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Genetics Misconception on High School Textbook, the Impact and Importance on Presenting the Order of Concept through Reorganization of Genetics

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Abstract
The aim of this research was to uncover the misconception of high school class XII textbook, especially on genetic material. Fiveteen textbooks were analyzed and published in 2007-2010. This research was conducted to identify misconception page by page and chapter by chapter and validated by geneticist. The result show that misconception found in the concept of the scope of genetics, the genetic material of chromosome, gene, DNA; replication; polypeptide synthesis; Mendel and inheritance, cell division and mutation. The cause of the misconception was still a classic presentation of genetic material or Mendel mindset still dominate, the use of analogy was not appropriate, use the bias terminology and the selection of language (word and sentence not appropriate), and the ideas of the author. Misconception affect the concept of genetic disorder. Misconception can be overcome by doing the selection of books, and reorganization of the genetic concept that takes into account the order of presentation of the concept.
Keywords: misconception, cause of misconception, genetics, high school textbook

Introduction

Misconception on genetic material can occur by several factors, it could be caused by the teacher, the student's preconceptions of the genetic material that obtained from the previous class or due to the many textbooks provide the incorrect information from scientist understanding or the misconceptions. Textbook or student handbook is very diverse. School do not provide provision of textbooks which can or not be used because there is not recommendation about the quality of research on textbooks used in schools. This ensues in undetectable the faults of existing concepts in the textbook. Students can use a variety of good textbooks obtained from the upper level students, borrowed from the library or purchased a book.

Adisenjaya (2007) stated that until now the textbook is still the main source of information in the learning process, both teachers and students. Textbooks used by teachers to deliver material and even determine the learning strategies and students use it as a source of information to do the work in school and homework.

Abimbola (1996) stated that Teachers should have another handbook from a trusted source such as textbook. A textbook is compiled by a team of teachers or lecturers and uses different sources, so the quality is also different. Textbook quality can be assessed based on the validity of textbooks with specific criteria, content of specific biology, readability or the ability to customize and misconceptions.

Wangintowe (2000) also stated that from the tracing of the source of books which used by teachers and students, it can be concluded that the limited explanations written in the books that are used as a source of reading materials in the biological learning process likely leads to the misconceptions.

As stated by Kaharu (2007) that when referring to the applied current and previous curriculum, includes student and teacher handbooks, it can be seen that the material or concepts that have been given in elementary school to high school is a depth and a different emphasis, depending on the level of school where such material is given. The higher the level of schools is the deeper the concept. So that when in the previous level the misconception occurred, it will ensue in misconceptions to the next level.

Research related to textbooks is still very sparse compared with research related to other educational components. Research related to such textbook deals with the analysis of the material terms of the depth, breadth and compliance with applicable curriculum (Wahidah and Widaningsih, in Adisenjaya, 2007). This is confirmed by Venville (2002) that for most students the lesson Genetics considered tiresome and boring (Barlow, 2006, in Venville 2010). Students have difficulty understanding abstract concepts to their genetic and away from everyday life. Often with these difficulties may occur misconceptions.

Teaching experience of the author during the course of genetic in Pascasarjana, according to a student who also works teacher stated that, Genetics is a difficult concept for students to learn. Many teachers are difficult to teach genetics concepts so that the students always the gain a low score on this material. One reason is the misconceptions of textbooks and resulting in teachers and students of misconceptions.

Venville 2002) stated that there are 90% teachers in the United States relied on biology textbooks (the research that is compiled in a book) in their learning activity. Yager (in Nigerian science teachers rely on textbooks for the content of sufficient material for the preparation of syllabus requirements at institutions in

West Africa and the *Different Science Subject* national curriculum biology teachers in the U.S use a variety of curriculum supplements such as using film, tape recordings, and computer with the compatible software. Nigerian teachers entrust textbook or college textbook as a handbook of teachers, students, and workbook. So the author states the importance of writing a new book by using various sources of literature. This shows the importance of writing the new book by using a trusted source, so that the books misconceptions can be avoided.

Based on the importance of textbooks that can provide a true learning experience for students, the authors need to evaluate textbooks used in schools, Material to avoid mistakes that result in misconception. Therefore, the research problem were:

1. Assessing any misconceptions found in high school textbooks in particular the genetic material
2. Examine the concept of genetic causes of errors found in high school textbooks in particular on genetic material.
3. Reveal the impact of genetics on teacher misconceptions
4. How to repair misconception in textbooks through the concept of genetic reorganization.

The purpose of this study were to provide information regarding misconceptions genetics and causes misconceptions in high school biology textbooks, and its impact on the concept of the teacher. Furthermore, the authors also provide recommendations on how the teacher's role in avoiding or overcoming misconceptions problem. The benefits of research are the result of this study can be used as a source of information about misconceptions and needs to be followed up by policy makers (government) in order to immediately fix the problem misconceptions in textbooks.

Methodology

The method used in this research was descriptive method which aim to describe the misconception contained in the high school biology textbooks XII class specifically on the concept of genetics and analyze the cause of misconception. Objects in this study is the concept of the concepts included in high school biology textbooks were analyzed by 15-year textbooks published 2007-2010. It refers to the provision Permendiknas No. 1 of 2011 Date 4 January 2011 about the textbooks used in schools published at least 5 years books provided by the school for student use in learning as much as 12 books. Errors were analyzed concept was the concept:

1. the meaning and scope of genetics
2. genes, DNA and chromosomes including
3. the relationship of genes, RNA, polypeptides, and the process of protein synthesis
4. the linkage between the processes of mitosis and meiosis division of inheritance
5. principles of heredity and the mechanisms of inheritance and
6. sex Determination, and
7. mutation and its implications.

Research subjects or informants is informants such as teachers involve 12 teachers in the District of Gorontalo, 10 teachers in the area of North Gorontalo, and 20 teachers in the city/district of Gorontalo.

The instrument used was: First, observation sheets used for fill ratio concept of the book studied the sources of foreign text books referenced. Second, objectively reasonable test is used to identify teachers' understanding/informant against the concept under study. This test was developed based on data obtained from the results of the identification of errors and misconceptions in textbooks.

Test to examine the misconception were

1. What books are you father/mother use to teaching of school biology?
2. What genetic material is difficult to be taught during this?
3. Explain the differences in genes, DNA and chromosomes
4. How does the relationship of genes and loci?
5. Describe how the position of a gene on the same alel chromosome
6. What is the difference chromosome body with sex chromosome in humans

	Chromosome Body	Sex Chromosome
location		
number		
function		

7. What is the quantity of chromosomes in a human skin cell? is there any sex chromosomes in a human skin cell?
8. What is the number of chromosomes in germ cells (sperm and ova) human?
9. Mendel I pointed out the law? Part is separated?
10. Relate the law Mendel II? What part of the free combination?
11. Is monohibrid occurred at the intersection of I and II Mendel?
12. Is the law occurred Mendel dihybrid crosses I and II?

13. Which section of the organ of a plant or animal and human law Mendel I and II
14. Pose the hard part when speaking of the law Mendel I and II.

Third, the interview guide and interview sheet is used to obtain more information about the findings of teacher misconceptions reasoned objective test results. This research was broadly divided into six stages to identify misconception and reveal the impact of textbook on the genetics misconception teacher.

The Steps of Identifying the Genetics Misconception on the Book of Biology.

The steps of identifying the genetics misconceptions are done by following the procedure according to research misconceptions Abimbola & Baba (1996).

First, determining genetic concepts to be studied and grouped into 5 groups of concepts based on high school curriculum, that are the genetic material of DNA, genes, chromosomes, replication, relations of genes, RNA, polypeptide and protein synthesis processes, principles of heredity and inheritance mechanisms; relations mitotic and meiotic by inheritance; mutation .

Second, browse some books to determine whether high school textbooks have a conceptual problem or not. This activity is done by reading and finding examples of genetic misconceptions that might be found in some high school textbooks used in schools then assign the book for identification. In order to keep the research ethics, book title, author and publishers are not recorded. The author uses the initial. The complete data is on the researcher.

Third, identifying misconceptions, evaluating books page to page and chapter to chapter in order to find misconception related to the genetical material of science statement which is determined.

Fourth, tabulating identified conceptions continuing misconceptions. The tabulation is started by each textbook, and then the similarity of misconception in each material set into one piece. Reference books to assign misconception is genetically foreign language textbooks written by Gardner, E.J., Simmons, M.J & Peter, S. (1991) book's title *Principles of Genetics;* Campbell, Reece & Mitchell, L.G. (2002) *Biology* and Corebima (1997) *Penentuan Jenis Kelamin pada Makhluk Hidup;* Corebima (1997) *Genetika Mendel*

Fifth, the geneticists an evaluator team at the University of Malang validates and identifies misconceptions that have been found. *Validator* evaluates the truth or acceptability of conceptions identified as misconceptions. *Validator* does not any longer examine textbook that has been identified by researchers. The researchers can eliminate some items from the list of misconceptions identification based on validator's work.

Sixth, uncovering the misconception impact of teachers who are affected by misconception textbook. Implement the implementation phase identification tests misconceptions the teacher and ask the teacher give a reason in accordance with his conception. Furthermore, carrying out interviews with informants (teacher). The informants were asked to work on the problems related to the impact of applied genetics related to the misconception. Furthermore, data is deepened through discussions and interviews with informants. (Instruments questions on the attachment).

Data were obtained from analysis of textbooks then tabulated and counted the number of misconceptions found in each genetic concept. To get the information about the impact of misconceptions on the books of the misconceptions of teachers, a subjective test data are described in detail.

Result of Research and Discussion

The Genetics Misconception

Based on the presentation of the concept in 2013 curriculum at class XII, genetics concepts covered in 5 basic competencies. Based on the number of the found misconception, the presentation of the error concept in table 1 is grouped based on 7 seven groups of concept, they are:

1. The meaning and scope of genetics
2. Genes, DNA and chromosomes including
3. The relationship of genes, RNA, polypeptides, and the process of protein synthesis
4. The linkage between the processes of mitosis and meiosis division of inheritance
5. Principles of heredity and the mechanisms of inheritance and
6. Sex Determination, and
7. Mutation and its implications.

Findings of Misconception on Basic Competence of genes, DNA, and Chromosome

Misconceptions found in textbooks do not distinguish chromosomes, genes, and DNA structurally. Genes, DNA, chromosomes are functionally described only as a carrier of factor and determines the nature of living things. Result of this research was relevance with Shaw'statement (2008) that more of student was not be able to describe gen, it's structure, and it's function.

Acyually, the right consept of gene is structurally a segment of DNA that expresses a particular nature DNA is the genetic material that is composed of a phosphate, deoxyribose sugar and the nitrogenous bases forming a polynucleotide. Eukaryotic DNA is associated with histone proteins to form chromosomes, Gardner,

1991). Misconception, the gene is a series of triplet of nitrogen bases founded on the tape of DNA that would encode a polypeptide chain and further would become part of an enzyme or other proteins. (Definition of such genes can be mistaken that all these genes are all functional parts. By eukaryotic, not all of the parts of genes are functional, gene comprised of intron and exon regions. Areas of exons are the coding region of the polypeptide while intron areas are not functional or non-coding amino acids).

Misconceptions, genes are located in the locus formed a linear row of the chromosome. Locus is around object like a ball lined up a series. Gene is supposed to locate on chromosome threads in a row of sequential and orderly. (The right concept of locus is the relative position toward a genes location in chromosome (Gardner, 1991).

Misconceptions of alela that alela have alternative form of genes which are symbolized by large and small Latin alphabet. The double alela is considered that a person has more than two alleles. Misconception on those parts of the chromosome is mentioned as follows. The arm is a part that is created by threads of chromosomes. Threads of chromosomes shorten and thicken to form chromatin.

Misconceptions, the arms are made up of three parts namely membranes, matrix and chromonema. Part of the membrane is a thin piece body covering chromosomes; the matrix is a clear fluid that fills the entire arm. Chromosome matrix contains of fine threads swirling called chromonema. Chromonema are made up of beads lined called chromomeric to bring offspring traits of the so-called gene locus.

Misconceptions about the relationship of chromosomes, DNA and genes by analogy as a city that is like the structure of a chromosome. It is located in the cell nucleus that carries the instructions for each phase of the cell life. Each home symbolizes a molecule of DNA, the material that is immortality. Rooms are genes as regarded the son of the molecule that occupies special places in the DNA molecule. The bricks are nucleotides, the "building materials" molecules. (This analogy is more confusing among students because of hierarchy among DNA, genes, and chromosomes become indistinct)

Findings on the Misconception of Basic Competencies Describe the Relationship of Genes (DNA)-RNA-Polypeptide and Protein Synthesis in the Function of Characteristic Formation of Living Things

Misconceptions found as follows. Transcription is the process of DNA replication to form an RNA-d. Transcription is the process of transfer of genetic information from DNA segment (gene into mRNA molecules. The main material of polypeptide synthetic is gene. DNA requires intermediaries to bring messages to the ribosome. Protein synthesis process includes three main phases, including: DNA replication, transcription and translation, DNA carries out its functions in a way DNA is firstly copied into RNA and results of the copies do polypeptide synthesis. This is meant that the original genes remain protected, while the results of copies are assigned to carry the messages it contains, RNA does not have Thymine instead Uracil which has a chemical structure is similar to Thymine. RNAd is a link between DNA molecules and proteins and carry messages in the form of genetic information from DNA to form a protein, one molecule of RNAd makes ribosomes strands to synthesize polypeptide. RNA is mostly in the cytoplasm and the nucleus especially in the ribosome. Origin of RNAr is from DNA that is many inside the ribosome; the origin of rRNA is in the nucleus. RNAt is formed by DNA in the cytoplasm. Genetic code is a triplet coding sequence of nitrogenous bases of DNA and RNA. Information considered in the form of password code sequences in RNA will be connected into amino acids, peptides, polypeptides, until forming protein.

Misconception on Basic Competence in Describing the Relationship between Mitosis and Meiosis Fission with the Inherited Character

The misconceptions here are as follows: at S stage, the replication and duplication of DNA occur. Replication is the multiple process of DNA molecule therefore the child's cell will has same total DNA with the mother's cell. Duplication is copying process of chromosome so it will be length. At interphase stage, the cell does not do the activity whether physically or chemical reaction. At prophase stage, the arm of chromosome duplicates into two chromatids bound to the centromere. At mitosis fission stage, the segregated metaphase is homologous chromosome. At meiosis fission stage-the pachytene stage, bivalent or homologous chromosome duplicate into two chromatids, therefore each bivalent has four chromatids called tetrad.

Misconception Occurs on Basic Competence in Understanding the Heredity Principles in Its Mechanism

The misconception is in this sentence. If the individual is breed together, the homozygote individual will not be separated. While the individual with the Bb genotype if breed together will separate. In the example, Bb breed with Bb will result BB, Bb and bb.

Misconception of Mendel stated that segregation from allela couple which determines the heredity do not affect the other which determined the other heredity. Alleles of different characteristics segregated freely. This inference result the second Mendel law that is "independent division and assortment".

Misconception at meiosis division, accord with the segregation principle (division), the heredity factors

will separate in gamete form. The form of gamete cell of two genes couple will be generated independently to the inheritor through gamete. Then, in producing process, the separated ovum and sperm gamete will be paired randomly.

Misconception of those separated genes will be joined with the genes from anmother in breeding stage. Those mergers occurred randomly and freely. At this breeding, it clearly occurred that the genes can pair to form the various combinations. Those are known to Mendel II laws or the Law of Independent Assortment.

Misconception of each organism is formed by the somatic and gamete cell. Body cell is composed by the autosome while the sex cell is composed by gonosome. Misconception of eukaryotes cell has two chromosomes, autosome and lonesome. Autosome does not determine the individual sex while the gonosome determine it.

Misconception on Basic Competence in Describing the Mutation and Its Implication in Science, Environment, Technology and Society

Misconception of mutation is the genes mutation of inheritors that change the person's attitude of inheritor and the inherited. This change cause the phenotype of inheritors will be totally different with the phenotypes of both mothers. The divergence of structure and total number of DNA causes the deviation of fetus also the children handicapped or different character so it may be resulted the new species.

Misconception of every mutation in the body can be seen in somatic change (autosome mutation), generative or gametes change (sex chromosome mutation). Somatic change can occur in body tissue such as epithelium, muscle, bone and nerve. Generative and gametes change (sex chromosome mutation) occurred in sex gonad. Mutation happened spontaneously but randomly occurred naturally and has a disadvantage. The mutation caused the death is natural effort in keeping the genetics balanced in one population. Result of tis research relevance with Shaw'statement (2008) that few of student have right understanding about kind of mutation happened, cause of mutation, fisiogis effect of gen changes.

The Cause of Genetic Misconception in the Textbook

Based on the example of misconception which is found in Senior High School textbook, The cause of the genetic misconception can be categorized they are presentation of classical genetic material or Mendel genetic, not representative concept presentation (minimal molecular information), the use of analogy which inappropriately, the use of term inappropriately, the word selection or the wrong words, and the ideas or the analysis of the author itself.

The presentation of the genetic concept currently is still dominated by Mendel concept. The Mendel concept was considered as the main inheritance. Venvile (2002) stated that nowadays is the time for the presentation of the genetic concept leaving the mendels shadows in order to the understanding is more broadly about the genetic not only fixated on inheritance mendel.

The presentation of the genetic concept is not molecular. There are many faults of genetic concept because of there is no explanation in molecular level. As the gen statement explained as the determinant of the nature of the organism. DNA as a nature of the organism and chromosome is genetic material of an organism. This is confused. Venville (2002) stated that the presentation of the genetic concept needs to be presented representatively by presenting information molecularly. It bridges the rapid development of genetic in order can be a right foundation for the development of student's cognitive.

The molecular approach in the future will be needed to support the rapid development of genetic. Meanwhile, if the textbook is still providing the classical genetic so that our student's understanding will be slow. Therefore, we cannot avoid the representative's explanation biochemically or molecularly. As Treagust and Chittleborough state in Vanville (2002) that the difference of representative level in science is an explanation on a chemical level. We expect that there is a phenomenon like gen phenotype expression, microscopic nucleus, chromosome, submicroscopic DNA, and alkali A, G, C and T as the basic of genetic code. The alteration of representative level automatically is applied to all teachers in senior high school, junior high school, and at university level.

The use of an analogy in explaining a concept should be summarizing student in understanding the concept. But the use of a wrong analogy will cause a miss understanding of the students in understanding the concept (Gusril, 2008). Therefore, it should be careful in creating an analogy.

The use of wrong term and language, or the wrong words will cause the wrong perspective in understanding the concept. For instance, the use of body chromosome and genitals chromosome. It should be better if those terms are replaced by autism chromosome and gonosom chromosome. Likewise, the use of sentences or words which are wrong. The use of wrong sentences or wrong words can be caused by the author's understanding which is not appropriate. The ideas as a reflection of the author's understanding will also influence the misconception.

The Impact of Genetics Misconception in Textbook towards Teacher's Understanding

By doing triangulation data of misconception in textbook through interviewing as well as the answer from questionnaire then the author gets the data of the impact of misconception to the teacher. In interviewing section the researcher asks several questions related to the impact of misconception towards the mastery of genetic concept.

The impact of misconception on the basic competence of genes, DNA, and chromosomes descriptions. The question asked is what is the difference of genes, DNA and chromosomes. Based on the responses it appears that teacher is difficult to distinguish genes, DNA and chromosomes structurally. Understanding the concept of genes, DNA and chromosomes them only on a functional level. It should be able to explain in molecular teachers so that the concept of genes, DNA and chromosomes become apparent. The impact of this concept is the teacher is not able to explain how the nature of the relationship of gene expression. The question of how the number of chromosomes bodies cells and the number of sex chromosomes in human cells. Answer most of the teachers stated that the human body cell body numbered only 44 chromosomes, whereas human sex cells contain only 2 sex chromosomes. The concept of teacher impact is difficult to imagine a parallel process of meiosis to Mendel's Law I and II. Because of the assumption that all sex cells contain only 2 sex chromosomes. On the other hand teachers also know that the result is a reduction of meiotic chromosomes from 2 sets to 1 set of chromosomes. The teacher stated that the chromosomes that have two sex chromosomes and chromosome body. Sex chromosomes determine the sex, body chromosomes determine the nature of the body. It is also the impact of preconceptions that one happens to students and teachers and the students and faculty, as has been reported in studies Nusantari (2012). This needs to be a solution in the form of presentation of the concept of genes, DNA, chromosomes and the molecular basis of the concept of structuring relationships of genes, chromosomes, Mendel and meiosis as well as information about the latest findings of the work or the expression of genes in expressing the nature of living beings.

The impact of misconception on the basic competence in describing the relationship among genes (DNA) - RNA - polypeptides and protein synthesis in the establishment of living things characters.

The question is how the nature of the relationship of gene expression in living organisms. Many teachers are hard to imagine how a gene can be expressed in the form of nature. Teachers also had overlapping concepts of the role of DNA as a template or mold, the role of the mRNA codons, while transcription translation RNAr role, do not understand the role of amino acids as a carrier RNAt. The teacher is difficult to imagine the process of transcription and translation to form proteins. This is due to the textbook explanation of the concept is not molecular. The impact is most teachers thought that the genetic code is the amino acid building blocks. This is due to the presentation of concepts in the book that states the formation of protein transcription begins subsequent translation of the genetic code. This has an impact on the misconception that the genetic code was formed material or constituent amino acids. In fact, the genetic code is actually a codon (3 bases each of Arnd) that encodes a particular amino acid. Amino acids are located in the cytoplasm to be taken by Arnt headed to the ribosome where protein synthesis. Translational stage is assembling amino acids in sequence the genetic code or codon are strung together to form a polypeptide. So should the concept of sequential order of presentation of the transcription, and translation of the genetic code.

The impact of misconception concept of basic competency describes the relationship among the processes of mitosis and meiosis division of inheritance. The question posed was difficult which section students be taught about the laws of Mendel's I and II? Mendel's first law when it happened and when it happened the second Mendelian law. Further crosses well presented one or two different properties of different nature, and teachers were asked to make arrangement and parental gametes. It turned out that the teacher is difficult to understand the process of formation of combinations of genes derived from gene to their children that exist in both parents. This can be seen in the data blurry streaks, difficulty determining the parental genotypes, how the formation of the constitution of gametes, genotypes derived. It is difficult to understand due to the combination occurs in gametes Meiosis division due process related to Mendel's Law I and II. The impact is hard to imagine teacher meiosis associated with heredity. Campbell (2002) stated that law of Mendel I happened at the moment of meiosis devide in anaphase I stage. Law of Mendel II happened at the moment of menafase I. Corebima (1997) stated that it is needed of explanation regarding the living creatures that experience. Mendel's laws related meiotic I and II occur in living organisms that reproduce sexually eukaryotic. While eukaryotes reproduce asexually through budding eg breeding is done through mitotic division.

The impact on the misconception of basic competence in understanding the mechanisms of heredity principle of inheritance.

The question asked is whether the pattern of inheritance in living organisms is always dominant and r recessive? Is there any pattern other than the dominant and recessive inheritance Answer teacher considers most of Mendel's Law as the main mechanism of inheritance. While other inheritance as a deviation or modification of

Mendelian inheritance pattern. The impact is that the nature consider teacher in the world is only just so dominant and recessive mutations only change will always be a recessive gene is dominant and consequently harmful to living things affected by the mutation. Corebima (1997) stated that needed of eksplanation about development of further research proved that the pattern of inheritance is very diverse, ranging from dominant recessive, codominant, semidominan, pleytropi, epistasis and hypostasis sex-linked inheritance pattern X.

Based on interviews teachers expressed more difficult to understand why the moment of fertilization, a recessive or dominant gene sex-linked gene X than the properties directly derived or expressed in boys, whereas in a girls only carrier. This is because the teacher does not know that the Y sex chromosome is holandrik alleles that do not have that when paired with an X chromosome X-linked gene that will be expressed.

The teacher also asked how the genetic content of identical twins are not identical twins. Is not identical twins are not identical and contain the same genes that the two sex chromosomes XY or XX alone. But why is there a difference, where is the difference? This question due to the misconception that assumes that there are only sex chromosomes in sex cells or gametes are sperm cells and ova. Corebima (1997) in his book of sex expression stated that ovum and sperm contain a set of chromosomes that consist of body chromosomes and sex chromosomes are numbered set (N). After fertilization the chromosome content of a baby becomes a full 46 chromosomes (instead of only 2 sex chromosomes). With the twins are not identical combination of different chromosomes containing chromosome in identical twins.

The impact on the concept of basic competencies that describe mutational events and their implications in salingtemas. Is the result of a dominant gene mutation? Answer majority of states that lasted only mutations of recessive genes become dominant. While always detrimental recessive trait. This resulted in an error in understanding the evolutionary process. The process of evolution is considered not happen at all. Mutants not the raw material of evolution because the mutations result is always harmful. So the genetic content in the population constant or no genetic variation in the population. So it is difficult to imagine evolution could occur. Important evidence described molecular mutations that will affect the mutated DNA sequence and its effect on the phenotype.

Error Repair Genetic Concepts in High School Textbooks Presentation Content Reorganization through Genetic Material

Based on the genetics textbook misconceptions that have been found in the concept of

(1) The meaning and scope of genetics.
(2) Genes, DNA and chromosomes including.
(3) The relationship of genes, RNA, polypeptides, and the process of protein synthesis.
(4) The linkage between the processes of mitosis and meiosis division of inheritance.
(5) Principles of heredity and the mechanisms of inheritance.
(6) Sex Determination, and
(7) Mutation and its implications.

As Corebima (2010) an expert in the field of genetics stated that occur due to the presentation of genetic misconceptions genetics concepts in text books only by order of discovery or presentation of the material for this is still oriented genetic history This led organization concept disjointed or fragmented. So the concept of fragmented genetic, and science studies difficult it becomes. Therefore, it is important to study the genetic concept of the new approach, and the approach should replace the concept of history is the approach. This means that the concepts that are no longer relevant should not appear in textbooks. Suryadi (2010) also argues that it is imperative in order of presenting the concept of student thinking in order to understand the concept step by step. Researchers in this case is a lecturer in the field of genetics. Then the researchers put through the concept of genetic reorganization in accordance idea Corebima (2002) and Suryadi (2010). Follow the sequence of concepts presented as follows.

The reorganization of the genetic material in concept of gene, DNA, and chromosome. The right presentation of molecular concept related to the gen is a DNA segment with the result that gen is the smallest part of DNA. This is from a DNA perspective as a long polynucleotide consists of phosphate, deoxyribose sugar, and nucleotide, with a certain distance or certain segment expressing certain nature. The meaning of chromosome is extensible briefly in eukaryotic and prokaryotic category which is different from histone protein and non-histone protein. The type of another pure genetic material of DNA is contained in acellular, an organelle eukaryotic, and plasmid, and also there is a chromosome out of the cell.

The reorganization of the genetic material in the concept of the relation between (DNA)-RNA-polypeptide and synthesizes protein in formatting the nature of the organism. The order of concept presentation is started from the function of gen in expressing the nature through the protein synthesis process. Protein synthesis process is started by transcription that is arranging the genetic code includes the determination of genetic code and Wobble and Wobble rule, then translation is a process of translating ARNduta to be

polypeptide.

The reorganization of the content of genetic material in concept of relation between mitosis fission process and meiosis through nature inheritance. Before discussing the genetic material inheritance, started from how the genetic material is doing genetic material reproduction by replication. Replication can be distinguished in prokaryotic organism category and eukaryotic, with a cellular of virus that is *rolling circle* replication. The eukaryotic organisms which proliferate sexually, the nature, inheritance are done through meiosis fission. For prokaryotic organism such as bacteria, the nature invention is done through binary fission, and for virus, the nature inheritance is done through infection to the chief.

Reorganization the content of genetic material at the concept of heredities principle in nature inheritance mechanism. This concept starts with heredity principle according to Mendel. Mendel's heredities only occur to eukaryotic organism which proliferates sexually. Mendel heredity principle does not occur to the eukaryotic organism which proliferates asexually, prokaryotic, and acellular (virus and retrovirus). The order of concept presentation is started by Mendel principle I and II. Then, the equivalence principle of Mendel I with Meiosis fission is in Metaphase 1level. Then, it is explained the appearance deflection of Mendel principle and the meaning of appearance deflection and also how the concept should be. It is also explained how the expression or the way gene works in determining nature, for example; pseudo dominant, polymer, criptomery, epitasis hypostasis, etc. Next, is presents the examples of the error in crossing caused by the wrong genetic concept and the way to do correctly.

The reorganization of the content of genetic material in mutation concept. Mutation concept is started with correcting the wrong concept that mutation always damage. The cause of mutation comes from the internal and external factor. The correcting of mutation, whether it is during replication or not, the correcting mutation is during the protein making. The types of mutation are gene mutation and chromosome mutation. The effect of mutation for organism. The role of mutation in evolution. Based on the research on moleculer stage was proved that DNA experience changes in structural stage that it's caused fenotip changes. DNA changes can happen, both fast and slow, so at the moment it's the this time for explaning of gen in moleculer stage to be base to support of moleculer evolution concept (Nusantari, 2013)

Recommendations for Teachers to Overcome Miskonsep the Textbook?
The role of the teacher as Selectors Miskoncep Textbook.

Teachers play an important role in addressing misconception textbook. misconception this will have an impact on students and teachers. Weak mastery of concepts will impact on the ability to understand the concept further. The occurrence of misconceptions will lead to the goals that should be achieved will be hampered and worried at the failure in achieving the learning objectives. How to do the teacher steps in order to provide correct information to the students? The recommendations made by the authors in accordance with the idea of Abimbola (1996), Corebima (2010), and Suryadi (2010).

In detail can be done *First*, teachers should always make the learning process related to planning how to present the material properly and not misconceptions. Teachers should conduct a content analysis of RPP (lesson plan) and learning materials or the right teaching materials as well as thinking about how to deliver the material / concepts systematically and correctly so that students can understand. This can be done through communication forums. Lesson Study can be used as a means of teacher discuss all issues related learning lesson plans, textbooks and the correct implementation of learning.

Second, the teacher selects the text books to be used in learning. The author recommends teachers use textbooks that have been evaluated by the agency or expert knowledge in the field to limit the number of textbooks is problematic

Third, the concept should be immediately reorganized the genetic material present in order of genetic concepts. Teachers should be able to perform a selection of books to be used in learning.

Fourth, the teacher can describe misconceptions found from the textbook. The teacher can consult with experts, colleagues, and using genetics book level college/university to clarify some misconception cases.

Fifth, if the current implementation of learning, the teacher found the misconceptions in the textbooks, teachers to discuss students' misconceptions by students of lecture method will not guarantee that the teacher has submitted misconceptions and correct them appropriately. Students need conviction of why such material contains misconceptions. Furthermore, teachers can help students make sense of these misconceptions.

Sixth, peers together teachers can discuss the misconceptions found in the book as well as those found when learning. Furthermore, teachers can inform by writing articles in journals on misconceptions found. Teachers need to be skilled refine misconceptions that students become aware of the concept correctly. This can be improved through genetic material up to date with routine follow seminars and trainings genetics.

Conclusion

Misconceptions found in high school textbooks on the concept (1) The meaning and scope of genetics, (2)

Genes, DNA and chromosomes including, (3) The relationship of genes, RNA, polypeptides, and the process of protein synthesis, (4) The linkage between the processes of mitosis and meiosis division of inheritance, (5) Principles of heredity and the mechanisms of inheritance and, (6) Sex Determination, and (7) Mutation and its implications.

Misconceptions on high school textbooks in class XII caused by the presentation of the genetic material is still classic or Mendelian genetics, the concept of non-representative approach (biochemical and molecular level), improper use of analogy, the use of the term, language selection (choosing the wrong word or phrase), or the results of the analysis of the ideas of the author himself.

The impact of genetics misconceptions is as follows. Teachers are not able to explain how the nature of the relationship of gene expression in living organisms. The teacher is difficult to imagine a parallel process of meiosis to Mendel's Law I and II. Teachers assume that the genetic code was formed material, or constituent amino acids. The teacher is difficult to imagine the main phase of meiosis stages of meiosis I, metaphase I and Anaphase I linked to heredity in living organisms. Teachers assume that the nature of this world is just so dominant and recessive mutations only change will always be a recessive gene that is dominant and consequently always harmful for living beings affected by the mutation. So that evolution could not have occurred through the raw material is always destructive mutants.

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