7) obtain a

stock of knowledge, concepts and skills of science as a basis for continuing education to junior high school or Islamic junior high school.

In order for natural science learning goals can be achieved optimally, both the curriculum and the approach and methods applied learning and instructional material and media used should match the characteristics of the natural sciences and age student progress of elementary school.

3) Method.

Method is a way of learning that can be done to help the teaching-learning process in order to run properly,[15] one such method is a method of role playing/simulation method is a way of mastery learning materials through the development and appreciation of the students.

4) Assessment

Assessment includes two things, namely teaching and learning. Assessment study conducted to see the achievement of learning objectives that can be achieved. In other way the assessments also learning process.[16] This assessment aims to factor inhibiting learning can be overcome so that the process of learning that will come will be more easily and smoothly.

[15] Dewi Salma Prawiradilaga, *Prinsip Desain Pembelajaran,* (Jakarta: Prenada Media Group, 2008), hlm. 18

[16] Ibid. hlm. 19

2. **Simulation methods**

a. **Definition of Simulation Methods**

Simulation comes from the word "*simulate*" which means to pretend or fake as like reality. As a teaching method, the simulation can be defined how the presentation of the learning experience using mock situations to understand about the concept, principle, or a particular skill.[17] Simulation can be used as a teaching method assuming not all learning can be done directly on the actual object. According to Syaiful Bahri Djamarah, the simulation method is a way of presenting subjects with demonstrates to students the process, certain situations or objects being studied, either real or imitation that are often accompanied by verbal explanations. According to the definition of national education department, simulation method is a form of practice methods that are to develop students' skills (cognitive or skills),[18] this method to move a real situation into a learning activity or due to the difficulties or limitations to practice in situations that in fact as well as in learning activities recycled water or rain.

b. Goal Simulation Methods

The purpose of the simulation method is:

1) Training certain skills in professional as well as for everyday life.
2) Getting an understanding of a concept or principle.
3) Training to solve problems.

[17] Iif Khoiru Ahmadi dan Sofan Amri, *loc.cit.*
[18] Yogi Yogaswara, *loc.cit*

4) Increasing active learning.
5) Providing motivation to students.
6) Training students to conduct cooperation in group situations.
7) Increasing the creativity of students.
8) Training students to develop tolerance.
9) In order for the learning process more interesting for students.
10) Minimize one direction learning process from the teacher with this method the students are actively involved in learning process. [19]

c. **The Strengths and Weaknesses Simulation Methods**

There are several advantages to using simulation as a method of teaching, which are:

1) Simulation can be used as a preparation for students to face the real situation later, both in family life, community, or face the working world.
2) Simulation can develop the creativity of students, because through simulation students are given the opportunity to play a role in accordance with the topic being simulated.
3) Simulation can cultivate courage and confidence of students.
4) Enrich the knowledge, attitudes, and skills needed to face of problematic social situations.
5) Simulation can increase motivation students in the learning process.[20]

[19] Iif Khoiru Ahmadi dan Sofan Amri, *op.cit.*, hlm. 86

Besides having advantages, simulation also has weakness, such as:

1) Experience gained through simulation is not always appropriate and in accordance with the realities in the field.
2) If not good management, simulation is often used as a means of entertainment, so that the learning objectives to be ignored.
3) Psychological factors such as fear and shame often affect students in simulation.[21]

d. **Preconditions Implementation of Simulation Methods**

In principle in the learning process, nothing the best method of learning, that there is a proper method for studying the learning process. It means learning method is strongly influenced by the circumstances that occurred during the process of learning. Thus simulation methods are not always right at any time to be used, will depend on how the characteristics of students, teachers, learning materials and factors of existing resources.

Simulation method can be implemented effectively on condition that:

1) According to the Ministry of Education, that the method of simulation requires the availability of "material and tools are adequate to implement simulation". Readiness of teachers to guide students in implementing in simulate, means that teachers understand exactly what to do the students in simulation. Teachers

[20]lif Khoiru Ahmadi dan Sofan Amri, *op.cit.*, hlm. 86-87.
[21] Anissatul Mufarokah, *op.cit.,* hlm. 94

act as a director that impose limits and landing so what is simulated is not out of the corridors of learning objectives. Teachers should make clear planning. In this plan there should be the expected objectives and indicators of activities learning are happening.

2) Readiness of students to carry out simulation, meaning that before carrying out simulation students already understand what to do. Thus meaning this simulation method must be combined with other methods such as experiment method, functions to create pre-conditions that are conducive to the simulation.

3) Availability of sufficient time to carry out simulation. Activities must be intact, should not be disturbed because of insufficient time. This method is not suitable when used on subjects who had a relatively short time such as 2-hour lesson.

3. **Instructional Materials**

a. Definition of Instructional Materials

Abdul majid argued instructional material is a set materials arranged systematically so to create the environment/atmosphere that allows students to learn well.[22] Meanwhile, according to the national center for competency based training materials is any material used to help teachers or instructors in implementing the learning process in the classroom. And according Pannen instructional materials are materials

[22] Abdul Majid, *loc. cit.*

or subject matter systematically arranged, used by teachers and students in the learning process.[23] Abdul majid further notes that instructional material is any material used to help teachers or instructors in conducting teaching and learning. Material in question can be written material or material not written.[24]

From some views on the definition instructional materials can be concluded that any substance (whether information, tools, and text) are arranged systematically, which depicted the complete of competencies that will be controlled by the students and used in the learning process with the purpose of planning and review learning implementation. For example: textbooks, modules, handouts, worksheets, models or mockups, audio instructional materials, interactive instructional materials, and etc.

Instructional material referred to in this research is a form of text textbook. Meanwhile, according to Tarigan textbook is a book that is used as a textbook in a particular field of study, which is the standard book compiled by experts in the field for the purposes and instructional purposes, which is equipped with teaching tools that suitable and easily understood by the users in schools and colleges so can support a teaching program.[25]

[23] Andi Prastowo, *loc.cit.*
[24] Abdul Majid, *loc. cit.*
[25] Tarigan, Henry. G dan Tarigan, Djoyo, *Telaah buku teks bahasa Indonesia*, (Bandung: Angkasa 1986), hal. 13

Textbook is one of the means of the successful implementation of the learning process. Textbook learning is an integral unit that provides information, discussion and evaluation. Instructional material systematically arranged will facilitate students in learning the material that supports the achievement of learning objectives. Therefore, materials must be systematically arranged, attractive, high readability aspect, easy to digest and comply with the applicable rules of writing.

So that meant textbook is a paper in the form of books used by teachers and students in the learning process. Based on the above two opinions, it is concluded that the textbook is a form of writing that book in a specific subject, which is the standard book compiled by experts in the field are used by teachers and students in the learning process for a purpose-instructional goals and objectives, which is equipped with means of matching teaching and easily understood by the users in schools to support a program of teaching, especially in natural science learning.

b. Types of Instructional Materials

Instructional material can be divided into four kinds, namely:

1) Printed instructional material (printed), the amount of material prepared in the paper, which can serve for learning purposes or delivery of information, such as, among others, handouts, books, modules, student worksheets, brochures, leaflets, wall chat, photos/images, and models/mockups.

2) Listening instructional material (audio), that all systems use radio signals directly, that can be played or heard by a person or group of people. For example: cassette, radio, phonograph records, movies and audio compact disc.
3) Instructional material of view-listening (audio-visual), that everything probably radio signals can be combined with moving images sequentially. For example: video compact discs, films.
4) Interactive multimedia instructional material (interactive instructional material), which is a combination of two or more media (audio, text, graphics, images, animation, and video) that by its manipulated or treated for a command and control/natural behavior of a presentation. For example CAI (Computer Assisted Instruction), compact disk (CD) multimedia interactive learning and instructional material via the web method (web-based learning materials).[26]

c. The goals developing of instructional material

The purpose of making instructional material there are four that are:[27]

1) Provide instructional materials in accordance with the demands of the curriculum taking into consideration the needs of the students,

[26] Andi Prastowo,. *Panduan kreatif membuat bahan ajar inovatif*. (Jogjakarta: DIVA Press, 2012), hlm. 40
[27] Andi Prastowo, *op. cit.,* hlm. 26-27.

the instructional material appropriate to the setting or environment characteristics and social students.

2) Assist students in obtaining alternative instructional material in addition to textbooks that are sometimes difficult to obtain.
3) Allows teachers to implement learning. In order for the learning activities more attractive.

d. The benefits of making instructional materials

The benefits of making instructional material can be divided into two kinds, namely usability educators and students usability.

1) Benefits for teachers
    a) Obtained instructional material that suit the demands of the curriculum and appropriate to the needed of students.
    b) No longer dependent on the textbooks which are sometimes difficult to obtain.
    c) Enriching, because it was developed using a variety of references.
    d) Increase the knowledge and experience teachers in writing materials.
    e) Establish effective learning communication between teachers and students because students will feel more confident to his teacher.
    f) Adding credit points if collected into a book and published.
2) Benefits for Students

a) Learning activities become more interesting.

b) Opportunities for independent learning and reduce dependence on the presence of a teacher.

c) Get the ease of studying each competency that must be mastered.[28]

e. The Steps Instructional Materials Development

1) Doing analysis of controlling materials needed

Analysis requirements of instructional materials is a beginning perform process for arrange instructional materials. Inside there are three phases, namely analysis of curriculum, learning resources analysis, and determination as well as the title of instructional.

a) Analyzing the curriculum

This step is intended to define the competencies that require instructional material. Thus the instructional material are expected to be made can make the students master the competencies that have been determined. To achieve this, there are five things that must be considered:[29]

(1) Standard of competence is the ability of a minimum qualification students describe mastery attitudes, knowledge, and skills that are expected to be achieved at each level/semester.

[28] Andi Prastowo, *op. cit.,* hlm. 27-28
[29] Andi Prastowo, *op. cit.,* hlm. 50-51

(2) Basic competence is a number of capabilities that must be owned by the students in a particular subject as a reference to develop competence indicator.

(3) Indicator learning achievement. Indicator is the formulation of specific competencies, which can be used as a reference in the assessment criteria determine whether a person competent.

(4) Subject matter, the primary information, knowledge, skills, or values are structured in such a way by the teachers so that students master the competencies that have been determined.

(5) Learning experience, which is an activity designed by educators that done by the students so that they master the competencies that have been determined through organized learning activities.

b) Analyzing Learning Resources

Criteria analyze the learning resources are based on the availability, suitability, and ease of use. The trick is to inventory the availability of learning resources related with needed.[30]

c) Select and determine instructional materials

There are three guidelines in the selection of the materials:[31]

[30] Andi Prastowo, *op. cit.,* hlm. 55

(1) The principle of relevance, instructional materials selected should be relation to the achievement of standards of competence and basic competences.

(2) The principle of consistency, meaning instructional material which chosen have a fixed value and is not changeable.

(3) Sufficiency principle, meaning that when choosing instructional materials, should be sufficient to help students to mastering the basic competencies that are taught.

In addition to the above three principles, there are several steps the selection of instructional materials that also we need to understand and use as a handle, such as:[32]

(1) Identifying the aspects contained in the standards of competence and basic competences is the reference or referral selection of instructional material, such as cognitive, psychomotor, and affective.

(2) Identify the types of instructional material, such as (facts, concepts, principles, or procedures).

(3) Selecting instructional materials in accordance with the standards of competence and basic competences that have been identified.

2) Understand selection criteria of learning resources

[31] Andi Prastowo, *op. cit.,* hlm. 58
[32] Andi Prastowo, *op. cit.,* hlm..59

To make essay in the selection of learning process resource this study, there are two criteria that we can use in the selection of learning resources, the general criteria and specific criteria.[33]

a) General Criteria

In this criteria generally include four things:

(1) Economical, it means that inexpensive of learning resources. Expected of all walks of life were able to have the learning resources.

(2) Practical and simple, it means learning resources do not need the service or supply side is difficult to find and rare to get.

(3) Accessible, meaning that the source is close and easy to get.

(4) Flexible, meaning that learning resources can be used for a variety of learning goals.

b) Specific criteria

In this criteria, in the selection we have considering learning resources are as follows:

(1) Learning resources can motivate students in learning process.

(2) Learning resources for teaching purposes. That is, the selected learning resources to support teaching and learning activities should be organized.

[33] Andi Prastowo, *op. cit.,* hlm. 61

(3) Learning resources for research. That is, the selected learning resources should be observed, analyzed, recorded accurately, and etc.

(4) Learning resources to solve the problem. That is, the learning resources selected should be able to solve problems of faced by students in the learning activities.

(5) Learning resources for presentation. That is, the selected learning resources should be able to function as a tool, method, or strategy of delivering a message.

3) To arrange map instructional material

According to the Department of Education, there are three utility maps compiled instructional material, is to determine the amount of materials that must be written, knowing the sequence or the order of instructional material (the order of these materials is necessary in determining the priority of writing), and to determine the characteristic of instructional material (dependent/independent).

Dependent instructional material is instructional material related exist between instructional material with each other, so the writing should be considering for each other. While the independent instructional material are materials that stand alone or

in preparation does not have to considering or related with other materials.[34]

4) Understanding the structure of instructional material

In general, the structure of instructional material there are seven components in each instructional material: title, learn instructions, basic competency/subject matter, information support, practicum, training, assignment/work sheet, and assessment.

5) Techniques of arrange printed instructional material (book)

In the print instructional materials' preparation technique, there are several things considering are:[35]

a) Title or the material presented should be from basic competencies or subject matter to be achieved by students.

b) To arrange print instructional materials, there are six other things that need to be understood, that are:

(1) The composition of zoom is clear and interesting. In the aspect of its structure, should be arranged in the order that is easy, short title, there is a table of contents, clear cognitive structure, as well as summaries and assignments are readers.

(2) Easy language. That is, the flow of vocabulary, clear sentences, and explained the relationship between sentences, and sentences that are used are not too long.

[34] Andi Prastowo, *op. cit.,* hlm. 63
[35] Andi Prastowo, *op. cit.,* hlm. 73

(3) Able to test comprehension (understanding). This relates to the judge through a check list for his or her understanding.

(4) There is stimulant. This involves the least palatable seen printed materials, writing encourages the reader to think and examine stimulant.

(5) Legibility. This involves the use of the letters that are not too small and not too large so easy to read. Additionally text should also be structured order and easy to read.

(6) Instructional materials. This involves selecting the text, study materials and worksheets.

4. Definition of Development

Definition of research by Brog and Gall development is a process used to develop and validate educational products. This research follow the steps or process development consists of the study of the findings of the research products will be developed, to develop products based on the findings, conduct field trials, and to revise the results of the field test. Meanwhile, according to other Seels & Richey research development are: development research, as appose to simple instructional development, has been defined as the systematic study of designing, developing and evaluating instructional programs, process and products that must meet the criteria of internal consistency and effectiveness.[36]

[36] Punaji setyosari, *Metode Penelitian Pendidikan,* (Jakarta: Kencana, 2010), hlm. 194-195.

Development research is research that oriented to develop and validity product that use in research. According to Dick and Carey there are ten steps in developing instruction, are: identify an instructional goal, conduct an instructional analysis, identify entry behaviors and characteristics, write performance objectives, develop criterion-referenced test items, develop an instructional strategy, develop and or select instruction, design and conduct the formative evaluation, revise instruction, conduct summative evaluation.

5. Hydrology

a. Definition of hydrology

Hydrology is a science that studies the incidence, the cycle and the spread of water in the atmosphere and the surface of the earth and under the surface of the earth. Meanwhile, according to Sri Harto hydrology is the study about the water, occurrence and distribution, and the nature of its chemical properties, as well as his reaction to human needs.[37]

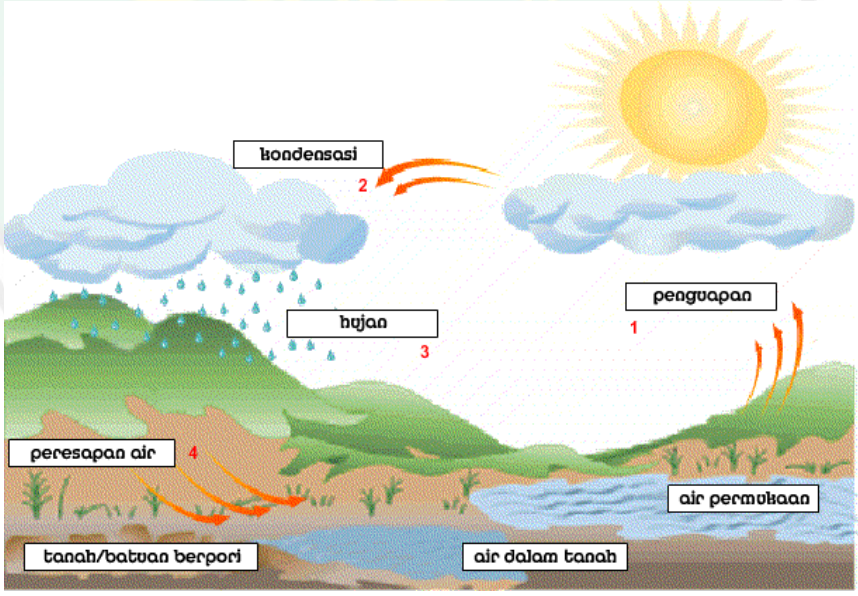
b. The water cycle (Cycle Hydrology)

Hydrological cycle, the circulation of water on earth is endless, start from rain to seep into the earth. Some water seep into the ocean, some flowing into the channels and lakes. At the same time the water began to phase reverse the cycle, ie evaporation (*dots).* Majority actually has evaporated water during rains; was largely up from the wet ground, from rivers and lakes, from the leaves of plants, and especially of the

[37] Sri Hrto, *Analisis Hidrologi*, (Jakarta: PT Gramedia,1993), hlm.6.

ocean. The water has evaporated, gathered in the clouds: if the cloud it be cold, there was an outpouring of-the cycle repeats.[38]

Recycled water is water changes that occur with a certain pattern continue. When the weather is warm the earth, the water from the land and sea evaporated (evaporation) and gathered steam in the atmosphere. In the collection of atmospheric water vapor into clouds, clouds move with the wind to a higher (colder temperature) there was condensation (condensation). Water droplets in the cloud more and more eventually fall to earth in the form of rain (precipitation). On earth, the water flows into the river, and returned to the sea. The plant uses water from the soil. The water moves from the roots to the leaves. Some of the water evaporates into the air on the leaves, called transpiration.



Picture: water cycle, resource: 4.bp.blogspot.com

[38] Luna B. Leopold, Kenneth S. Davis dan para Editor Pustaka Time-Life, *Air* , (Jakrta: PT Dainippon Gitakarya Printing, 1981), hlm. 41

CHAPTER III

RESEARCH METHODOLOGY

A. Types of Research

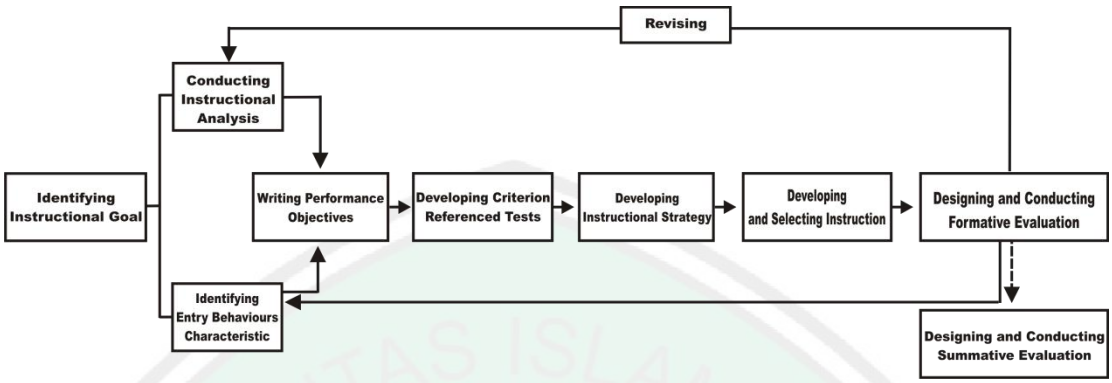
This study aimed to test the model through the development learning device product. The method which is used in this study is research and development.

Development research is a form of research that related to improve the education quality, both in terms of process and education outcomes. This consist with the research that will be aimed to develop the product which is made by researcher, that talk about textbooks through the lab simulation method which is devoted to teach natural science at 5^{th} grade students in Islamic Elementary School. This product is expected to help the teacher in teaching natural science concept for students.

B. The Developing Model

This study uses the conceptual development model by Dick and Carey instructional design that follow the basic pattern.

Picture planning in learning process according to Dick & Carey Model (Dick & Carey Adaptation) as follow:



Picture 3.1 Development Concept of Dick & Carey

Dick and Carey model is one of the procedural models. It is said that there are ten steps which is consist:[1]

1. Identifying Instructional Goal (identifying the general learning purpose). Doing a need analysis to determine the purpose of the program or product to be developed.
2. Conducting Instructional Analysis (undertaking the assessment of learning). Doing analyze of learning, which includes the skills, processes, procedures, and learning tasks to achieve the learning objectives.
3. Identifying Entry Behaviors Characteristics (recognize the behavior and students characteristics). The students analyze and contexts, which includes the ability, attitude, and baseline characteristics of learners in the learning setting. And, also including the characteristics of learning setting in which new knowledge and skills will be used.

[1] Walter Dick and Carey, *The Systematic Design of Instruction*, (USA: Harper Collins Publishers,, 1990), page 5-7.

Step (2) and (3) can be performed either sequentially or concurrently (simultaneously).

4. Writing Performance Objectives (formulate specific learning objectives). Describe the general objectives into more specific objectives that form the formulation of performance objectives, or operational. This picture reflects the operational formulation of special-purpose programs or products, procedures are developed. The objectives specifically provide information for developing test items.
5. Developing Criterion-Referenced Test (developing benchmark test reference point). Developing assessment instruments, which are directly related specific objectives.
6. Developing Instructional Strategy (developing learning strategies). Developing learning strategies, specifically to help students to achieve specific objectives.
7. Developing and Selecting Instruction (developing and selecting instructional materials). Developing and select instructional materials, which in this case be: printed materials, manuals both for learners and learners, and other media that are designed to support the achievement of objectives.
8. Designing and Conducting Formative Evaluation (designing and implementing formative evaluation). Formative evaluation is conducted during the learning process which takes place by a view to support the process of increasing the effectiveness. Under the certain

conditions, the developer is quite up to this step. Dick & Carey, recommends a formative evaluation process that consists three steps:

a. The material prototype individually tests (one-to-one trying out).
b. The small group trial which consist of six to eight subjects.
c. The field trials which involving all subjects in the class (a whole class of learners).

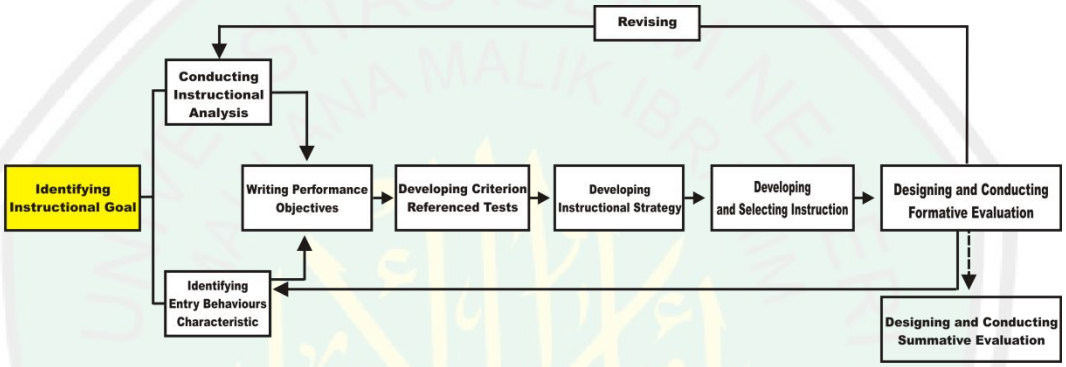
9. Revising Instruction (revising instructional materials). Revisions were done to the learning process, procedures, programs, or products that associated with the previous steps. Revisions were made to the seven steps, namely: general purpose learning, analytical learning, beginning behavior, performance, or performance objectives, test items, learning strategies, and learning materials.
10. Designing and Conduct summative Evaluation. After program or process development has been developed, the next step is to conduct a summative evaluation. Summative evaluation conducted to determine the level of effectiveness of the overall program that compared to the other programs.

C. The Instructional Materials Developing Procedure

Based on the system approach model for designing instruction, Walter Dick and Lou Carey was explained that the development of procedures in this research to follow the steps as instructed in the model design as follow:

1. Identifying Instructional Goal (Identifying the General Purpose of Learning)

   Conducting with attention and doing an assessment of the needs of students, through analysis of needed (need assessment) students of 5th Grade suitable with the demand of the curriculum.

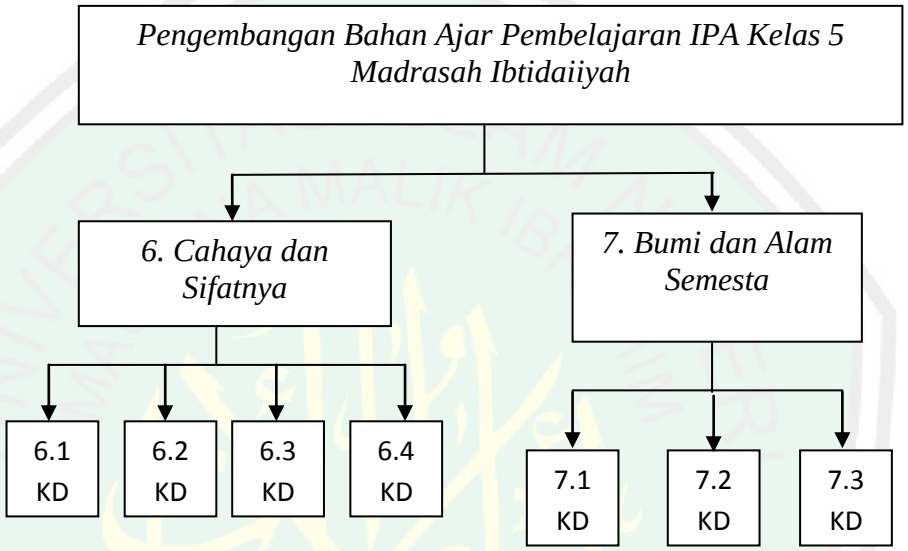


Picture 3.2 Development Concept of Dick & Carey

The first step was to identify the common goal of science learning by doing, is need analysis to determine the objectives. This step is meant to determine what it wants to be done after the students take a part in natural science learning (goal instruction). Common goals based on those identified needs analysis, curriculum subject, experts of lesson study suggestion.

To get an idea of the qualifications abilities are expected and to be held by the students after participating in learning science at The State Islamic Elementary School 5th grade and it can assess science curriculum.

This map is the common purpose of learning science for 5th grade Elementary School in 2nd semester, that shaped by cluster structure in the following chart:



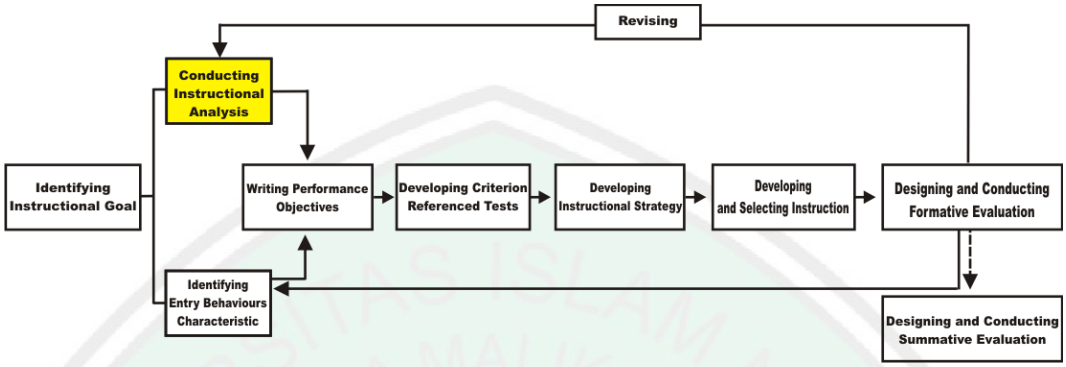
Learning Objectives Science Class V Semester II

Material Water Cycle

Standar Kompetensi	*Kompetensi Dasar*
Bumi dan Alam Semesta *7. Memahami perubahan yang terjadi di alam dan hubungannya dengan penggunaan sumber daya alam*	*7.1 Mendeskripsikan proses pembentukan tanah karena pelapukan* *7.2 Mengidentifikasi jenis-jenis tanah* *7.3 Mendeskripsikan struktur bumi* *7.4 Mendeskripsikan proses Daur Air dan kegiatan manusia yang dapat mempengaruhinya* *7.5 Mendeskripsikan perlunya penghematan air* *7.6 Mengidentifikasi peristiwa alam yang terjadi di Indonesia dan dampaknya bagi makhluk hidup dan lingkungan* *7.7 Mengidentifikasi beberapa kegiatan manusia yang dapat mengubah permukaan bumi (pertanian, perkotaan, dsb)*

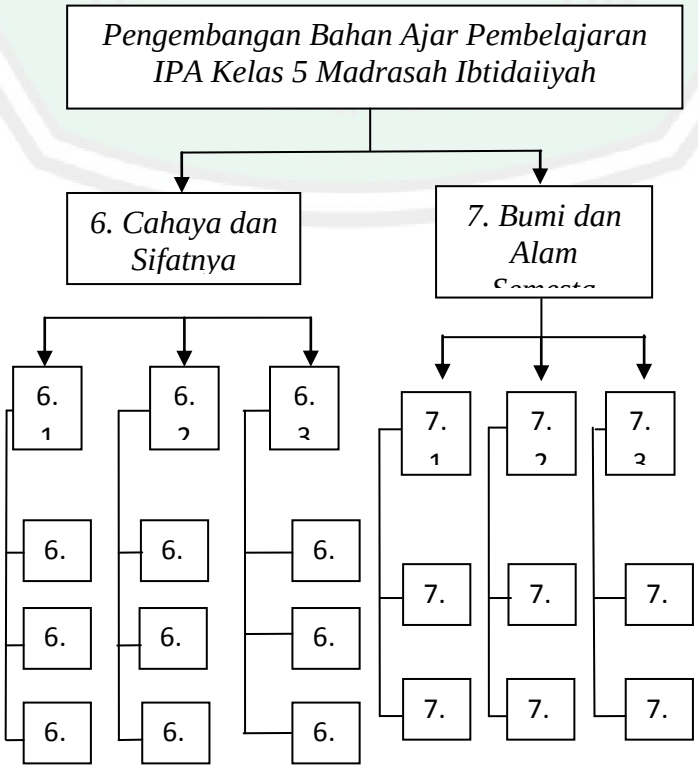
Table 3.1: Learning Objectives

2. Conducting Instructional Analysis (Doing learning analysis)



Picture 3.3 Development Concept of Dick & Carey

Doing by: (1) classify the formulation of learning objectives by domains type (psychomotor skills, intellectual skills, verbal information, attitudes), and (2) recognize the learning analysis techniques which is good to correct the learning sharply that should be done to achieve objectives until the characteristics lesson that become the research object. The objectives focused on the intellectual skills achievement. Here is the analysis of learning as follow:



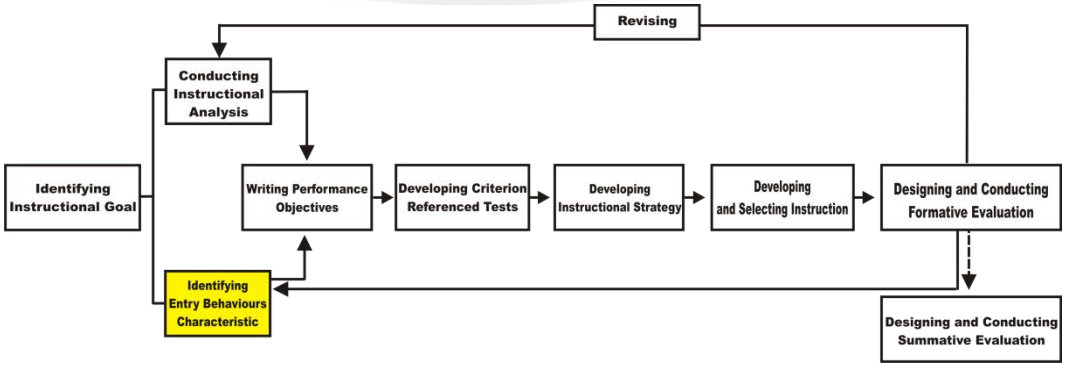
The Relationship of Analysis Indicators Basic Competence Learning

Results IPA and V Class II Semester in Water Cycle Material

Standar Kompetensi	***Kompetensi Dasar***	***Materi Pokok***	***Indikator***
7. Memahami perubahan yang terjadi di alam dan hubungannya dengan penggunaan sumber daya alam	*7.4 Mendeskripsikan proses Daur Air dan kegiatan manusia yang dapat mempengaruhinya*	***Air:*** *1. Sumber air, daur air, macam-macam daur air.* *2. Manfaat air* *3. Kegiatan manusia yang mempengaruhi ketersediaan air.*	*1. Memahami proses daur air.* *2. Menjelaskan ururtan tahapan peristiwa pada proses daur air.* *3. Memahami macam-amacam daur air.* *4. Memahami manfaar daur air bagi manusia.* *5. Menjelaskan kegiatan-kegiatan manusia yang dapat mempengaruhinya.*
	7.5 Mendeskripsikan perlunya penghematan air	*1. Menghemat air.* *2. Pengolahan air.*	*1. Menjelaskan menghemat air.* *2. Menjelaskan cara pengolahan air.*

Table 3.2: Learning Objectives and indicators

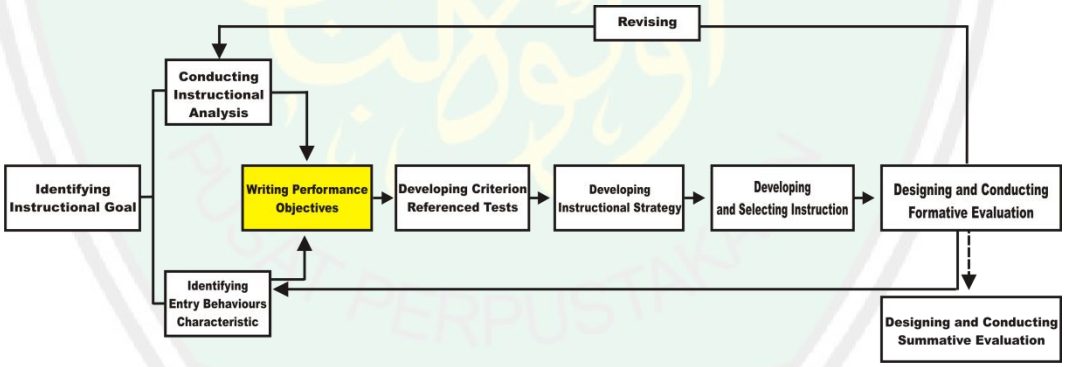
3. Identifying Entry Behaviors, Characteristics (Know the behavior and characteristics of student input)



Picture 3.4 Development Concept of Dick & Carey

In identifying the content that will be included in the study, this requires the identification of specific skills and knowledge that must be possessed by the students to be ready to enter the learning and use of instructional material. As known that instructional material of science users are learning Elementary School five grade students. In the previous step is a preliminary analysis of the Government Elementary School five grade was found still need a concrete illustration of the material explanation and it can do it by simulation practice.

4. Writing Performance Objectives (Formulating Learning Special Objectives).



Picture 3.5 Development Concept of Dick & Carey

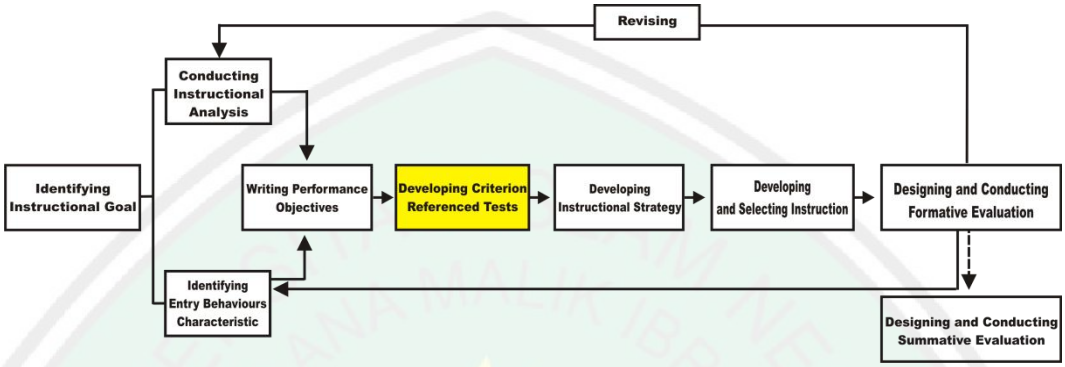
The objective specification of learning is formulating the ability or behavior that is expected to hold by students after following in particular learning program. The ability or behavior must be specifically formulated and operational, so that it can be observed and measured. Thus, the level of student achievement in the existing behavior in specific learning objectives can be measured by tests or

other measuring device. Writing specific learning objectives is used as the basis for developing the instructional strategies and developing learning test grating. Based on the analyze of learning results, it is against two general formulation of learning objectives generally and identify the characteristics and beginning abilities for students in the 5th Grade Elementary School.

Basic Competencies and Learning Objectives of the Basic Competence that can be Achieved Students in Fifth Grade Science Lesson Material Recycling water

Kompetensi Dasar	***Tujuan Pembelajaran***
7.4 Mendeskripsikan proses Daur Air dan kegiatan manusia yang dapat mempengaruhinya *7.5 Mendeskripsikan perlunya penghematan air*	*1. Siswa mampu menjelaskan proses daur air.* *2. Siswa mampu menjelaskan ururtan tahapan peristiwa pada proses daur air.* *3. Siswa mampu memahami macam-amacam daur air.Siswa mampu menyebutkan hasil fotosintesis.* *4. Siswa mampu memahami manfaar daur air bagi manusia.* *5. Siswa dapat menjelaskan kegiatan-kegiatan manusia yang dapat mempengaruhinya.* *6. Siswa mampu menjelaskan menghemat air.* *7. Siswa mampu enjelaskan cara pengolahan air.*

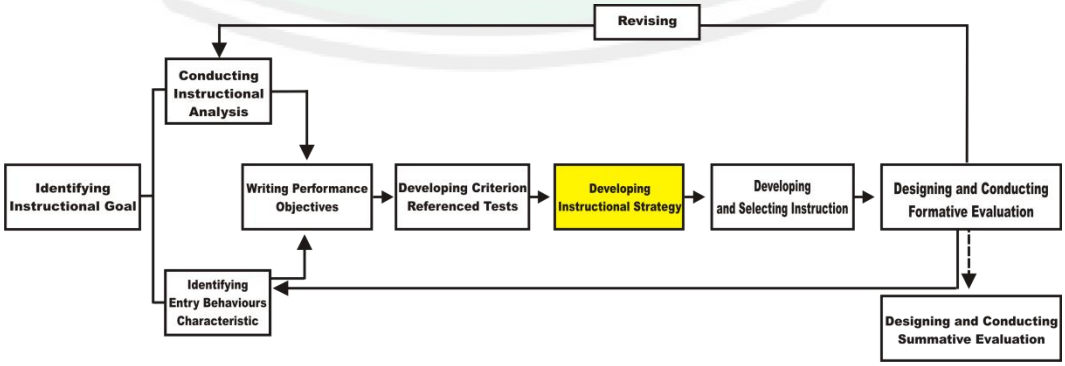
5. Developing criterion referenced test (Develop a test point of reference Develop a test point of reference)



Picture 3.6 Development Concept of Dick & Carey

To measure the ability of students to achieve what has been stated in the objectives learning, as in the process of collecting data and information that can be used to revise the learning process. To develop this measurement is made through the written theory test, the specific learning objectives to be achieved largely includes cognitive domains. Besides, the written theory test and practice test also developed to measure psychomotor skills students.

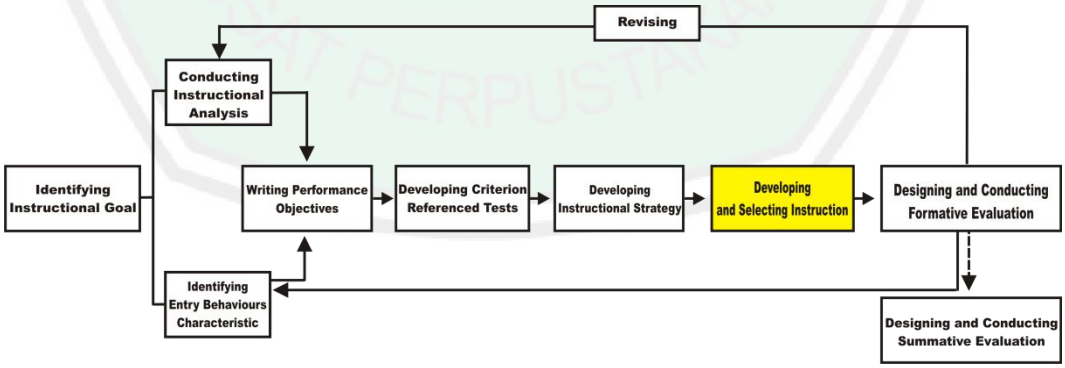
6. Developing instructional strategy (developing learning strategies)



Picture 3.7 Development Concept of Dick & Carey

This phase is an effort to select and develop general learning components and procedures that will be used to teach the students, so the students can learn easily with their characteristics in achieving the learning objectives that have been set. The main component learning strategies include the following activities: (1) Pre-learning activities, which seek the strategies in conditioning and mental readiness when students will follow learning activities. (2) Presentation of information, the strategy to develop the materials content of presentation to be given to students to achieve the learning objectives. (3) The students role, the strategies effort mental engagement of students. (4) The learning closing, by evaluation the strategy to see the understanding and achievement students objectives in learning process.

7. Developing and selecting instruction

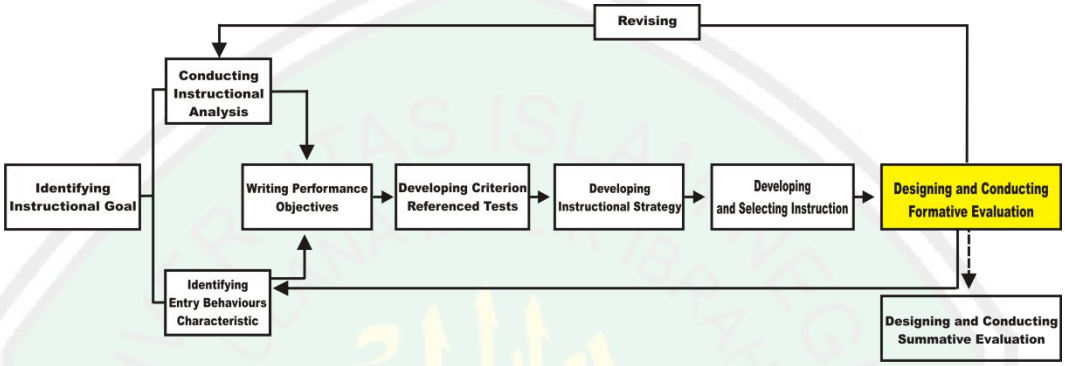


Picture 3.8 Development Concept of Dick & Carey

Principle steps this design instructional is the phase of development and the selection of instructional materials. The results of product

development in the form of printed material with the addition of the textbook method of simulation

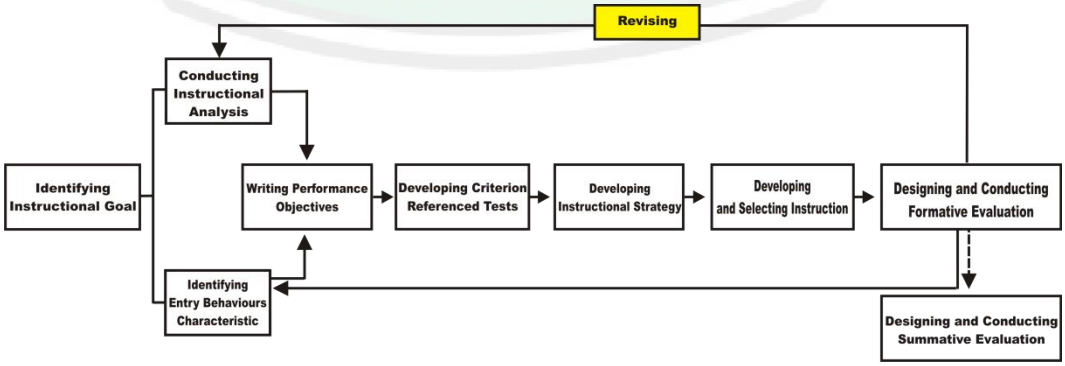
8. Designing and conducting formative evaluation



Picture 3.9 Development Concept of Dick & Carey

After learning materials produced, conducting formative evaluation. Formative evaluations conducted on two groups, that are the evaluation by experts include content expert to see the truth of the matter is presented, design experts to obtain good design developed. While the evaluations for students, there are two phases of testing at small groups (small group evaluation) and field test (field evaluation).

9. Revising Instruction (Revising instructional materials)



Picture 3.10 Development Concept of Dick & Carey

Data obtained from the formative evaluation were collected and interpreted to solve the difficulties faced by students in achieving the learning objectives also to revise the learning to be more effective.

The both phase of the above will be presented in the results of the development which includes the presentation of tryout data teaching materials, analysis of tryout data and revising product development.

Procedural steps in the research and development that are classified by Walter Dick and Lou Corey is similar to *Nana Syaodih* description of the implementation procedure, the research and development there are several methods used are descriptive, evaluative, and experimental.

This research was conducted with collect preliminary data about the condition of the textbooks used by the school intends to be reviewed. Then recognize the user's condition is students before conducted tryout then identify the deficiencies that exist in the learning that has lasted with using textbooks in order to analyze students' needs and then produce a product and evaluate it through a set of trials and the last phase is to test the attractiveness, effectiveness, of products that will produce in this study.

10. Designing and conducting formative summative after revising the textbook that conducted the summative evaluation. Summative evaluation conducted to obtain data to revise the learning material will be produced to make it more effective. Summative evaluation

conducted on two groups, that are evaluation of experts includes test by expert content materials subjects to see the truth content of the material presented, design experts to get god design that development, while the evaluation for students only using one phase of the test field (field evaluation). If in this phase of the students are enthusiastic in using the textbook, then revising phase of learning materials was not done.

D. The Validation of Product

At this stage to determine the feasibility of drafts produceed from the development stage so that can be improved to improve products in the form of textbooks. Validation phase in the form of comments and suggestions about product instructional materials science. Furthermore, based on the criticisms and suggestions, a revised product development in order to obtain the right products are used in learning science.

In order validation is achieved, need accuracy in the selection of design validation, subject validation, data type, data collection instruments, and data analysis techniques development of teaching materials. In detail, these things are described as follows:

1. Design Validation

   Design validation is used in this development research is validation of learning science from teachers and students as users of the product. This validation includes the validation contents and design of products. Validation aims to obtain data in the form of assessment and

suggestions validator, to know the validity of instructional materials developed and subsequently used as the based for revision.

Guidelines Indicators Questionnaire

No	Validator	Aspects of Assessment
1.	**Expert subject material of natural science.**	➢ Organization material content. ➢ Suitability to Standards of Competence teaching materials, Competence Basic, learning objectives, content material. ➢ Suitability language. ➢ Questions evaluation.
2.	**Instructional design experts**	➢ The cover design. ➢ Font type and size. ➢ Suitability and image size.
3.	**Teacher of natural science subjects.**	➢ Appropriateness of teaching materials to the curriculum. ➢ Ease of use instructional materials in the learning process ➢ Motivation of students in learning ➢ Clarity evaluation of learning.

2. Subject Validation

Subject validation or the Validator textbook consists of 2 Lecturer in program study of teacher education for Islamic primary school (*PGMI*) and a custodian of teachers teaching natural science at MIN 2nd Malang. Criteria each validator is as follows:

a. Lecturer validation contents of the textbook 5th grade science

1) Lecturer in study program of teacher education for Islamic primary school who competent in the field of science primary school.
2) Understanding about science lab.
3) Knowing the science curriculum *SD/MI*.
4) Has written a book about science and others.

b. Validation design of the book by lecturer

1) Lecturer in study program of teacher education for Islamic primary school teaching of source development and instructional media.
2) Has experience in designing books.
3) Has written textbooks.

c. Teachers teaching of science

1) A teacher who has experience teaching science.
2) Understanding about science lab.
3) Understanding the science curriculum in primary school (*SD/MI*.)

E. The Testing of Products

1. Product Design

In education, product design such as new teaching methods can be directly tested, after validation and revised. Tryout early phase is done with simulation by using of teaching that methods. After the simulation, it can be tested on a limited group. Tryout conducted to obtain

information on whether a new teaching method that is more effective and efficient than the old methods of teaching or the other.[2]

For tests conducted with the study design experimental design with control group (pretest-posttest control group design).[3]

Group	Pretest	Treatment	Posttest
Experiment	0_1	X_1	0_2

Description:

X_1 = Learning process is using textbooks through lab simulation methods.

0_1 = Score of pretest (before using material teaching)

0_2 = Score of posttest (after using material teaching)

2. Subject of Testing Products

Test subjects in research development will be conducted in the 5th grade students will be given materials on the hydrological cycle, to know feasibility teaching materials.

3. Kind of Data

Data to be obtained in this study is a quantitative and qualitative data. Quantitative data were collected using a questionnaire in the form of a closed question pointers structured questionnaire containing product assessment in terms of both content and design and test achievement on science learning through the use of teaching materials simulation

[2] Sugiyono, *Metode Penelitian Pendidikan Pendekatan Kuantitatif, kualitatif dan R&D*. (Bandung: CV. ALFABETA,2009), hlm. 414.

[3] M. Djunaidi Ghony, *Pedoman Di Dalam Penelitian & Penilaian,* (Surabaya: Usaha Nasional, 1991), page. 91.

methods. While the qualitative data collected from the assessment results, input, feedback, criticism, and suggestions for improvements through open questionnaire.

F. The Instrument Collecting of Data

Instrument used to obtain the expected data using interviews, questionnaires, and tests of learning outcomes.

1. Questionnaire

Questionnaire was used to collect data to know response of the product of teaching materials in the form of comments and suggestions, which are then used for revision materials. While the interview is used to fulfill the data obtained through the questionnaire.

2. Test

The tests used the pre-test and post-test. Tests were conducted to collect data on the results that show changes understanding material before and after the learning process with using science textbook 5^{th} grade *SD/MI* through simulation methods.

G. Techniques Analyze of Data

Analysis techniques are used to process data from the test results the product is content analysis, descriptive analysis, and test T. These three techniques are good with characteristics of the data obtained from the data collection process as explained above.

1. Analyzing of the learning content

   Analyze of content be done with analyze group to formulate goals of science learning based on competency standards and organize the learning content that developed. Results of the analysis this development are used for the basic development of teaching materials.

2. Analyzing of Descriptive

   In the test phase, the data collected with close assessment questionnaires and open assessment questionnaire to criticism and suggestions were used material revisions or improvements. Descriptive analysis results are used to determine the feasibility of product development of teaching materials in the form of textbooks.

   As stated in point 3, the data collected can be grouped according to the type of data and grouped into two, namely: quantitative data in the form of tables or numbers and qualitative data in the form word or symbol.

   Data from the questionnaires is qualitative data was made quantitative using a four level scale criteria *Linkert* then analyzed by calculating the percentage score on each question item in the questionnaire. To determine the percentage can be used the following formula:[4]

[4] Arikunto, *Dasar-Dasar Evaluasi Pendidikan (Jakarta: Bumi Aksara,* 2003). Hlm. 313

$$P = \frac{\Sigma x}{\Sigma x_i} x\ 100\%$$ [5]

Information:

P: is the percentage eligibility

Σ x: sum total answer score validator (real value)

Σ x_i: total answer score highest (expected value)

In giving meaning and decision-making to revise the textbooks used qualifications have the following criteria:[6]

Table 3.3 Qualification Level Eligibility Based on Average Percentage

Percentage (%)	Level of validity
80-100	Valid / no revision
60-79	Quite valid / not revised
40-59	Less valid / partial revision
0-39	Invalid / revision

Based on the criteria above, the textbook is valid if it meets the criteria for a score of 80 from all the elements contained in the validation assessment questionnaires media experts, subject matter experts, learning experts, and students. In this study, the textbooks are made must meet the criteria valid. Therefore, doing revision if still not convey the criteria valid.

[5] *Ibid*
[6] *Ibid.*.

3. The analyzing of T Test

In the field trials, the data collected using questionnaires and achievement tests or achievement test (learning achievement tests). Data field trials collected by using the test early (pre-test) and final test (post-test) in order to know learning outcomes trials target group is students of 5th grade before and after using the product development of teaching materials. Techniques data analysis use Dependent Sample Test. The criteria of T test are based on the Dependent Sample T Test.

The formula that used with level 0,05% is:[7]

$$t = \frac{Md}{\sqrt{\frac{\sum D^2 - \frac{(\sum D)^2}{n}}{n(n-1)}}}$$ [8]

Information:

t = test of T for correlation sample

Md = Mean from gain between posttest and pretest

D = =Different, different between sore of pretest and posttest $(x_2 - x_1)$

d^2 = Variansi

n = Sum of Sampel

[7] Suharsimi Arikunto, *Manajemen Penelitian,* (Jakarta: PT Rineka Cipta, 1993), hal. 509
[8] ibid

CHAPTER IV

EXPOSURE DATA RESEARCH

A. Presenting Description the Results of Development Instructional Material

Instructional materials are presented with the instructional principles and specific systematics. Preparation and presentation of instructional material must be systematic in order to make easy in using for the learning process in the classroom. In this case, the materials are divided into three components are described as below:

1. Introductory section consisting of preface, standard competence and basic competences details and Indicators clues for instructional material use, table of contents:

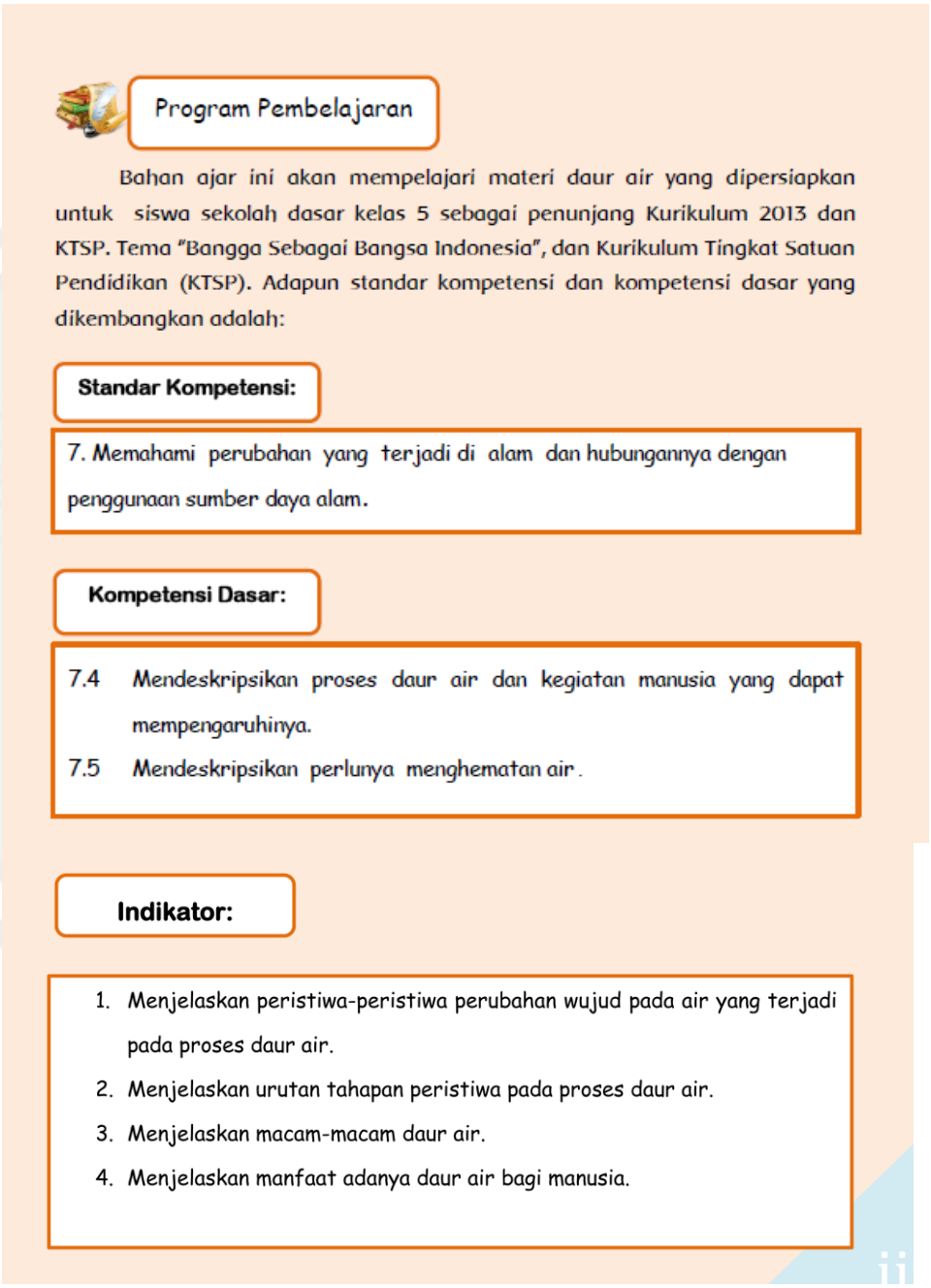
   a. Preface

      Preface made by simple language in order easy to read. In the other way to made interesting remarks for the students' interest in reading. Preface made in this interactive instructional material aim to motivate the students.

   b. The competency standards details, basic competence and Indicators

      In this component contains details of competency standards, basic competence, indicators, and objectives that must be achieved by students in learning. Overview of competence includes competency standards (*SK*), basic competence (*KD*), an indicator, and the chapter titles are a reflection of the indicator. The following is *SK* breakdown, *KD* and

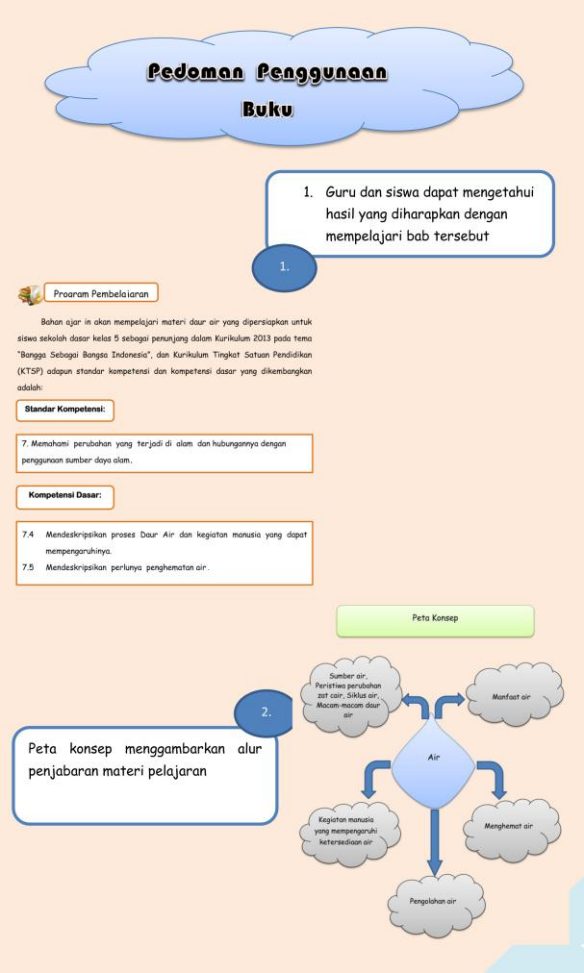
indicators on the instructional material which is developed by researchers.



Picture 4.1 Details of *SK, KD* and Indicators

c. Guidelines for the using books

Guidelines are provided to facilitate the use of the book and began to inform the reader about the purpose, the maps concept to the instructional material content.



Picture 4.2 Usage Books Guidelines

d. Table of contents

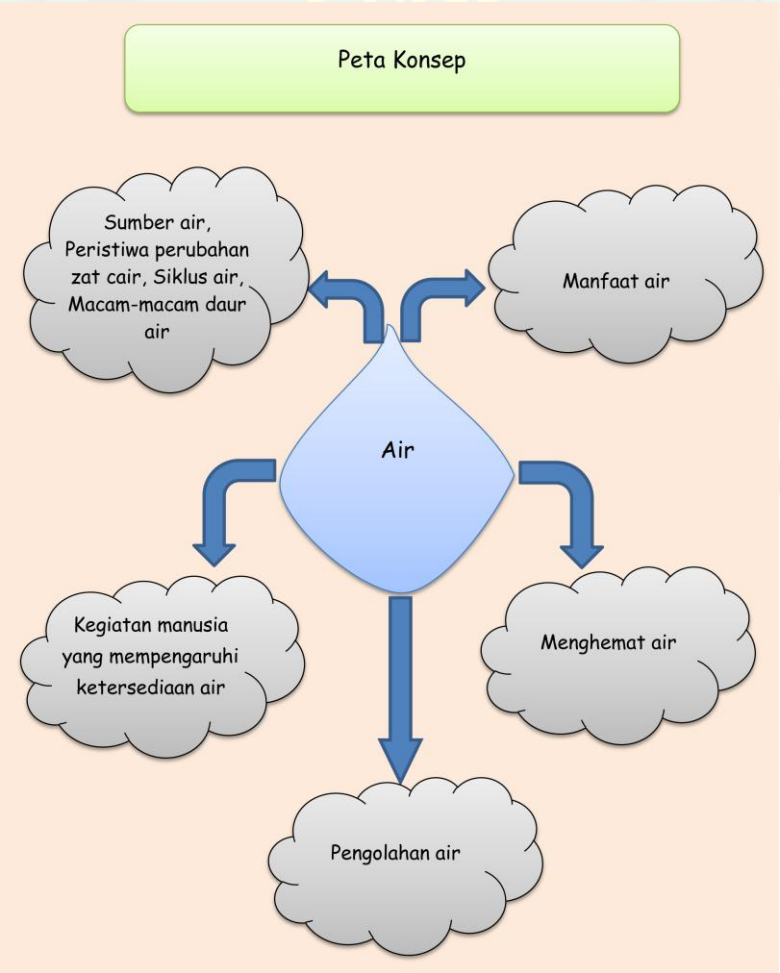
Table of contents contains whole pages on every part of the textbook from the preface until the last page.

2. Second, the core contain

The core explanation parts in the form are:

a. At the beginning of the activities contains mind mapping and introductory material.

Mind mapping as the opening chapter, in order to find out the systematic material that will be studied. The content of introductory instructional material is about the introductory material theory that has a purpose to go to hydrological cycle.



Picture 4.3 Mind Mapping

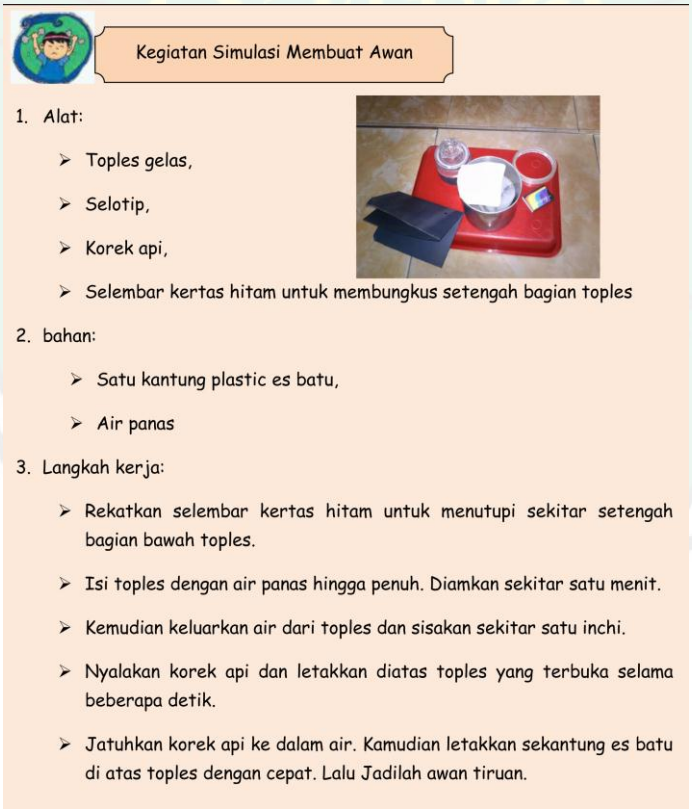
b. The core activities content are:

1) The hydrologic cycle theory

2) The practicums

3) The evaluation activities

The hydrological cycle theories describes about the water circulation from the earth to the sky and then return to the earth continuously. To complement the result, the practical has to do continuously in practical activities by observation. To determine the level of students' understanding, there are also provided several exercises.



Kegiatan Simulasi Membuat Awan

1. Alat:
   - Toples gelas,
   - Selotip,
   - Korek api,
   - Selembar kertas hitam untuk membungkus setengah bagian toples

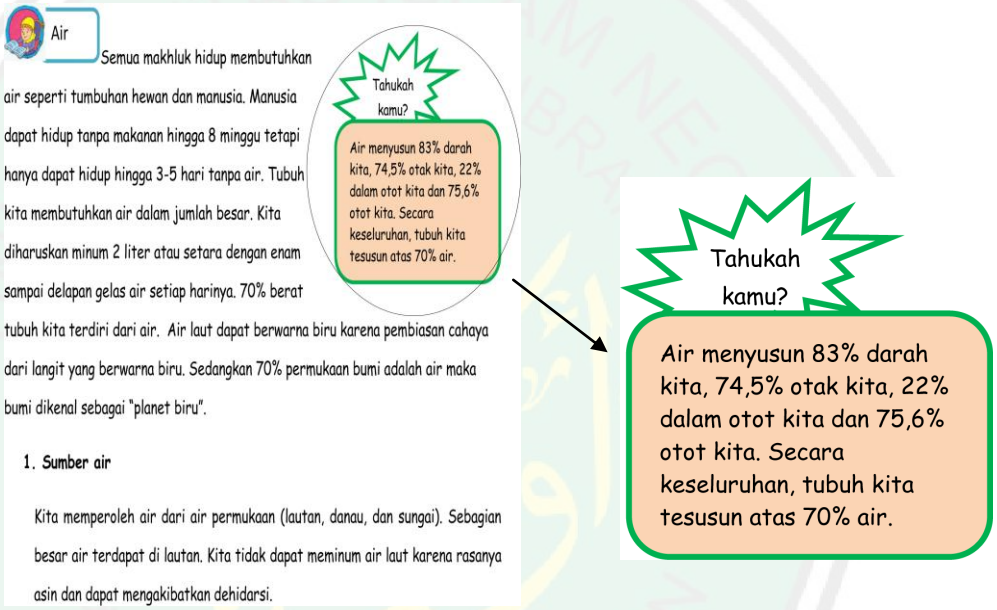
2. bahan:
   - Satu kantung plastic es batu,
   - Air panas
3. Langkah kerja:
   - Rekatkan selembar kertas hitam untuk menutupi sekitar setengah bagian bawah toples.
   - Isi toples dengan air panas hingga penuh. Diamkan sekitar satu menit.
   - Kemudian keluarkan air dari toples dan sisakan sekitar satu inchi.
   - Nyalakan korek api dan letakkan diatas toples yang terbuka selama beberapa detik.
   - Jatuhkan korek api ke dalam air. Kamudian letakkan sekantung es batu di atas toples dengan cepat. Lalu Jadilah awan tiruan.

Students perform lab activities that have been accompanied by practical guidance to facilitate activities

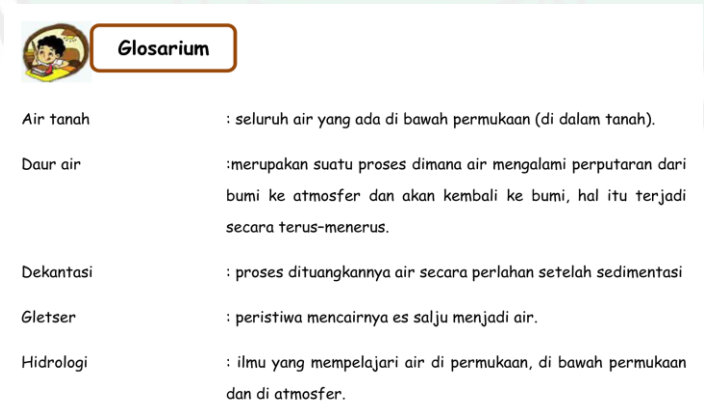
Picture 4.4 Practicum activity

3. Third, complementary parts and closing

On the complement, it is consists of knowledge snippets with the title "Do you know?" additional science, and a summary with the title "Summary." Concluding section consists of list of references and glossary that will be presented as follows.



Picture 4.5 Additional Science



Picture 4.6 Glossary

Glossary on the closing provides the collection of words that can be used by students to increase the knowledge.

Azmiyawati, Choiril dkk. 2008. *IPA Salingtemas untuk Kelas V SD/MI.* Jakarta: Pusat Perbukuan, Departemen Pendidikan Nasional.

Badan Standar Nasional Pendidikan. 2006. *Sandar Kompetensi dan Kompetensi Dasar Mata Pelajaran Ilmu Pengetahuan Alam SD/MI.* Jakarta: Depdiknas.

Datta, Shakuntala dan Diana Septiana. 2012. *Wonders of Science 5B.* Bogor: Quadra.

Haryanto. 2007. *Sains untuk Sekolah Dasar Kelas V.* Jakarta: Erlangga.

———— . 2007. *Soal dan Penyelesaian Sains 5.* Jakarta: Erlangga.

http://1.bp.blogspot.com diakses pada tanggal 3 april 2014 jam 9.00 WIB.

http://2.bp.blogspot.com diakses pada tanggal 3 april 2014 jam 9.06 WIB

http://4.bp.blogspot.com diakses pada tanggal 3 april 2014 jam 9.09 WIB

http://data.tribunnews.com diakses pada tanggal 3 april 2014 jam 9.19 WIB

Picture 4.7 List of references

List of references contains a variety of books which be used, encyclopedias, and internet resources that has been written in the full of researchers used in developing instructional material.

B. The Validation of Instructional Materials Product Development for Hydrology Natural Science material in 5th grade of SD / MI

In the description of instructional material explanation which have been developed, it shows that the next stage is product has been validated by experts, the instructional material expert design, and science teacher,

which was held on April 10th-16Mei 2014. This data present by each subject validation:

1. . **Validation Results of the Instructional Materials Expert Content**

The scientifically validation of instructional material experts content was held on 10 April 2014. Validation carried out for the faculty of science learning and State University of Islamic Maulana Malik Ibrahim Malang, was validated by Mr. Agus Mukti Wibowo, M.Pd.

The expert assessment results and response by the contents of hydrological cycle instructional material science materials as follows:

Table 4.1

Results Validate Content Expert of Instructional Materials Science

No	Criteria	Score		P	Interpretation	Specification
		X	x_1			
1.	How the formulation topic on the of natural science development in this textbooks?	4	4	100	Valid	Not revision
2.	How the suitable material presented on the development of natural science in this textbook?	4	4	100	Valid	Not revision
3.	Is the indicator in the book of student present the formulation of the basic competencies specified in *KTSP* 2006?	3	4	75	Valid enough	Not revision
4.	How is the relevant competency standard with indicators on the development of natural science in this textbooks?	4	4	100	Valid	Not revision
5.	Is learning content in this textbooks is accordance with in *KTSP* 2006?	4	4	100	Valid	Not revision
6.	How is the systematic description of learning content in natural science textbooks?	3	4	75	Valid enough	Not revision

No	Criteria	Score		P	Interpretation	Specification
		X	x_1			
7.	How does the material scope that present in the natural sciences textbook?	3	4	75	Valid enough	Not revision
8.	Is the material present through the science textbook can motivate the students to be more study hard?	4	4	100	Valid	Not revision
9.	How does the difficulty level of the language used, whether in accordance with the level of student understanding?	4	4	100	Valid	Not revision
10.	Is the evaluation instrument used to measure the ability of students?	4	4	100	Valid	Not revision
	Sum	**37**	**40**	**92,5**	**Valid**	Not revision

Description:

X: Scores of respondent by validator in one item

X_1: Score the highest response

P: Percentage rate of validity

Table 4.2

Frequency Distribution validity Level of Instructional Material

Science Content Expert

Feasibility level	F	%
Valid	7	70
Valid enough	3	30

Based on the validation data with the contents expert of the instructional material science who has been presented in Table 4.1 and 4, of the 10 the questions presented in the questionnaire declared invalid by

the 70% frequency of 7 on items 1, 2, 4, 5, 8, 9, 10 further 30% stated quite valid with a frequency of 3 on item 3, 6, 7.

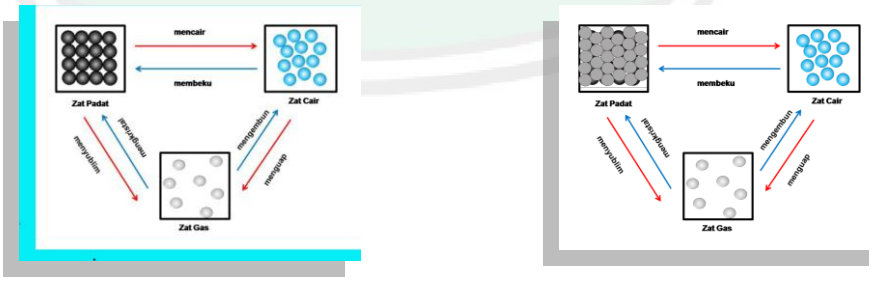
In addition to the assessment data was also obtained verbal data in the columns written notes and verbal data were transcribed from interviews with content expert instructional material science. The verbal data used qualitative data are described as follows:

a. The expert contents instructional material stated on the concept of material science that made clearly and how many liters the water that need by humans in daily live.
b. The instructional material expert content of science express the need an explanation why humans should not drink sea water.
c. The instructional material expert content need to be revised stating the phrase "In the process of water recycling occurs some change in the form of water, that events of the form of liquid water changing into a gas."
d. Content expert of instructional material science experts claim that the image on the density of states of matter change event less dense and still tenuous.
e. In the questionnaire who given instructional materials science content experts also commented on the revision of the concept of water.

Based on comments and suggestions from the content expert of the instructional materials, so that way made some further revisions as follows:

1) Clarify the information material concept of water that is: "man needs 2 liters of water a day, equivalent to six to eight glasses."
2) Clarify description the concept of water resources material that is: "We could not drink sea water because it tastes salty and can lead to dehydration (excessive thirst)."
3) Clarify the sentence needs to be revised is the phrase "In the process of water recycling occurs some change in the form of water, that is events of the form of liquid water changing into a gas." Being "In the water cycle process form a process of change, which is a form of liquid into a gas."
4) Clarify the images from the internet and images through documentation.

Example images before revision after revision



Picture 4.8 revised product

2. Validation Results of Design Expert the Instructional Materials

Validation of instructional materials with expert design held on April 10-May 12, 2014. Validation carried out for Mr. Ahamad Abtokhi, M.Pd.

The results of expert assessment and response to the design of instructional material science are as follows:

Table 4.3

Results Validation of Instructional Materials Design Expert

No	Criteria	Score		P	Interpretation	Specification
		X	X_1			
1.	Cover design in accordance with the content.	4	4	100	Valid	Not revision
2.	The font used in accordance with students' 5th grade.	3	4	75	Valid Enough	Not revision
3.	Font size used in accordance with students' 5th grade.	3	4	75	Valid Enough	Not revision
4.	The images on the books in accordance with the material.	4	4	100	Valid	Not revision
5.	The images used to attract students.	4	4	100	Valid	Not revision
6.	The layout of the in the book interesting.	3	4	75	Valid Enough	Not revision
7.	The images on the book close to the student life.	3	4	75	Valid Enough	Not revision
8.	The size of the on the right book.	3	4	75	Valid Enough	Not revision
9.	Consistent color in the book.	3	4	75	Valid Enough	Not revision
10.	Layout on the book interesting.	3	4	75	Valid Enough	Not revision
	Sum	**33**	**40**	**82,5**	**Valid**	Not revision

Description:

X: Scores of respondents by validator in one item

X_1: Score the highest response

P: Percentage rate of validity

Table 4.4

Frequency Distribution Level Expert Content validity Science Instructional Materials

Feasibility level	F	%
Valid	3	30
Valid enough	7	70

Based on the validation data with the contents of the instructional material science expert who has been presented in Table 4.3 and 4.4, of the 10 questions presented in the questionnaire stated 30% with a frequency of 3 valid on items 1, 4 and 5. Then 70% stated they were quite valid with frequency 7 on items 2, 3, 6, 7, 8, 9, 10.

In addition to the assessment data was also obtained verbal data in the columns written notes and verbal data were transcribed from interviews with content experts instructional material science. The verbal data used qualitative data are described as follows:

a. Design expert instructional materials science states that the color of cover image was not appropriate to contain and needs to be replaced to make it more interesting.
b. Design expert of instructional material science expert stated that the design of the learning programs too tightly.

c. Design expert of instructional material science claim that the origin of the source image needs to be given and a detailed explanation.

d. Design expert of instructional materials science states the selection font do not monotonic had better find writing that is often used elementary school textbooks as kind letter curriculum books 2013.

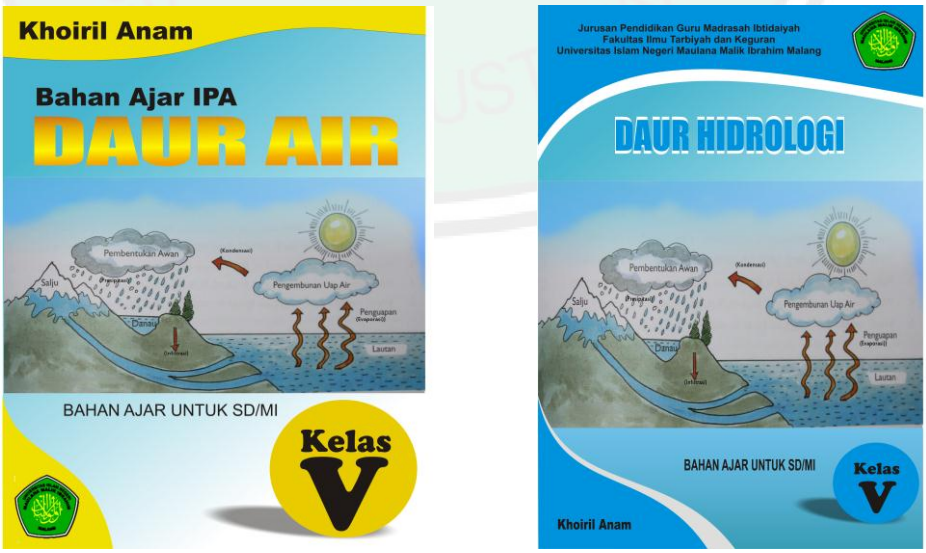
e. Design expert of instructional material science expert said on lab activities should be given picture.

f. Design expert of instructional material science experts claim that a translation of the holly Qur'an verses and tables using space 1 (one).

Based on comments and suggestions from the expert content of the instructional materials, so made some further revisions as follows:

1) Clarify the cover image with proper color selection and matching.

Example picture cover before revision Picture cover after revision

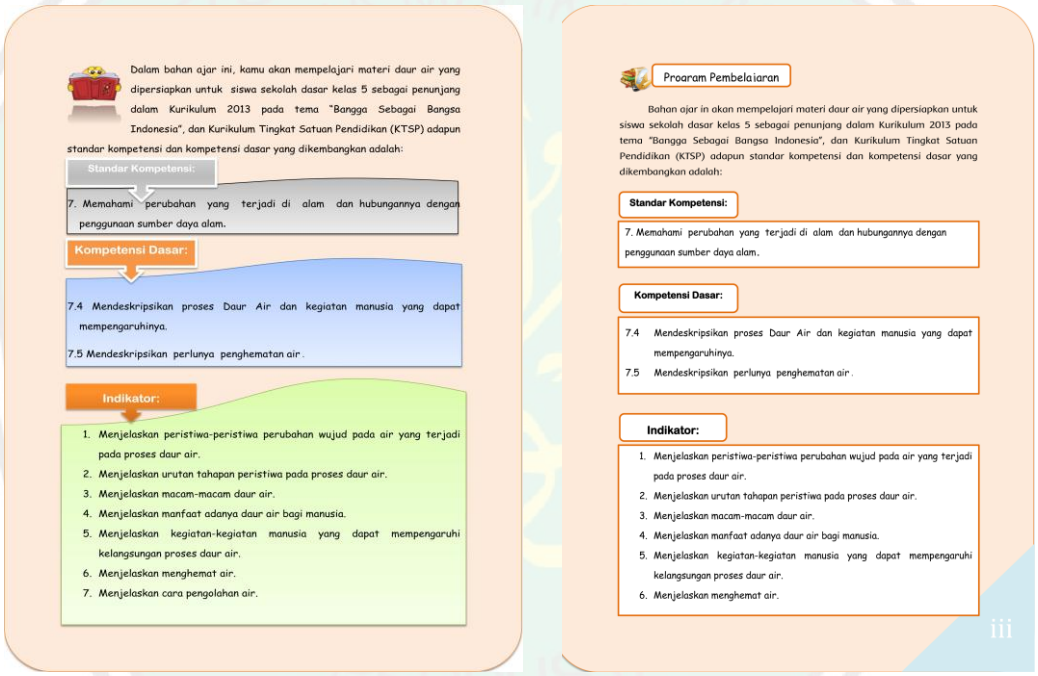


Picture 4.9 revised product

From the example of the cover before and after revision seems that has been clarified. In terms of color are already harmony, in terms of the size of font has also been fixed. So it looks more attractive.

2) The design of learning programs too tight, made simple and interesting.

Before revision after revision



Picture 4.10 revised product

There was a difference between the image before revision and after revision. In terms of design it's not too tight so it is clear to read, in terms of the colors are made more consistent. Revisions that have been made to make the image look more effective and interesting in lay out so students are more enthusiastic in reading.

3) Image needs to be the origin of the source and description in detail.

Before revision

1. Sumber air

kita memperoleh air dari air permukaan (lautan, danau, dan sungai). Sebagian besar air terdapat di lautan. Kita tidak dapat meminum air laut karena rasanya asin. **Gambar 1.1** Contoh air tawar dari danau, kolam, sungai

After revision

1. Sumber air

Kita memperoleh air dari air permukaan (lautan, danau, dan sungai). Sebagian besar air terdapat di lautan. Kita tidak dapat meminum air laut karena rasanya asin dan dapat mengakibatkan dehidarsi.

(a) (b) (c)

Gambar 1.1 (a) air tawar dari danau, (b) kolam, (c) sungai *Sumber http://images.detik.com*

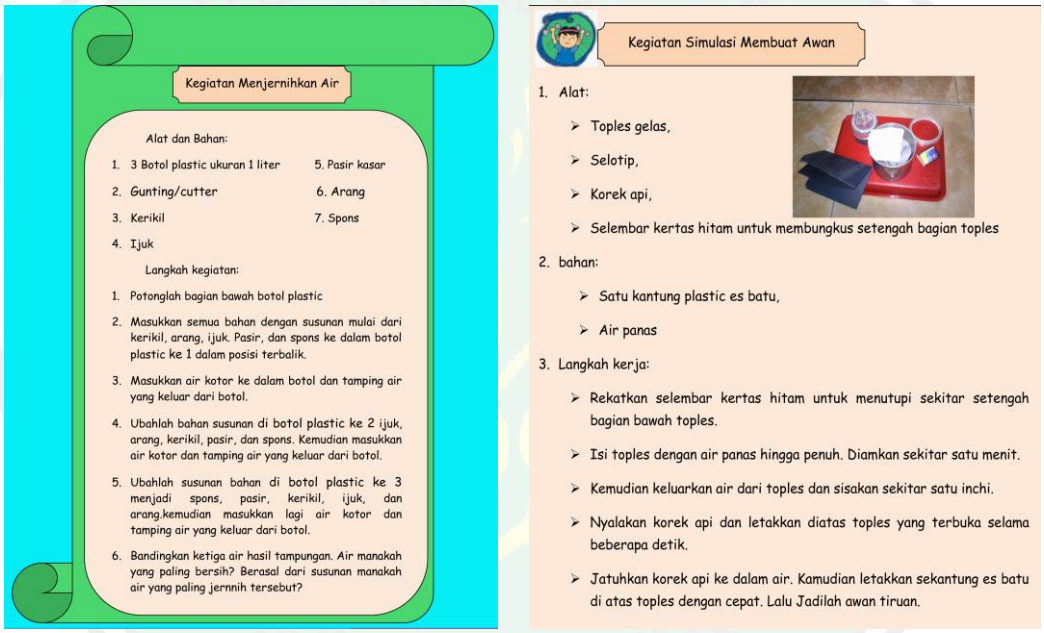
Picture 4.11 revised product

From the sample images before and after the revision has been made clear picture appears. In terms of the source of the shooting has been written in a neat and detailed. In terms of information it was clear and easy to read making it easier for students to understand description of the types of water sources.

4) From the selection of the type of letter writing has been adapted from the use of the typeface Comic Sans MS replaced with the typeface used book which has been elementary level learners. For example, curriculum book of 2013. Namely the font *Baar Metanoia.*

5) In the lab activities should be a picture.

Before revision after revision



Picture 4.12 revised product

From the sample images before and after the revision has been made clear by a picture looks replacement simpler design and attractive, as well as giving a picture to describe the tools and materials used in the simulation. This is to facilitate students in understanding the steps lab activities.

6) Writing a translation of verses of the Koran and the original table using 1.5 spacing later revised to 1 (one).

3. Validation Results of Science Teacher

Validation of instructional material to teachers teaching science held on 21 April 2014. Validation carried out to teachers teaching science Islamic Elementary School State 2nd of Malang is Mrs. Eny Maria Andriany, S.Pd. The results of the assessment and response to the teacher teaching science instructional materials matter hydrological cycle is as follows:

Table 4.5

Validation Results Subject Teacher of Science

No	Criteria	Score		P	Interpretation	Specification
		X	X_1			
1.	How the description of topic in material teaching of science?	3	4	75	Valid Enough	Not revision
2.	How the suitable of the lesson that presented in this material teaching of science?	3	4	75	Valid Enough	Not revision
3.	What is relevant the indicators in this book with basic competence according to *KTSP 2006*?	3	4	75	Valid Enough	Not revision
4.	What is relevant Standard of competences with indicators in this book of science?	3	4	75	Valid Enough	Not revision
5.	What is relevant of the learning contain in this book with *KTSP 2006*?	3	4	75	Valid Enough	Not revision
6.	How the systematic of contain explanation in this book of science?	3	4	75	Valid Enough	Not revision

No	Criteria	Score		P	Interpretation	Specification
		X	X_1			
7.	How the material scope that presented in this book of science?	3	4	75	Valid Enough	Not revision
8.	Is the material that presented trough this book can give motivation to students in order to study hard?	4	4	100	Valid	Not revision
9.	How the difficulty level of language that used in this book?	3	4	75	Valid Enough	Not revision
10.	Is the instrument of evaluation that used can measure the ability of students?	4	4	100	Valid	Not revision
	SUM	**32**	**40**	**80**	**Valid**	**Not revision**

Description:

X: Scores of respondents by validator in one item

X_1: Score the highest response

P: Percentage rate of validity

Table 4.6

Frequency Distribution Validity Level Teacher of Science Instructional Materials

Level of feasibility	F	%
Valid	2	20
Valid enough	8	80

Based on validation data with teacher of science that presented on the table 4.5 and 4.6 from 10 questions that presented in questioner state 20% valid with 2

frequencies at items 8 and 10 and 80% state valid enough with 8 frequencies at items 1, 2, 3, 4, 5, 6, 7, 9.

Score data also gotten by writing in open questioner and verbal data that transcript from result of interview with the teacher of science. Verbal data that presented in qualitative data that explain this following:

1. Material teaching had cab increase motivation of students but rather given picture animation that more interesting.
2. The material of material teaching in the book more much no just in water cycle material.

C. Evaluation Results of Attractiveness Level the Instructional Materials

The results of assessment and students feedback through questionnaires to determine of attractiveness level the material science. Giving attractiveness of the questionnaire given to 18 students 5th B grade who have been awarded treatment and posttest. Here is an assessment and student feedback MIN 2nd of Malang VB grade on the hydrological cycle materials instructional material:

Table 4.7

Assessment Questionnaire Students of VB Grade Science Instructional Materials

Students	Assessment Aspect										∑n	X_1	%
	1	2	3	4	5	6	7	8	9	10			
X1	5	5	5	4	5	5	5	5	5	5	49	50	98
X2	4	5	4	5	4	5	4	4	5	5	45	50	90
X3	4	5	4	5	5	5	5	4	4	5	46	50	92
X4	4	5	4	4	4	4	4	4	4	4	41	50	82
X5	4	5	4	5	5	5	4	5	5	5	47	50	94

Students	Assessment Aspect										∑n	X_1	%
	1	2	3	4	5	6	7	8	9	10			
X7	5	5	5	5	4	5	4	4	5	4	46	50	92
X8	5	4	3	5	4	4	3	4	4	5	41	50	82
X9	5	5	5	5	5	5	4	5	4	5	48	50	96
X10	5	5	4	5	4	5	4	4	5	5	46	50	92
X11	3	5	4	4	4	3	5	5	4	5	42	50	84
X12	5	5	5	5	5	4	4	5	5	5	48	50	96
X13	5	5	5	5	5	5	4	5	5	5	49	50	98
X14	5	5	5	5	4	4	4	3	5	5	45	50	90
X15	4	5	4	4	5	5	5	5	5	5	47	50	94
X16	5	5	5	5	5	5	5	5	5	5	50	50	100
X17	4	5	4	5	5	5	4	4	5	5	46	50	92
X18	4	5	5	4	5	4	4	4	5	5	45	50	90
∑X	81	89	79	84	83	83	77	79	85	88	828	900	
$\sum X_1$	90	90	90	90	90	90	90	90	90	90	900		
%	90	98	87	93	92	92	86	88	94	98			92%

Description:

X1 , X2 , X3 , ... : students

ΣN : sum of all scores

ΣX : total respondents in 1 item

ΣX1 : number of the ideal answer in 1 item

P : percentage

Aspects of assessment 1 : attractiveness of the cover of the science instructional materials.

Aspects of assessment 2 : easing font size and type used in instructional material.

Aspects of assessment 3 : clarity of learning objectives.

Aspects of assessment 4 : giving examples of images in instructional material science.

Aspects of assessment 5 : clarity steps simulation experiments on science instructional material.

Aspects of assessment 6 : simulation experiments improve understanding of the concept of matter hydrological cycle.

Aspects of assessment 7 : phrase used in instructional material.

Aspects of assessment 8 : clarity of tasks and exercises.

Aspects of assessment 9 : ease of understanding the material descriptions.

Aspects of assessment 10 : increase motivation.

Based on student assessment questionnaire is presented in Table 4.7 , of the 10 questions presented in the questionnaire stated very attractive with a frequency of 1-10 with percentages : 90 , 98 , 87 , 93 , 92 , 92 , 86 , 88 , 94 , 98.

D. Results of Field Trial on the Use of Instructional Materials Science

This study not only develops the instructional materials, but also to look after the differences and to improve the understanding to the student trough several tests which are given, namely pretest and posttest. Pretest and posttest performed on 5^{th} B grade. The assessment results of tests given to students 5^{th} as follows:

Table 4.8

Students value VB Class (Class Experiment)

No.	Name	SCORE	
		Pre test	Post test
1.	Ahmad Farchan	86	90
2.	Alyah Rahma Nisa’	76	73
3.	Cahya wulandari	70	83
4.	Dhewi Ngujiwat S.P.	66	86
5.	Dhimas Wahyu Pratama	70	90
6.	Gearnidha Syafa Dinar T.	70	96
7.	Grizelda Aura Safira	50	86
8..	Habiba Sabrina Kunaifi	40	43
9.	Larasati Putri Hardani	83	86
10.	Lutfiah Hamidah Nur’aini	70	100
11.	M. Izra Aryawar Dana	76	93
12.	Madinatul Ilmil Hidayah	86	100
13.	Muhammad Fikri W.	76	96
14.	M. Hilman Bil Haq D	63	80
15.	Mutiara Izza Rahmanda	70	70
16.	Risqi Bahreisy Al-Arif A	86	96
17.	Roykhan Anshar	83	90
18.	Salsa Feby R.	66	93
	SUM	1287	1551
	MEAN	71,5	86,16

Based on the data in Table 4.8 and 4.9 shows that the average value mean 71,5 for pretest and posttest is 86. This is suggested that there are differences in pretest and posttest. So the significant differences in the use of instructional materials that have been developed, so that can increase in understanding after use instructional material of science.

CHAPTER V

DISCUSSION

A. The Analysis of Instructional Material Development Description Results

The existence of instructional material is very important in learning process, both for teachers and students. Instructional material can serve as a guide for the teachers who will teach directly in the learning process and for the student that have an instructional material which is used as a guide in learning directly all in the learning process.

The good instructional material is made by systematic structure and sequence, it describes the objectives instructional that will be achieved, motivate the student to learn, give a concept understanding, anticipate the difficulty of students' learning in the form of the lab practical, provide a lot of exercise for the students, and provide a summary.

To correlate that, the result of this study shows that instructional material natural science in hydrologic cycle material have several components in terms of content and appearance. In terms of content, it is divided into three sections: introductory, core, and closing. In the terms of appearance there are the terms of color and the pictures are displayed. For the more details as follows:

1. Contents of Instructional Material of Science

There are some eligibility criteria for the instructional material content that must be filled, namely (1) a description of material conformity with the standard of competence (*SK*) and basic competence (*KD*) which contain in a

curriculum subject in questioning, (2) the accuracy of the material and learning support materials.

In the terms of component instructional material content is divided into three parts:

a. Introduction that are preface, consisting of *SK* and *KD*, Indicators, teaching materials guiding use, and table of contents.
b. The core section presents the concept map as the opening, introductory reading theories, theories about the hydrological cycle, lab activities, comprehension of exercises, summary of the material, the concept of knowledge understanding, and the student's competence and training. The material is presented complete and adapted to the science curriculum for the 5th grade 2nd semester. The lab activity is to test and support the theory that is presented in the instructional materials content. The exercise and comprehension test are used to train the students skills who have read the material and to determine the level of student understanding.
c. The concluding section contains a list of glossary references, and key answer.

2. Display of Instructional Materials

The illustrations and images hold an important role in instructional material as an attractive or absence of instructional material that is determined by display. Considering the book, it is aimed at the students' objectives development in the fifth grade primary school which need the visual aspects

to support the verbal aspect. In addition, it is expected to attract the visual aspect that can increase the motivation to read the instructional material contents. So that, it can increase the students' understanding about material concepts. There are several points to consider in view of instructional material such as:

a. The layout of the material that involves A4S (215x297mm), the proportion of the margin above 4, down 3, right 3, and left 4. Dimensions spaces using 1 and 1.5.
b. *Baar Metanoia* The font size for the title of chapter 12. *Lynotype Palatyno* letter-sized 12 for materials and exercises.
c. The use of color in instructional materials is dominated by 80% blue, 10% and 10% brown color mix.
d. In the instructional material also combined with the pictures and the write are colorful. This is motivated the students for the fifth grade elementary school.

B. The Analysis of Validation Natural Science Instructional Material Development

The instructional materials of natural science can be developed quite successfully and quite appropriate when the result has got the minimum criteria about 75. If the analysis results in a wide range of subject validator achieve the minimum criteria for instructional natural science material, it can be said that it is appropriate for the learning process.

To obtain the analysis of feasibility instructional materials achievement, the cycle water natural science materials for MI students' is determined as the following criteria:

Table 5.1

Eligibility Criteria Subjects

Percentage (%)	Level Of Validity	Information
80-100	Valid	Not Revise
60-79	Valid Enough	Not Revise
40-59	Less Valid	Most Revise
0-39	Not Valid	Totally Revise

1. The Analysis of Natural Science Expert Content Validate Data Results

Based on the assessment which is given by the of instructional material expert, it shows that the instructional material are very relevant to the curriculum. It is evidenced by the very material details on instructional material and supported by experiments which are presented to clarify the concept. Giving the questions and conclusions at the end of the experiment is quite appropriate and considered for the elementary students.

To support the proficiency analysis level, it can be demonstrated with the overall assessment questionnaire calculation which is presented as follows:

$$P = \frac{\sum X}{\sum X_i} X\ 100\%$$

$= \frac{37}{40}$ X 100%

= 92,5%

The data analysis shows that overall percentage of the content instructional material natural science validation has results from the expert contain reached 92.5% which has the criteria quite valid and do not need revision. Instructional material in terms of the content and the form of hydrological cycle matter is was appropriate and fit to use for learning process.

2. The Analysis of Data Results Validate the Design Expert of Instructional Material Natural Science

Based on the assessment which has been given by expert design, it is suggested that the textbook view is quite good and can be used in the learning process. This is evidenced by images, fonts, typing layouts, consistency and others which have been very precise, appropriate, and attractive.

To support this analysis, it can be proved by calculating all of the questionnaire assessment and it is presented as follows:

P= $\frac{\sum X}{\sum X_i}$ X 100%

= $\frac{33}{40}$X 100%

= 82,5%

The data analysis show that all of percentage validation design expert of natural science instructional materials reaches 82.5% on the criteria which is

valid and do not need revision. Instructional material in terms of design and appearance has been interesting, therefore, in accordance with the elementary students' age characteristics who loved the pictures and the colors are bright.

3. The Analysis of Validate Teacher Data Results

Based on the assessment which has been given by the teachers, the teaching natural science shows that the textbook is quite feasible to use. Textbook is considered to be sufficient to provide and improved the concept understanding and to clarity the material and can motivate the students to learn about natural science.

To support this analysis, it can be proved by calculating the overall questionnaire assessment which is presented as follows.

$$P = \frac{\sum X}{\sum X_i} X\ 100\%$$

$$= \frac{32}{40} X\ 100\%$$

$$= 80\%$$

The data analysis showed that the all of percentage teachers natural science validation results is reaching about 80 % on the criteria. It is valid and do not need further revision. Instructional materials in terms of content able to provide additional knowledge that does not exist on the books that have been used, while in terms of the design of instructional materials has been very nice and interesting to motivate the students.

C. The Analysis of Attractiveness Instructional Materials Assessment Result

Based on the assessment, it is given for 18 students of the 5th grade, shows that in the terms of the cover is very attractive, typeface easy to read, easy to understand the materials description, also provide the new knowledge, the experiment activities which is presented very helpful in understanding the concepts, and textbook also can increase the students' motivation to learn natural science. Here are several description of the analysis results for each question that asked in the questionnaire students:

1. Attractiveness of the cover of the instructional materials science materials hydrological cycle reaches 90 % with the assessment expressed by 10 students are very interesting, 7 students interesting, and 1 students quite attractive.
2. Ease in reading instructional material, the size and typeface used in instructional material reach the percentage about 98% with a very easy assessment expressed by 17 students, 1 student is easy.
3. The learning clarity goals for the students percentage achieving 87 % rated is very clearly stated by 8 students, 9 stated clearly and 1 student quite obviously.
4. Providing pictures examples on each trial can be helpful for the students to achieve the percentage about 93 % with a very helpful assessment expressed by 12 students, helped by 6 students.

5. The instructional material clarity experiment steps for reached the percentage about 92 % with rated very clearly expressed by 11 students, clear 7 students.
6. Experiments that have been presented can help the concept understanding to measure in percentage about 92 % with a very helpful assessment expressed by 12 students, helping 5 students, and helping enough 1 student.
7. Ease of sentences which is used in the instructional material reaches 86 % with very helpful assessment expressed by 6 students, helping 11 students, and helping enough 1 student.
8. Clarity tasks and exercises reach 88 % with very helpful assessment expressed by 8 students, helping 9 students, and helping enough 1 student.
9. Ease of the lesson understanding descriptions reach percentage about 94 % rated is very easily expressed by 13 students, an easy 5 students.
10. Motivated the students to follow the natural science learning with instructional materials reaches 98 % the percentage of highly motivated assessment 16 students, motivated 2students.

To support the analysis that has been described can be demonstrated with the calculation of the overall assessment questionnaire is presented as follows:

$$P = \frac{\sum X}{\sum X_i} \text{ X } 100\%$$

$$= \frac{828}{900} \text{ X } 100\%$$

= 92%

In the terms of solid content of the instructional material with theory and concepts that can support the learning process, whereas in terms of instructional material look very attractive and give a different design variation from the books that are used. It shows that instructional material is interesting used by students in learning science.

D. The Different Test Analysis in Using Instructional Material

Having obtained the experiment then the next step is comparing the results of the pretest and posttest that differences exist or whether, through the T test to be elaborated below.

Step 1. Makes the Hypothesis

Ha: There are several differences in the hydrological cycle material understanding for the 5th grade students before and after using natural science instructional material at MIN Malang II.

Ho: There are not several differences in the hydrological cycle material understanding for the 5th grade students before and after using natural science instructional material at MIN Malang II

Step 2. Makes Ha and Ho in the form of statistical

Ha : $\mu_a \neq \mu_b$

Ho : $\mu_a = \mu_b$

Table 5:2.

Statistics on the results of pre-test and post-test

No.	Name	Score		X_1-X_2 (D)	d	d^2
		Pre test	Post test			
1.	Ahmad Farchan	86	90	-4	4	16
2.	Alyah Rahma N.	76	73	3	-3	-9
3.	Cahya wulandari	70	83	-13	13	169
4.	Dhewi Ngujiwat S.P.	66	86	-20	20	400
5.	Dhimas Wahyu P.	70	90	-20	20	400
6.	Gearnidha Syafa D.T.	70	96	-24	24	576
7.	Grizelda Aura SaFira	50	86	-36	36	1296
8..	Habiba Sabrina K.	40	43	-3	3	9
9.	Larasati Putri Hardani	83	86	-3	3	9
10.	Lutfiah Hamidah N.	70	100	-30	30	900
11.	M. Izra Aryaw	76	93	-17	17	289
12.	Madinatul Ilmil H.	86	100	-14	14	196
13.	Muhammad Fikri W	76	96	-29	29	841
14.	M. Hilman Bil Haq	63	80	-17	17	289
15.	Mutiara Izza R.	70	70	0	0	0
16.	Risky Bahreisy Al-Arif	86	96	-10	10	100
17.	Roykhan Anshar	83	90	-7	7	49
18.	Salsa Feby R.	66	93	-27	27	729
	Σ n= 18			Σ d= 271		Σ d^2= 6529
	SUM	1602	1637			
	MEAN	73	86			

$$\bar{D} = \frac{(\Sigma D)}{n}$$

$$= \frac{271}{18}$$

$$= 15{,}0556$$

Step 3. Finding t by the formula:

$$t = \frac{\bar{D}}{\sqrt{\frac{\Sigma D^2 - \frac{(\Sigma D)^2}{n}}{n(n-1)}}}$$

$$= \frac{15{,}0556}{\sqrt{\frac{6529 - \frac{(271)^2}{18}}{18(18-1)}}}$$

$$= \frac{15{,}0556}{\sqrt{\frac{6529 - \frac{7841}{18}}{306}}}$$

$$= \frac{15{,}0556}{\sqrt{\frac{6529 - 4080{,}0556}{306}}}$$

$$= \frac{15{,}0556}{\sqrt{8{,}0030}}$$

$$= \frac{15{,}0556}{2{,}82897}$$

$$= 5,\ 3219$$

Step 4. Determine t_{table}

- The level of significance (α = 0,05)
- Db = n-1

  = 18-1

= 17

So t_{table} = $t_{0,05}$: 17 = 2,110

Data were obtained t_{table} = 2,110(interpolated)

Step 5 compares t_{table} and t_{count}

t_{count} (5, 3219) > t_{table}(2,110)

So significantly, so that Ha is accepted and Ho is rejected. Because of t_{count} = 5, 3219> 2,110 (***t_{table}***)

Step 6. Criteria deduction

Because of t_{count}= 5, 3219 > 2,110 (***t_{table}***) then Ha is accepted and Ho is rejected, the conclusion shows that there is no significant difference between final value (posttest) with initial values (pretest). Furthermore, from the average price in mind (X_2) = 86 > (X_1) = 73, mean values of posttest are better than pretest.

Based on the T test results it can be carried out that there is a significant difference in the hydrological material cycle understanding in 5th grade experimental group. The understanding hydrological cycle material can cause the increasing implementation of this instructional material form natural science to the experimental group 5th grade students. This may conclude that the instructional material give effect to improve hydrological cycle material understanding for the 5th grade students of MIN II of Malang.

CHAPTER VI

CLOSING

In this chapter, the writer would like to explain about two points, that are: (a) Conclusion and (b) Suggestion, specially for development the instructional material.

A. Conclusion

The product development result that has been revised based on the validity is:

1. The instructional material development science produces for the 5th grade elementary school textbook. Product which has been developed has a fulfill component as good as instructional material and can be used in learning process.

2. The result of instruction development l field test material of science for the 5th grade elementary school has high validity based on the assessment from the material reached 92,5%, the design expert reached 82,5%, the natural science teacher reached 80%, the students 5th grade test field to instructional material reached 92%.

3. The learning result based on the field test which is measured by achievement test after using product show that:

a. The mean of achievement result on posttest reached 86 and pretest reached 73, so, it shows that there is improvement in students learning as 13 point, after using the natural science instructional material learning.

b. According to the test t result, it shows that the result of $t_{count=}$ 5,3219 and $t_{table=}$ 2,110 or t_{count}> $t_{table.}$ So, there are have significantly differences after using the instructional material science for the 5^{th} grade.

B. Advices

The advice that recommended by the writer includes suggestions for the purposes of the product which is used and the needs further development for the further research. In detail, these suggestions can be explained as follows:

1. Suggestions for Purposes Product Utilization

To optimize the utilization science textbook for the fifth grade students, the hydrological material cycle through the simulation of method as follow:

a. The natural science textbook for the fifth grade hydrological material cycle through method simulation should be used as alternative learning science.

b. The natural science textbook for the fifth grade students that talking about the hydrological material cycle through the method simulation should be used with the teacher guidance. Because of the natural science textbook for the fifth grade students is not widely known, therefore ought to read the instructions before using the book.

2. Suggestions for Development

The purposes of suggestion for development are:

a. This material textbook is confined to the water cycle only, because it needs the development for other materials, especially natural science subject for the 5^{th} grade of elementary school.

b. The instructional science water cycle material for the 5^{th} grade trough simulation method can be referenced by natural science teacher and try to develop the instructional material which is suitable based on the students' condition.

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Air

Tahukah kamu?

Air menyusun 83% darah kita, 74,5% otak kita, 22% dalam otot kita dan 75,6% otot kita. Secara keseluruhan, tubuh kita tesusun atas 70% air.

Semua makhluk hidup membutuhkan air, seperti tumbuhan, hewan, dan manusia. Manusia dapat hidup tanpa makanan hingga 8 minggu tetapi hanya dapat hidup selama 3-5 hari tanpa air. Tubuh kita membutuhkan air dalam jumlah besar. Kita diharuskan minum 2 liter atau setara dengan enam sampai delapan gelas air setiap hari. 70% berat tubuh kita terdiri atas air. Air laut dapat berwarna biru karena pembiasan cahaya dari langit yang berwarna biru. Sedangkan 70% permukaan bumi adalah air maka bumi dikenal sebagai "planet biru".

1. Sumber air

Kita memperoleh air dari air permukaan (lautan, danau, dan sungai). Sebagian besar air terdapat di lautan. Kita tidak dapat meminum air laut karena rasanya asin dan dapat mengakibatkan kehilangan cairan tubuh secara berlebihan atau dapat disebut dengan dehidarsi.

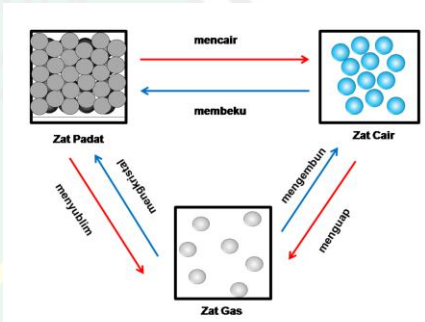
(a) (b) (c)

Gambar 1.1 (a) air tawar dari danau, (b) kolam, (c) sungai *Sumber http://images.detik.com*

Sebagian besar makhluk hidup membutuhkan air tawar. Danau, sungai kecil, dan kolam merupakan sumber air tawar. Air tawar juga dapat ditemukan di bawah tanah, yang disebut air tanah. Manusia menggali sumur untuk dapat menggunakan air tanah. Sebagian air tanah mengalir melalui celah kecil yang terdapat di permukaan bumi, ini disebut mata air. Mata air dapat mengalir ke anak sungai, sungai kecil atau sungai besar.

2. Peristiwa perubahan wujud zat (air) pada proses daur air

Pada proses daur air terjadi proses perubahan wujud, yaitu wujud cair menjadi gas disebut menguap, wujud gas menjadi cair disebut mengembun, wujud cair menjadi padat disebut membekua.



Gambar 1.2 Peristiwa perubahan wujud zat cair *Sumber: http://1.bp.blogspot.com*

3. Daur Air

Daur air merupakan suatu proses air yang mengalami perputaran dari bumi ke atmosfer dan akan kembali ke bumi, hal itu terjadi secara terus–menerus melalui tahapan–tahapan sebagai berikut:

a. Tahap evaporasi (penguapan)

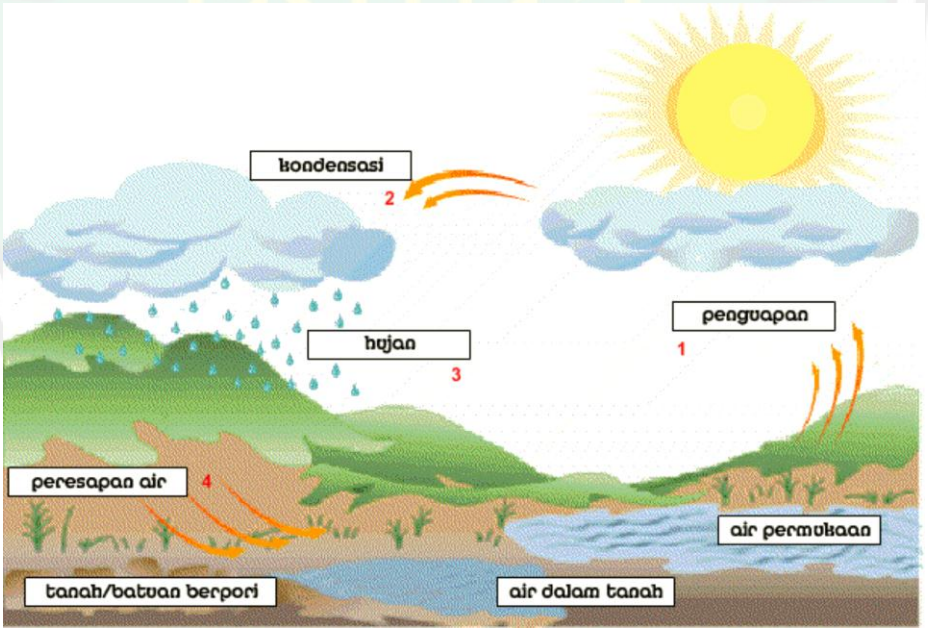
Air di permukaan bumi, misalnya yang berada di lautan, danau, dan sungai dapat mengalami evaporasi atau penguapan. Karena adanya pengaruh suhu panas yang berasal dari sinar matahari. Contohnya penguapan pada jemuran pakaian, penguapan yang ada di laut, sungai dan danau dan lain sebagainya.

b. Tahap presipitasi (pengendapan)

Setelah air mengalami proses penguapan maka akan menghasilkan butir–butir uap air. Uap air tersebut akan naik serta berkumpul di udara dan lama–kelamaan udara tersebut akan penuh sehingga udara tidak mampu menampung uap air yang cukup banyak. Akibatnya terjadilah hujan.

c. Tahap kondensasi (pengembunan)

Dengan adanya perubahan suhu yang cukup dingin, uap air tersebut akan berubah menjadi titik–titik air yang membentuk awan (awan mendung). Titik–titik air yang membentuk awan tersebut akan turun menjadi hujan. Air hujan tersebut akan mengalir ke sungai sampai ke laut dan menguap kembali.



Gambar 1.3 Daur air *Sumber: http://etnize.wordpress.com/*

Semua peristiwa ini sudah dijelaskan dalam al-Qur'an Surah ar-Rum Ayat 48:

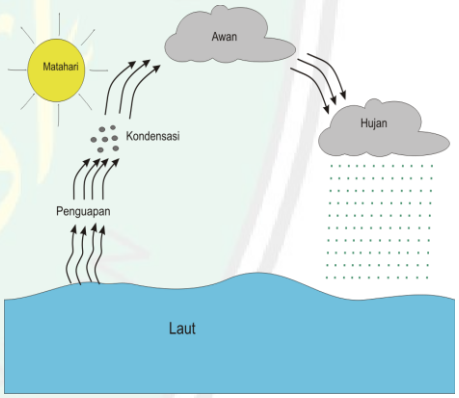
ٱللَّهُ ٱلَّذِى يُرۡسِلُ ٱلرِّيَٰحَ فَتُثِيرُ سَحَابٗا فَيَبۡسُطُهُۥ فِى ٱلسَّمَآءِ كَيۡفَ يَشَآءُ وَيَجۡعَلُهُۥ كِسَفٗا فَتَرَى ٱلۡوَدۡقَ يَخۡرُجُ مِنۡ خِلَٰلِهِۦۖ فَإِذَآ أَصَابَ بِهِۦ مَن يَشَآءُ مِنۡ عِبَادِهِۦٓ إِذَا هُمۡ يَسۡتَبۡشِرُونَ ﴿٤٨﴾

Artinya: "Allah, Dialah yang mengirim angin, lalu angin itu menggerakkan awan dan Allah membentangkannya di langit menurut yang dikehendaki-Nya, dan menjadikannya bergumpal-gumpal; lalu kamu Lihat hujan keluar dari celah-celahnya, maka apabila hujan itu turun mengenai hamba-hamba-Nya yang dikehendakiNya, tiba-tiba mereka menjadi gembira." (QS. Ar-Ruum: 48).

4. Macam-Macam Daur air:

a. Daur Pendek /Daur Kecil

1) Air laut menguap menjadi uap gas karena panas matahari.
2) Terjadi kondensasi dan pembentukan awan.
3) Turun hujan di permukaan laut.



Gambar 1.4 Daur pendek *Sumber: dokumen pribadi*

b. Daur Sedang

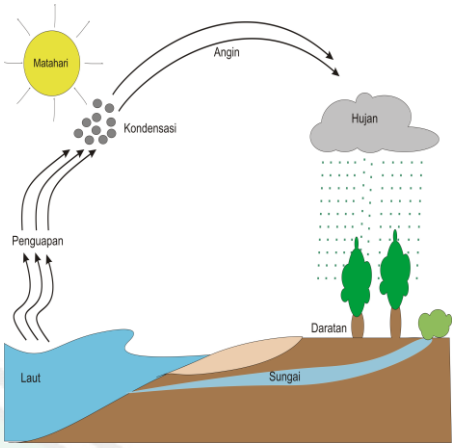
1) Air laut menguap menjadi uap gas karena panas matahari.
2) Terjadi kondensasi.

3) Uap bergerak oleh tiupan angin.

4) Pembentukan awan.

5) Turun hujan di permukaan daratan.

6) Air mengalir di sungai menuju kembali laut.



Gambar 1.5 Daur sedang *Sumber: dokumen pribadi*

c. Daur Panjang / Daur Besar

1) Air laut menguap menjadi uap gas karena panas matahari.

2) Pembentukan awan yang mengandung kristal es.

3) Awan bergerak oleh tiupan angin ke darat.

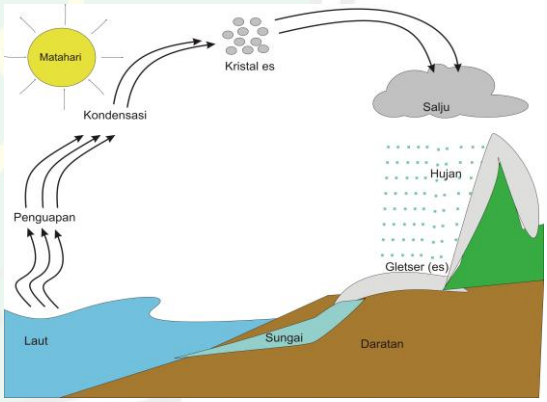
4) Pembentukan awan.

5) Turun salju.

6) Pembentukan gletser

7) Gletser mencair membentuk aliran sungai

8) Air mengalir di sungai menuju darat dan kemudian ke laut.



Gambar 1.6 Daur panjang *Sumber: dokumen pribadi*

Sekarang kalian sudah tahu bagaimana proses terjadinya hujan, sehingga kalian dapat bersyukur dan merenungkan bahwa hujan adalah salah satu tanda kebesaran Allah SWT.

وَٱللَّهُ أَنزَلَ مِنَ ٱلسَّمَآءِ مَآءً فَأَحۡيَا بِهِ ٱلۡأَرۡضَ بَعۡدَ مَوۡتِهَآۚ إِنَّ فِي ذَٰلِكَ لَأٓيَةٗ لِّقَوۡمٖ يَسۡمَعُونَ ٦٥

Artinya: *"dan Allah menurunkan dari langit air (hujan) dan dengan air itu dihidupkan-Nya bumi sesudah matinya. Sesungguhnya pada yang demikian itu benar-benar terdapat tanda-tanda (kebesaran Tuhan) bagi orang-orang yang mendengarkan (pelajaran)." (QS. An-Nahl ayat:65)*

Berikut ini adalah kegiatan untuk membuat hujan sendiri.

Kegiatan Simulasi Membuat Awan

1. Alat dan bahan:

   - Toples gelas,
   - Selotip,
   - Korek api,
   - Satu kantung plastik es batu,
   - Air panas
   - Selembar kertas hitam untuk membungkus setengah bagian toples

2. Langkah kerja:
   - Rekatkan selembar kertas hitam melingkari toples sekitar setengah bagian bawah toples.
   - Isi toples dengan air panas hingga penuh. Diamkan sekitar satu menit.
   - Kemudian keluarkan air dari toples dan sisakan sekitar satu inchi.
   - Nyalakan korek api dan letakkan di atas toples yang terbuka selama beberapa detik.
   - Jatuhkan korek api ke dalam air. Kamudian letakkan sekantung es batu di atas toples dengan cepat. Lalu Jadilah awan tiruan.

Bagaimana hal ini bisa terjadi? Air hangat dan korek api membuat udara di dalam toples menjadi panas. Udara yang hangat dan basah naik ke atas toples dan bercampur dengan udara dingin dari bawah es batu. Ketika udara yang hangat dan basah bertemu dengan udara yang basah dan dingin, mereka membentuk awan yang mengandung tetesan air.

Latihan 1

1. Kita tidak dapat hidup tanpa . . . .
2. Tiga perempat permukaan bumi tertutup oleh . . . .
3. Sebagian besar air ditemukan di . . . .
4. Kita tidak dapat meminum air laut karena . . . .
5. Air terus mengalami perubahan di alam yang disebut dengan . . . .

Manfaat Air

Tahukah kamu bahwa kita menggunakan air untuk berbagai hal, seperti:

1. Untuk makan dan minum. Air dapat dikonsumsi langsung (bagi binatang) dan dimasak dulu (bagi manusia). Sedangkan untuk makan, air harus diolah bersama bahan makanan lain.

Berikut ini gambar manfaat air.

(a)

(b)

Gambar 1.7 (a) Minum, (b) Memasak S*umber: dokumen pribadi*

2. Untuk MCK (Mandi, Cuci, Kakus). Air sangat diperlukan untuk kepentingan manusia yang berkaitan dengan aktivitas kebersihan.

(a)

(b)

Gambar 1.8 (a) Mandi, (b) Mencuci. *Sumber:* http://epkhas.ses.usm dan *dokumen pribadi*

3. Untuk pengairan pada pertanian dan perkebunan. Pengairan dilakukan agar tanaman cukup air untuk proses asimilasi dan fotosintesisnya.

Gambar 1.9 Menyirami tanaman, *Sumber: http://v-images2.antarafoto.com*

4. Untuk perikanan (tempat tinggal ikan) dan pariwisata serta lalu lintas perairan (transportasi).

(a) (b) (c)

Gambar 1.10 (a) Tempat tinggal ikan, (b) pariwisata air dan (c) kapal**.** *Sumber: http://2.bp.blogspot.com*

5. Olah raga seperti selancar, arung jeram dan masih banyak yang lain.

(a) (b)

Gambar 1.11 (a) Selancar air**,** (b) arung jeram**.** *Sumber: http://4.bp.blogspot.com/ dan http://4.bp.blogspot.com/*

6. Bersuci sebelum beribadah seperti berwudlu

Gambar 1.12 berwudlu *Sumber: http://ddhongkong.org/wp-content/uploads/2012/02/wudhu.pn*

Salah satu ayat al-Qur'an yang menjelaskan manfaat air adalah ayat 9 surah Qaf:

وَنَزَّلْنَا مِنَ ٱلسَّمَآءِ مَآءً مُّبَٰرَكًا فَأَنۢبَتْنَا بِهِۦ جَنَّٰتٍ وَحَبَّ ٱلْحَصِيدِ ۝٩

Artinya: *"Kami turunkan dari langit air yang banyak manfaatnya lalu Kami tumbuhkan dengan air itu pohon-pohon dan biji-biji tanaman yang ditanam."*

Begitu banyak kegiatan manusia yang menggunakan air sehingga ketersediaan air bersih sangat penting bagi manusia. Oleh sebab itu kita harus menjaga ketersediaan air.

Kegiatan Manusia yang Mempengaruhi Ketersediaan Air

Jumlah air bersih sepertinya tidak terbatas, namun sebenarnya air mengalami siklus hidrologi di mana air yang kotor dan bercampur dengan banyak zat dibersihkan kembali melalui proses alam. Proses daur hidrologi berlangsung terus-menerus yang membuat air menjadi sumber daya alam yang terbaharui. Jumlah air di bumi sangat banyak baik dalam bentuk cairan, gas/uap, maupun padat/es. Jumlah air seakan terlihat semakin banyak karena es di kutub utara dan kutub selatan mengalami pencairan terus-menerus akibat pemanasan global bumi sehingga mengancam kelangsungan hidup manusia di bumi.

Tahukah kamu?

Gas-gas beracun dari asap kendaraan bermotor dan pabrik dapat mengakibatkan hujan asam

1. Penggundulan Hutan

Penebangan pohon di hutan yang tidak terkendali menyebabkan hutan kehilangan fungsinya sebagai daerah resapan air hujan. Hutan gundul tidak lagi bisa menyimpan air hujan ke dalam tanah sehingga cadangan air tanah berkurang.

Karena hutan sudah tidak bisa menyimpan air hujan dan air langsung mengalir ke tempat rendah hal ini akan menyebabkan banjir. Selain itu tanah akan menjadi tandus.

Gambar 1.12 Penebangan pohon, *Sumber: http://4.bp.blogspot.com*

2. Pencemaran Air

Pencamaran air disebabkan oleh limbah rumah tangga dan limbah pabrik yang dibuang ke sumber-sumber air seperti sungai.Limbah rumah tangga adalah limbah yang dihasilkan dari kegiatan rumah tangga, berupa sampah kertas, plastik, sisa makanan, atau air buangan dari cucian pakaian. Sedangkan, limbah pabrik adalah bahan kimia Yang digunakan di pabrik- pabrik dan dapat menimbulkan polusi bagi lingkungan sekitar.

Gambar 1.13 Akibat limbah pabrik industry, *Sumber:: http://shellaaach.files.wordpress.com*

3. Pembangunan jalan dengan pengaspalan baik di kota maupun di desa.

   Hal ini dapat mengganggu proses penyerapan air ke dalam tanah, sehingga saat hujan air tidak dapat merasap ke dalam tanah melainkan akan menjadi bencana banjir.

Gambar 1.14 Banjir di Kota. *Sumber: http://poskotanews.com*

Latihan Bersama

Nama: 1. _____ 3. _____

2. _____ 4. _____

Kelompok:

Berikut ini terdapat beberapa jenis kegiatan manusia, kelompokkan berdasarkan jenisnya (yang mempengaruhi daur air ada yang tidak mempengaruhi daur air) dengan memberi tanda centang (V). Beri penjelasan seperti pada contoh no.1. jika kegiatan tersebut termasuk kegiatan manusia yang mempengaruhi daur air!

No.	Jenis kegiatan manusia	Mempengaruhi daur air	Tidak mempengaruhi daur air	Penjelasan
1.	Menebang pohon di hutan secara berlebihan	V		Menyebabkan hutan menjadi gundul sehingga cadangan air yang berada

				didalam tanah semakin berkurang.
No.	Jenis kegiatan manusia	Mempengaruhi daur air	Tidak mempengaruhi daur air	Penjelasan
2.	Menebar benih ikan di danau			
3.	Mengubah daerah resapan air menjadi bangunan-bangunan lain.			
4.	Membiarkan lahan kosong tidak ditanami tumbuhan.			
5.	Menanam tumbuhan bakau di daerah pantai			
6.	Menggunakan air secara berlebihan			

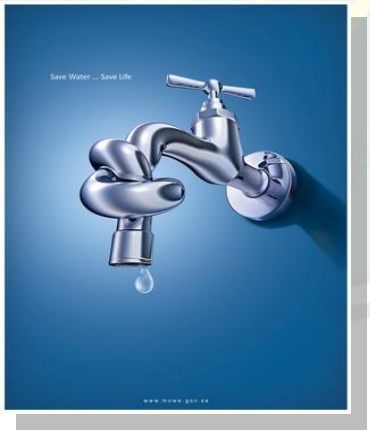
Menghemat Air

Air sangat berguna bagi kita semua. Kita harus menghemat air dan tidak membuang-buangnya. Berikut ini adalah cara-cara menghemat air.

Tahukah kamu?

Hari Air Sedunia diperingati setiap tanggal 22 Maret, inisiatif peringatan ini di umumkan pada Sidang Umum PBB ke-47 tanggal 22 Desember 1992 di Rio de Janeiro, Brasil.

1. Pastikan kran air benar-benar tertutup rapat.
2. Jangan biarkan air kran mengalir ketika sedang menggosok gigi atau setelah mencuci tangan.
3. Usahakan mencuci pakaian setelah mencapai jumlah yang cukup banyak.
4. Gunakan air bekas mencuci beras atau sayuran untuk menyiram tanaman.
5. Mencuci kendaraan yang kotor saat dibutuhkan.



Gambar 1.15 Menghemat air *Sumber: http://2.bp.blogspot.com*

Pengolahan Air

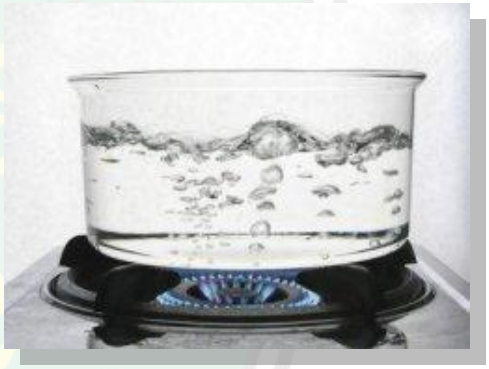
Tahukah kamu?

Arab Saudi adalah Negara pengolah air asin (laut) menjadi air tawar terbesar di dunia.

Membersihkan air disebut "Pengolahan Air". Mengolah air sangat perlu, agar lebih aman untuk diminum oleh manusia air harus dimasak. Di alam, air tidak selalu cukup bersih untuk diminum manusia. Kotoran alami dapat bercampur dengan air dengan mudahnya. Selama pengolahan air, zat kimia tertentu ditambahkan ke dalam air untuk membunuh kuman sehingga air dapat diminum, mencuci, dan sebagainya.

1. Merebus air

   Cara paling sederhana untuk memurnikan air adalah dengan merebus air hingga mendidih. Merebus air dapat membunuh kuman yang ada di dalamnya. Setelah direbus, air harus disimpan di tempat tertutup.



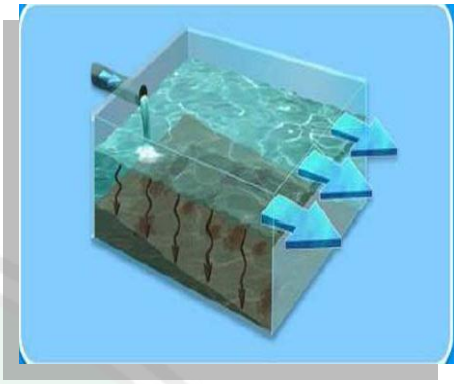
Gambar 1.16 Merebus air *Sumber: http://data.tribunnews.com*

2. Sedimentasi dan dekantasi

   Proses ini digunakan untuk memisahkan kotoran yang tidak larut seperti pasir, lumpur, dan lain-lain dari air. Pada metode ini, air di dalam container didiamkan selama beberapa saat. Kemudian kotoran akan mengendap di dasar container. Proses pengendapan kotoran yang terdapat di dalam air disebut sedimentasi. Air kemudian dituangkan ke dalam container lain

secara perlahan, agar tidak mengganggu kotoran yang mengendap di dasar container.

Proses dituangkannya air secara perlahan setelah sedimentasi disebut dekantasi. Setelah melalui proses dekantasi, air mungkin saja masih mengandung kotoran.



Gambar 1.20 Sedimentasi dan dekantasi,*Sumber: http://tentangteknikkimia.files.wordpress.com*

3. Penyaringan

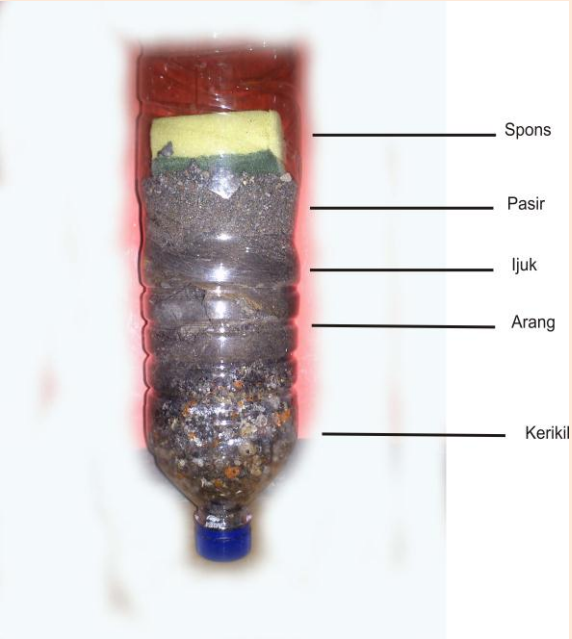
Metode ini lebih baik daripada dekantasi. Penyaringan merupakan proses di mana air yang mengandung kotoran dialirkan melalui kertas saring. Kotoran tertinggal pada kertas saring dan air jernih ditampung pada container lain dibawahnya. Proses pemisahan kotoran dari air dengan menggunakan kertas/kain katun saring disebut filtrasi/penyaringan.

Gambar 1.21 Proses penyaringan air *Sumber: dokumen pribadi*

Kegiatan Menjernihkan Air

Alat dan Bahan:

1. 3 Botol plastic ukuran 1 liter
2. Pasir kasar
3. Gunting/cutter
4. Arang
5. Kerikil
6. Spons
7. Ijuk



Langkah kegiatan:

1. Potonglah bagian bawah botol plastic
2. Masukkan semua bahan dengan susunan mulai dari kerikil, arang, ijuk. Pasir, dan spons ke dalam botol plastic ke 1 dalam posisi terbalik.
3. Masukkan air kotor ke dalam botol dan tamping air yang keluar dari botol.
4. Ubahlah bahan susunan di botol plastik ke 2 ijuk, arang, kerikil, pasir, dan spons. Kemudian masukkan air kotor dan tamping air yang keluar dari botol.
5. Ubahlah susunan bahan di botol plastik ke 3 menjadi spons, pasir, kerikil, ijuk, dan arang.kemudian masukkan lagi air kotor dan tampung air yang keluar dari botol.
6. Bandingkan ketiga air hasil tampungan. Air manakah yang paling bersih?
7. Berasal dari susunan manakah air yang paling jernih tersebut?

Latihan 2

1. Membersihkan air disebut . . . .
2. Memasak air hingga mendidih dapat membunuh . . . .
3. Proses membersihkan air dengan mengalirkan air melalui kertas saring disebut . . . .
4. Proses pengendapan kotoran air disebut . . . .
5. Proses penuangan air secara perlahan setelah sedimentasi disebut . . . .

RINGKASAN

A. Air

1. Sumber air: lautan, danau, kolam dan sungai.
2. Peristiwa perubahan zat cair yaitu berubahnya air dari wujud cair menjadi gas disebut menguap, wujud gas menjadi cair disebut mengembun, wujud cair menjadi padat disebut membeku.
3. Siklus air yaitu: suatu proses air mengalami perputaran dari bumi ke atmosfer dan akan kembali ke bumi, hal itu terjadi secara terus-menerus,
4. Macam-macam daur air yaitu: daur pendek, daur sedang dan daur panjang.

B. Manfaat air

1. Untuk masak dan minum.
2. Untuk mandi, mencuci dan kakus (MCK).
3. Untuk pengairan tanaman.
4. Untuk perikanan, pariwisata dan transportasi.
5. Untuk olahraga seperti selancar dan arung jeram.
6. Untuk besrsuci seperti berwudlu

C. Kegiatan manusia yang mempengaruhi ketersediaan air

1. Penggundulan hutan.
2. Pencemaran air.
3. Pembangunan jalan dengan cara pengaspalan atau betonisasi.

D. Menghemat air

1. Pastikan kran air benar-benar tertutup rapat.
2. Jangan biarkan air kran mengalir ketika sedang menggosok gigi atau setelah mencuci tangan.
3. Usahakan mencuci pakaian setelah mencapai jumlah yang cukup banyak.
4. Gunakan air bekas mencuci beras atau sayuran untuk menyiram tanaman.
5. Mencuci kendaraan yang kotor saat dibutuhkan.
6. Lakukan pengolahan air.

E. Pengolahan air dapat dilakukan dengan cara: merebus, sedimentasidan dekantasi serta penyaringan

Uji Kompetensi

A. Pilihlah satu jawaban yang benar.

1. Air bersih tidak diperlukan dalam….

   a. Mandi
   c. Memasak makanan
   b. Mencuci pakaian
   d. Membuang sampah

2. Berikut adalah yang bukan merupakan ciri-ciri air bersih ….

   a. Jernih
   c. Tidak berbau
   b. Berwarna
   d. Tidak berasa

3. Berikut ini yang bukan merupakan cara menghemat air….

   a. Matikan kran air jika tidak digunakan
   b. Gunakan air secukupnya
   c. Pastikan kran air benar-benar tertutup
   d. Gunakan air untuk bermain semprotan

4. Air menjadi uap air. Peristiwa ini disebut ....

   a. Pemanasan
   c. Penguapan
   b. Pendinginan
   d. Penyubliman

5. Bencana yang terjadi karena daur air terganggu adalah ....

   a. Kekeringan
   c. gempa bumi
   b. kebakaran hutan
   d. serangan hama tumbuhan

6. Daerah yang sulit mendapatkan air bersih adalah wilayah di….

   a. Pedesaan
   b. Pegunungan
   c. Dekat pegunungan
   d. Dekat pembuangan limbah

7. Berikut ini yang termasuk olahraga yang memanfaatkan air yaitu ...
   a. lompat jauh dan renang
   b. selancar dan arung jeram
   c. lari lintas alam dan bersepeda
   d. senam dan atletik

8. Di bawah ini yang bukan merupakan beberapa manfaat air dalam kehidupan manusia sehari-hari....

   a. Mencuci
   b. Mandi
   c. Minum
   d. Mengecat

9. Beberarapa daerah di Indonesia sering mengalami kekeringan pada musim kemarau. Sumur mengering begitu juga dengan sungai-sungai. Penyebab kekeringan pada musim kemarau adalah ….

   a. Sinar matahari terlalu terik
   b. Air tercemar limbah pabrik
   c. Sungai penuh sampah rumah tangga dan limbah pabrik
   d. Penebangan pohon di hutan dan didaerah resapan air yang tidak terkendali

10. Yang harus kita lakukan agar di musim kemarau tidak kekurangan air, dan ketika musim hujan tidak kebanjiran adalah….

a. Rajin merawat tanaman di pot

b. Tidak menanam pepohonan

c. Tidak melakukan penggundulan hutan

d. Menanam rumput di pekarangan kita

B. Soal isian singkat.

Isilah titik-titik di bawah ini dengan kata-kata yang tepat.

1. Panas matahari menyebabkan terjadinya. . . (pengembunan/pengauapan) air dari danau, sungai maupun laut.
2. Metode paling sederhana dalam pemurnian air adalah dengan . . . (merebus/dekantasi) air.
3. Kita memperoleh air tawar dari . . . (danau/lautan).
4. Kegiatan . . . (penanaman/penebangan) hutan dapat mengurangi ketersediaan air.
5. Jangan meninggalkan kran air . . . (terbuka/tertutup) setelah mandi.

C. Soal uraian

Jawablah pertanyaan berikut ini.

1. Sebutkan berbagai sumber air!?
2. Jelaskanlah terjadinya siklus air?
3. Jelaskan beberapa pengaruh penggundulan hutan terhadap persediaan air?

4. Bagaiman cara menghemat air?

5. Apakah yang dimaksud pengolahan air?

Glosarium

Air tanah : seluruh air yang ada di bawah permukaan (di dalam tanah).

Daur air : merupakan suatu proses, air mengalami perputaran dari bumi ke atmosfer dan akan kembali ke bumi, hal itu terjadi secara terus–menerus.

Dekantasi : proses dituangkannya air secara perlahan setelah sedimentasi

Gletser : peristiwa mencairnya es salju menjadi air.

Hidrologi : ilmu yang mempelajari air di permukaan, di bawah permukaan, dan di atmosfer.

Pengembunan (kondensasi): perubahan bentuk pada air dari uap menjadi zat cair, seperti seperti yang terjadi dalam atmosfer uap berubah menjadi bintik hujan.

Penguapan (evaprasi) : perubahan bentuk air menjadi uap. Perubahan fisik ini terjadi bila air terkena panas, misalnya air mendidih berubah menjadi uap.

Penyaringan (filtrasi) : proses pemisahan kotoran dari air dengan menggunakan kertas/kain katun.

Peresapan : cara air permukaan meresap ke dalam tanah melalui lubang kecil-kecil dalam tanah.

Sedimentasi : proses pengendapan kotoran yang terdapat didalam air.

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Kunci Jawaban

Latihan 1

(halaman 8)

1. minum air
2. air
3. lautan
4. asin
5. daur air

Latihan Bersama

(halaman 13)

No.	Jenis kegiatan manusia	Mempengaruhi daur air	Tidak mempengaruhi daur air	Penjelasan
1.	Menebar benih ikan di danau		V	Penjelasan

No.	Jenis kegiatan manusia	Mempengaruhi daur air	Tidak mempengaruhi daur air	Penjelasan
2.	Mengubah daerah resapan air menjadi bangunan-bangunan lain.	V		Menyebabkan berkurangnya daerah resapan air tersebut sehingga bila terjadi hujan air tidak terserap ke dalam tanah dan membentuk kubangan yang lama-kelamaan semakin meluas sehingga menyebabkan banjir
3.	Membiarkan lahan kosong tidak ditanami tumbuhan.	V		Menyebabkan lahan kosong menjadi gundul sehingga daur air menjadi terganggu karena cadangan air yang berada di dalam tanah semakin berkurang. Sehingga air yang ada di sungai dan danau menjadi lebih sedikit
4.	Menanam tumbuhan bakau di daerah pantai		V	
5.	Menggunakan air secara berlebiahan	V		Menyebabkan persediaan air bersih semakin berkurang sehingga terjadi kekeringan.

Latihan 2

(halaman 18)

1. pengolahan air
2. kuman
3. penyaringan
4. sedimentasi
5. dekantasi

Uji Kompetensi

(halaman 20)

A. Soal pilihan ganda

1. d. mengecat
2. d. Penebangan pohon di hutan dan didaerah resapan air yang tidak terkendali
3. b. Berwarna
4. d. Dekat pembuangan limbah
5. d. Membuang sampah
6. c. Tidak melakukan penggundulan hutan

7. d. Gunakan air untuk bermain semprotan

8. c. penguapan

9. a. kekeringan

10. b. selancar dan arung jeram

B. Soal isian singkat

1. penguapan
2. merebus
3. danau
4. penebangan
5. mengalir

C. Soal uraian

1. a. Air permukaan : air laut, air danau, air sungai dan air kolam.

   b. Air tanah : air sumur.

2. Air yang berada di laut, sungai dan danau akan mengalami penguapan. Penguapan menyebabkan air berubah wujud menjadi uap air yang akan naik ke angkasa. Uap air ini kemudian berkumpul menjadi gumpalan awan. Gumpalan awan akan mengalami pengembunan karena suhu udara yang rendah. Pengembunan ini membuat uap air berubah wujud menjadi kumpulan titik-titik air yang tampak sebagai awan hitam. Titik-titik air yang semakin banyak akan jatuh ke permukaan bumi, yang dikenal sebagai hujan. Sebagian air hujan akan

meresap ke dalam tanah dan yang lainnya akan tetap di permukaan. Air yang meresap ke dalam tanah inilah yang akan menjadi sumber mata air sedangkan air yang tetap di permukaan laut akan dilairkan ke sungai, danau, dan saluran air lainnya. Air permukaan inilah yang akan menguap lagi nantinya membentuk rentetan peristiwa hujan.

3. a. Penggundulan hutan, penebangan yang secara liar membuat tidak berfungsinya hutan sebagai daerah resapan air.

   b. pencemaran air, pembuangan limbah yang sembarangan menimbulkan polusi bagi lingkungan sekitar.

   c. betonisasi, daerah yang diaspal atau di beton tanah tidak dapat menyerap air sehingga membuat semakin berkurangnya daerah resapan air.

4. - Tutuplah air keran setelah menggunakannya.
   - Usahakan mencuci pakaian setelah mencapai jumlah yang cukup banyak.
   - Gunakan air bekas mencuci beras atau sayuran untuk menyiram tanaman.
   - Mencuci kendaraan yang kotor saat dibutuhkan

5. Membersihkan air sehingga aman untuk diminum oleh manusia.

APPENDIX SHEET

Kata Pengantar

Alhamdulillah segala puji bagi Allah SWT yang telah memberi hidayah, ilmu, kesehatan, dan kesempatan yang sangat berharga, sehingga penulis dapat menyelesaikan bahan ajar Ilmu Pengetahuan Alam kelas V materi daur air ini sebagai tugas akhir penyusunan skripsi ini.

Dalam bahan ajar ini dilengkapi dengan peta konsep dan tujuan pembelajaran sehingga, lebih mudah dalam memahami isi bahan ajar ini. Materi buku ini, juga disusun dengan kegiatan-kegiatan simulasi pembuatan awan dan pengolahan air. Bahan ajar ini disusun dengan maksud untuk mempermudah memahami konsep daur air serta memahami betapa besar tanda-tanda kebesaran Allah SWT.

Dalam kesempatan ini, penulis ingin menyampaikan terima kasih kepada pihak yang telah ikut serta dalam penuyusunan bahan ajar ini, yaitu kepada:

1. Dr. H. Nur Ali, M.Pd selaku dosen pembimbing skripsi.
2. Bapak dan ibu dosen yang telah berkenan menjadi validator ahli dalam pengembangan bahan ajar.
3. Bapak dan ibu guru yang telah berkenan menjadi validator ahli dalam pengembangan bahan ajar.
4. Keluarga penulis yang selalu memberikan kasih sayang dan doa serta memotivasi, sehingga terselesaikannya bahan ajar.
5. Semua pihak yang telah membantu dalam penulisan bahan ajar ini.

Harapan penulis semoga bahan ajar ini dapat bermanfaat dan penulis mengharapkan kritik dan saran atas kekurangan penyusunan bahan ajar ini.

Malang, Juli 2014

Penulis

Program Pembelajaran

Bahan ajar ini akan mempelajari materi daur air yang dipersiapkan untuk siswa sekolah dasar kelas 5 sebagai penunjang Kurikulum 2013 dan KTSP. Tema "Bangga Sebagai Bangsa Indonesia", dan Kurikulum Tingkat Satuan Pendidikan (KTSP). Adapun standar kompetensi dan kompetensi dasar yang dikembangkan adalah:

Standar Kompetensi:

7. Memahami perubahan yang terjadi di alam dan hubungannya dengan penggunaan sumber daya alam.

Kompetensi Dasar:

7.4 Mendeskripsikan proses daur air dan kegiatan manusia yang dapat mempengaruhinya.

7.5 Mendeskripsikan perlunya menghematan air.

Indikator:

1. Menjelaskan peristiwa-peristiwa perubahan wujud air yang terjadi pada proses daur air.
2. Menjelaskan urutan tahapan peristiwa proses daur air.
3. Menjelaskan macam-macam daur air.
4. Menjelaskan manfaat adanya daur air bagi manusia.
5. Menjelaskan kegiatan-kegiatan manusia yang dapat mempengaruhi kelangsungan proses daur air.
6. Menjelaskan cara menghemat air.

Pedoman Penggunaan Buku

Guru dan siswa dapat mengetahui hasil yang diharapkan dengan mempelajari bab Bumi.

1.

Program Pembelajaran

Bahan ajar ini akan mempelajari materi daur air yang dipersiapkan untuk siswa sekolah dasar kelas 5 sebagai penunjang Kurikulum 2013 dan KTSP. Tema "Bangga Sebagai Bangsa Indonesia", dan Kurikulum Tingkat Satuan Pendidikan (KTSP). Adapun standar kompetensi dan kompetensi dasar yang dikembangkan adalah:

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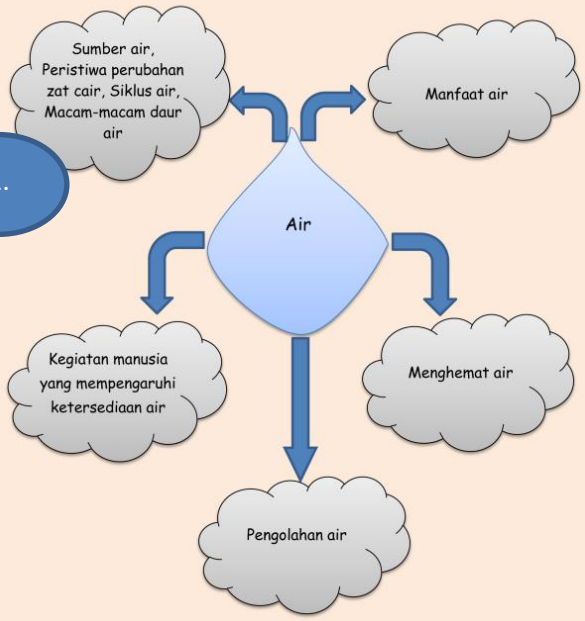
7.4 Mendeskripsikan proses daur air dan kegiatan manusia yang dapat mempengaruhinya.

7.5 Mendeskripsikan perlunya menghematan air.

Peta konsep menggambarkan alur penjabaran materi pelajaran.

2.

Peta Konsep



Ilustrasi mempermudah siswa untuk lebih memahami pelajaran yang diberikan guru.

3.

Air

Semua makhluk hidup membutuhkan air, seperti tumbuhan, hewan, dan manusia. Manusia dapat hidup tanpa makanan hingga 8 minggu tetapi hanya dapat hidup selama 3-5 hari tanpa air. Tubuh kita membutuhkan air dalam jumlah besar. Kita diharuskan minum 2 liter atau setara dengan enam sampai delapan gelas air setiap hari. 70% berat tubuh kita terdiri atas air. Air laut dapat berwarna biru karena pembiasan cahaya dari langit yang berwarna biru. Sedangkan 70% permukaan bumi adalah air maka bumi dikenal sebagai "planet biru".

Tahukah kamu?

Air menyusun 83% darah kita, 74,5% otak kita, 22% dalam otot kita dan 75,6% otot kita. Secara keseluruhan, tubuh kita tesusun atas 70% air.

1. **Sumber air**

Kita memperoleh air dari air permukaan (lautan, danau, dan sungai). Sebagian besar air terdapat di lautan. Kita tidak dapat meminum air laut karena rasanya asin dan dapat mengakibatkan kehilangan cairan tubuh secara berlebihan atau dapat disebut dengan dehidarsi.

Kegiatan simulasi memberi pengalaman siswa secara langsung yang meniru peristiwa sebenarnya.

4.

Kegiatan Simulasi Membuat Awan

1. Alat dan bahan:
   - Toples gelas,
   - Selotip,
   - Korek api,
   - Satu kantung plastik es batu,
   - Air panas
   - Selembar kertas hitam untuk membungkus setengah bagian toples

Tahukah kamu?

Air menyusun 83% darah kita, 74,5% otak kita, 22% dalam otot kita dan 75,6% otot kita. Secara keseluruhan, tubuh kita tesusun atas 70% air.

5. Memberi wawasan lebih kepada Siswa.

6. Membantu menguji kemampuan pengetahuan baru Siswa.

Latihan 1

1. Kita tidak dapat hidup tanpa . . . .
2. Tiga perempat permukaan bumi terutup oleh . . . .
3. Sebagian besar air ditemukan di . . . .
4. Kita tidak dapat meminum air laut karena . . . .
5. Air terus mengalami perubahan di alam yang disebut dengan . . . .

7. Ringkasan materi memudahkan siswa untuk mengingat kembali pelajaran yang telah dipelajari

RINGKASAN

A. Air

1. Sumber air: lautan, danau, kolam dan sungai.
2. Peristiwa perubahan zat cair yaitu berubahnya air dari wujud cair menjadi gas disebut menguap, wujud gas menjadi cair disebut mengembun, wujud cair menjadi padat disebut membeku.
3. Siklus air yaitu: suatu proses air mengalami perputaran dari bumi ke atmosfer dan akan kembali ke bumi, hal itu terjadi secara terus-menerus,
4. Macam-macam daur air yaitu: daur pendek, daur sedang dan daur panjang.

Uji Kompetensi menguji pemahaman siswa terhadap pelajaran yang diterimanya.

8.

Uji Kompetensi

A. Pilihlah satu jawaban yang benar.

1. Air bersih tidak diperlukan dalam….

   a. Mandi
   b. Mencuci pakaian
   c. Memasak makanan
   d. Membuang sampah

2. Berikut adalah yang bukan merupakan ciri-ciri air bersih ….

   a. Jernih
   b. Berwarna
   c. Tidak berbau
   d. Tidak berasa

Berisi tentang istilah penting berkaitan dengan materi yang dipelajari.

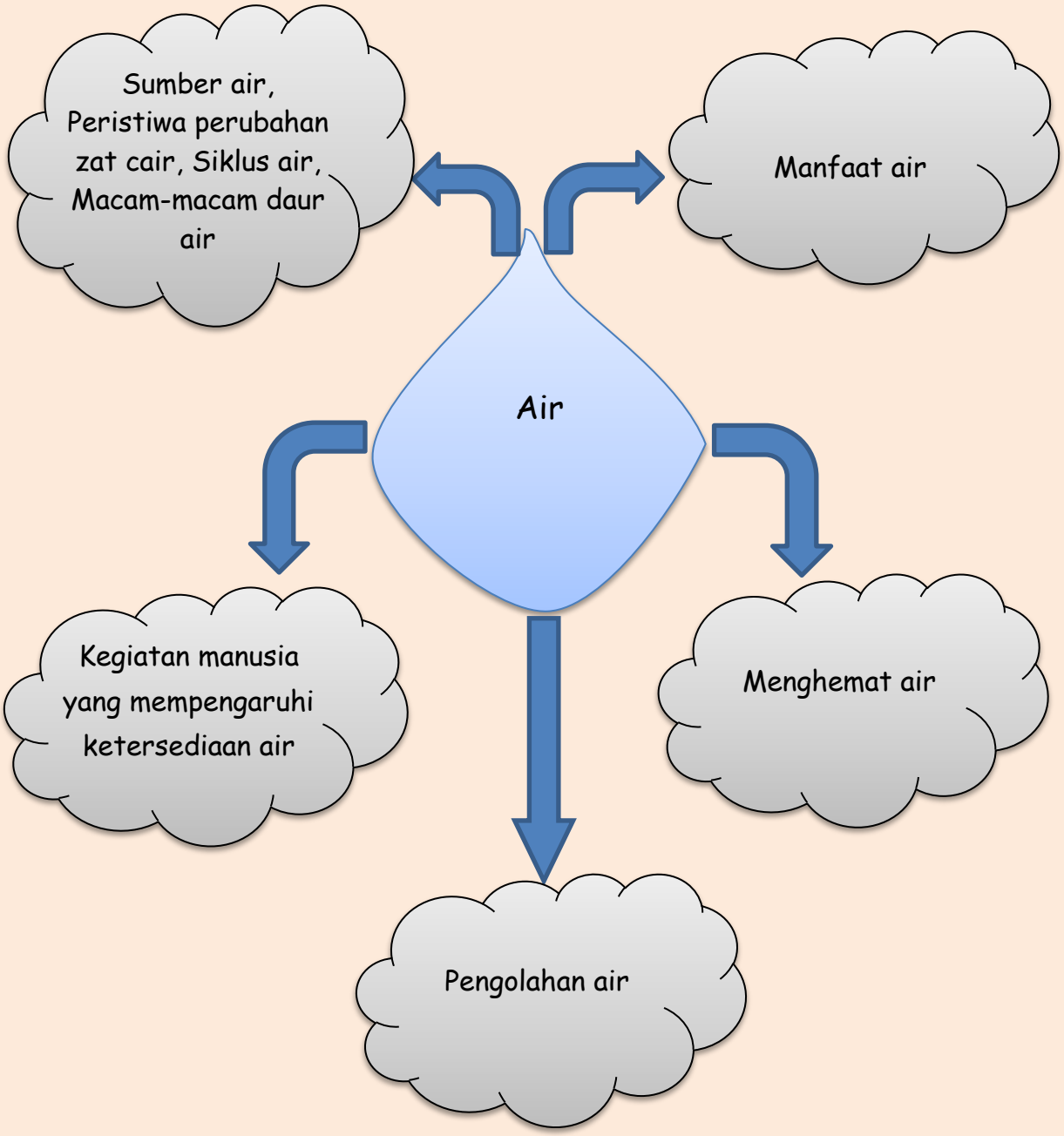
9.

Glosarium

Air tanah	: seluruh air yang ada di bawah permukaan (di dalam tanah).
Daur air	: merupakan suatu proses, air mengalami perputaran dari bumi ke atmosfer dan akan kembali ke bumi, hal itu terjadi secara terus–menerus.
Dekantasi	: proses dituangkannya air secara perlahan setelah sedimentasi

Daftar Isi

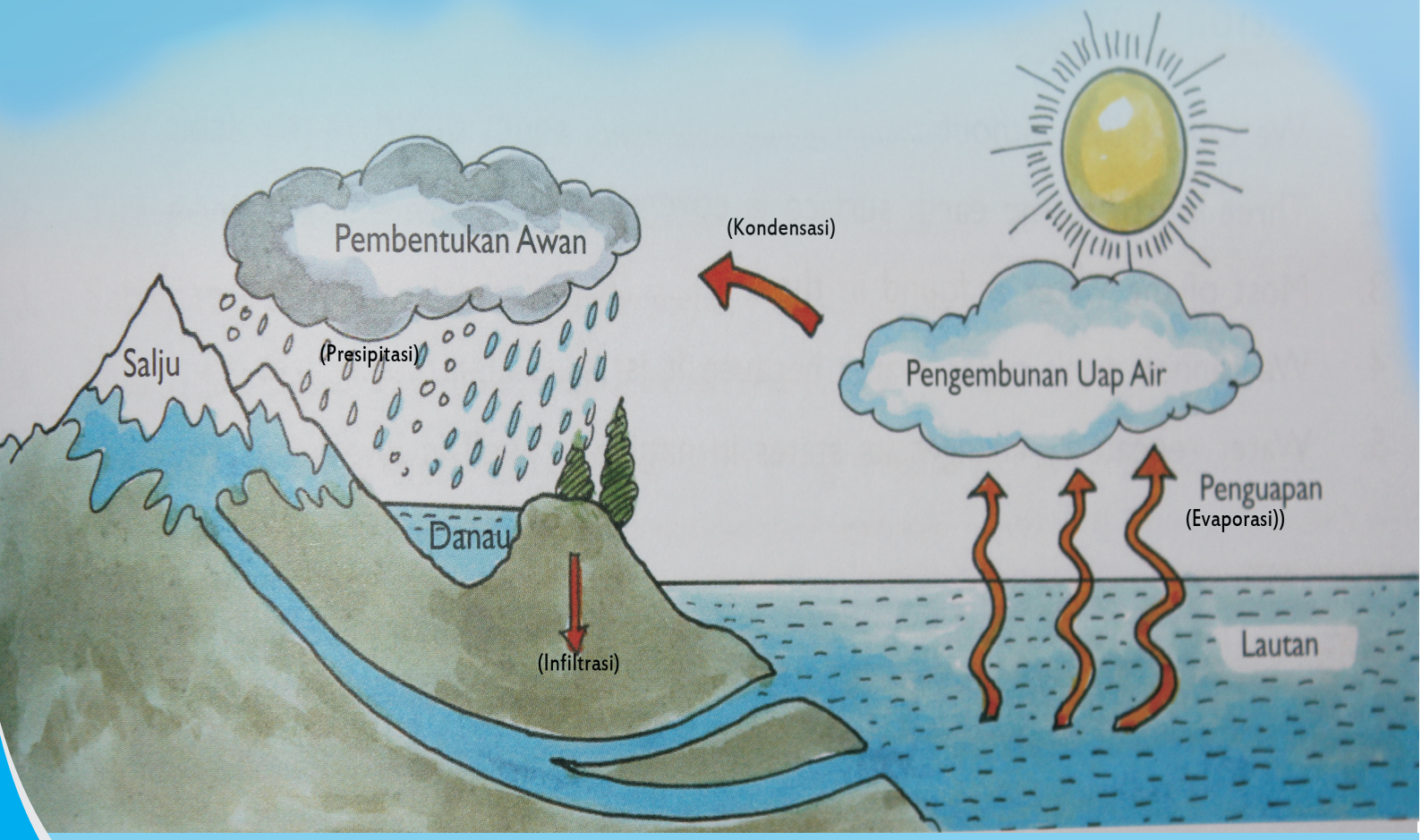
Peta Konsep


Sumber air, Peristiwa perubahan zat cair, Siklus air, Macam-macam daur air
Manfaat air
Air
Kegiatan manusia yang mempengaruhi ketersediaan air
Menghemat air
Pengolahan air

BAHAN AJAR UNTUK SD/MI

Kelas V

HIDROLOGI



Jurusan Pendidikan Guru Madrasah Ibtidaiyah
Fakultas Ilmu Tarbiyah dan Keguran
Universitas Islam Negeri Maulana Malik Ibrahim Malang

Khoiril Anam

Appendix V Identity of Subject Validator and Experiment Subject

1. Validator bahan ajar ahli desain:

Nama	: Ahmad Abtokhi, M.Pd
NIP	: 197610032003121004
Instansi	: Dosen Fisika Universitas Islam Negeri Maulana Malik Ibrahim Malang
Pendidikan Terakhir	: S1, S2, S3 UNESA

2. Validator bahan ajar ahli materi:

Nama	: Agus Mukti Wibowo, M.Pd
NIP	: 197807072008011021
Instansi	: Dosen PGMI Universitas Islam Negeri Maulana Malik Ibrahim Malang
Pendidikan Terakhir	: S2 Pendidikan Kimia
Alamat	: MSI E-29

3. Validator ahli pembelajaran untuk guru bidang studi IPA kelas V MI

Nama	: Eny Maria Andriyani, S.Pd
NIP	: -
Instansi	: MIN MALANG 02
Pendidikan Terakhir	: S1 IKIP Malang
Alamat	: Jl. Warinol 7/10

4. Daftar nama siswa pengguna Bahan ajar IPA

NO.	NAMA	NIS	JENIS KEAMIN	KELAS
1.	AHMAD FARCHAN	4819	L	V B
2.	ALYAH RAHMA NISA'.	4795	P	V B
3.	CAHYA WULANDARI	4771	P	V B
4.	DHEWI NGUJIWAT S.P.	4797	P	V B
5.	DHIMAS WAHYU PRATAMA	4772	L	V B
6.	GEARNIDHA SYAFA D.T.	4829	P	V B
7.	GRIZELDA AURA SAFIRA	5027	P	V B
8..	HABIBA SABRINA KUNAIFI	4803	P	V B
9.	LARASATI PUTRI HARDANI	4833	P	V B
10.	LUTFIYAH HAMIDAH N.	4779	P	V B
11.	M. IZRA ARYAWAR DANA	4847	L	V B
12.	MADINATUL ILMIL HIDAYAH	4780	P	V B
13.	MUHAMMAD FIKRI W	4784	L	V B
14.	M. HILMAN BIL HAQ	4836	L	V B
15.	MUTIARA IZZA RAHMANDA	4810	P	V B
16.	RISQI BAHREISY AL-ARIF	4840	L	V B
17.	ROYKHAN ANSHAR	4931	L	V B
18.	SALSA FEBY R.	4792	P	V B

Guru memberi penjelasan tata cara mengerjakan lembar pretest

Siswa mengamati bahan ajar IPA

Guru memaparkan materi

Koordinasi penugasan dengan masing-masing ketua kelompok

Siswa melakukan kegiatan simulasi penjernihan air

Siswa menyimpulkan hasil kegiatan simulasi penjernihan air

Siswa mengerjakan lembar postest

BIODATA OF STUDENT

Name	: Khoiril Anam
NIM	: 10140098
Place, Date of Bird	: Sragen, 01 August 1990
Faculty/Program	: Faculty of Tarbiyah and Teaching Sciences
Entered Study	: 2010
Address	: Demangan 07/02, Kec. Tahunan, Kab. Jepara
No. Hp	: 085641202504

Malang, July 30 2014

Student

(……)

Lestarikan Air...
Untuk Menyelamatkan Kehidupan...
dan Menyelamatkan Dunia...

Jurusan Pendidikan Guru Madrasah Ibtidaiyah
Fakultas Ilmu Tarbiyah dan Keguran
Universitas Islam Negeri Maulana Malik Ibrahim Malang