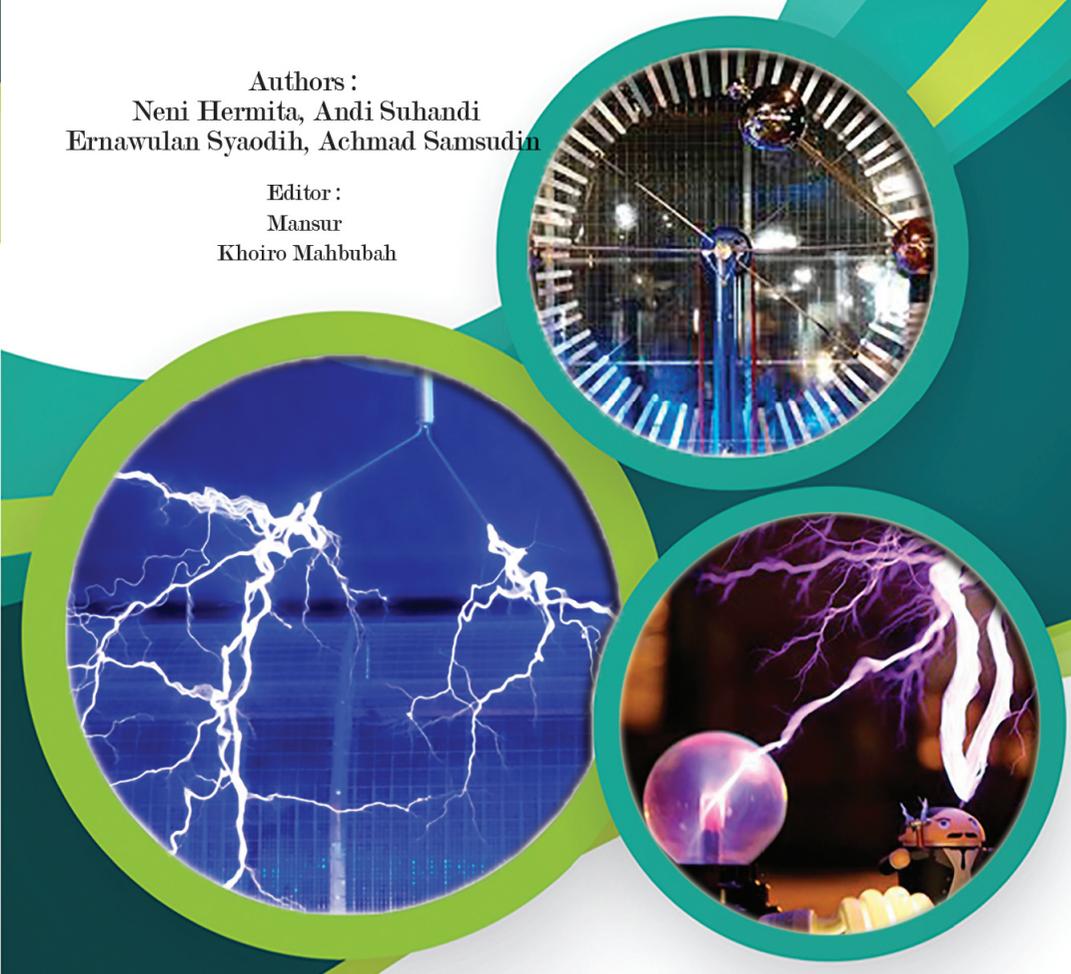


Visual Multimedia Supported Conceptual Change text (VMMSCText) of Static Electricity

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Desain Cover :
M. Firdaus

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Visual Multimedia Supported Conceptual Change Text (VMMSCCText) of Static Electricity

The concept of static electricity is abstract and susceptible to misconception. It takes a special strategy to turn a misconception into a scientific conception. The approach often used to change this false conception is known as the conceptual change approach. One of the strategies often used in conceptual change is the cognitive conflict strategy. This strategy holds that because it is difficult to change the state of a misconception because the person does not feel there is a problem with their conception, and even has a high confidence in the truth of their conception, there is no other way to remediate misconceptions unless it begins with the process of undermining the level of conceptual beliefs. Reducing the belief in a misconception, it is hoped that the person can immediately realize their misconception. In cognitive conflict strategies, to undermine the level of students' beliefs in their conceptions, conventional confrontation is typically processed by confronting the conception it embraces with actual reality according to the scientific conception. The usual technique used is that they are asked to perform a direct observation of phenomena contrary to their conceptions. The situations of conflict in their minds (disequilibrium state) are expected to occur when they face the fact that what they see while observing is contrary to their current conception. When this situation has happened it will be easier to change their false conception into a scientific conception. Cognitive conflict

strategies are developed on the basis of constructivism (Stepans, 2011).

In practice, cognitive conflict strategies are applied in the conceptual change model (CCM). According to Posner et al. (1982) there are four essential conditions for the conversion of conceptions: 1) dissatisfaction with their conceptions, 2) new conceptions introduced must be intelligible, 3) new conceptions introduced must be reasonable (plausible) and 4) new conceptions introduced must be fruitful.

Stepans develops CCM based on constructivism consisting of six stages of the process, namely: Phase 1, the process of disclosing the conception of learners on an event or physical phenomenon, Phase 2, the disclosure concept and conceptual beliefs, Phase 3, the confrontation of student conception beliefs through observation of a real phenomenon, Stage 4, a scientific explanation process to help learners accommodate a new scientific conception, Stage 5, the process of strengthening and expanding conceptions, and Stage 6, the process of searching for new ideas in accordance with the conception that is accommodated (Stepans, 1994; 2011).

CCM is suitable for use in remedial teaching activities. Remedial teaching is important after regular teaching, as it has been suggested to teaching can be a cause of misconceptions among learners. Remedial teaching can be done with various modes of learning, namely face-to-face mode in the classroom or the mode of giving reading material (text) that can be read and learned by the learners themselves.

Text is a lingual unit that is provided in writing or orally with a particular organizational order to express the meaning contextually. There are various types of texts, including: description text, discussion text, explanatory text, exposition texts, narrative text, negotiation text, procedural texts and others (KBBI, 2010). The text of conceptual change text (CCText) is a text type purposely developed for remedial-oriented remedial – oriented remedies of misconceptions experienced by learners. Since this text is tailor-made for this purpose, in its structure must necessarily include the four conditions proposed by Posner, et al. (1982) and the six phases of the conception-changing model (CCM) developed by Stepan (2011). As a text, CCText can be constructed from existing types of text, such as explanatory texts, discussion texts and procedural texts.

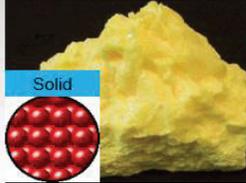
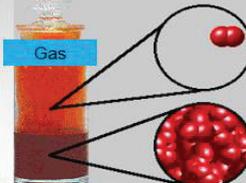
Conceptual change text consists of 4 parts, (1) Concept Disclosure and Conceptual Beliefs, (2) Text Confrontation Confidence Conception, (3) Scientific Explanation, and (4) Conception, Reinforcement and Enrichment Statement. The 4 sections apply to the concept of static electricity which is divided into 3 concepts that often occur misconception because of its abstract nature that is neutral object, force of attractive interaction of each charges and interaction between charged object and neutral object. The following is the storyboard of VMMSCText in static electricity on the concept of neutral objects.

1. Storyboard of Neutral Object in Static Electricity

Activities	Explanation of frame	Media	Explanation of media
Opening			<p style="text-align: center;">Visual Multimedia Supported Conceptual Change Text (VMMSCCText) Neutral Object</p> <p style="text-align: center;">VMMSCCText LSTS-1</p> 
	<p>The first page presents the media title neutral object concept.</p>		<p>The first page describes this media what will explain. In the concept of static electricity that is first introduced to understand the basic concept of all kinds of electrical charges. And students often misconception on the concept of a neutral object. This media was created to change the student's conception of the concept of a neutral</p>

			object.
		<p>Part I. Concept Disclosure and Conceptual Beliefs</p> <p>Material objects are made up of atoms, that it has electrically charged (positive and negative) and uncharged.</p> <ul style="list-style-type: none"> <input type="checkbox"/> Protons are positive charge <input type="checkbox"/> Electrons are negative charge <input type="checkbox"/> Neutrons are uncharged (neutral) 	
<p>Part I. Concept Disclosure and Conceptual Beliefs</p>	<p>The second page explains that objects are composed of atoms and kinds of electrical charges.</p>		<p>There are objects that are electrically charged (positive or negative) and some are not electrically charged (neutral). The electric charge is a fundamental conserved property of some subatomic particles, which determines their electromagnetic interaction.</p>

	<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #0070C0; color: white; margin: 0;">Part I. Concept Disclosure and Conceptual Beliefs</p> <p>Questions:</p> <p>1. Do you think that neutral objects do not has atoms positive or negative charged? Why do you think it? Explain it!</p> <hr/> <p>2. Are you confidence with your belief?</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p style="text-align: center; background-color: #0070C0; color: white; margin: 0;">Answer</p> <div style="border: 1px solid #0070C0; height: 100px; width: 100%;"></div> </div>	
<p>In the last page for step concept disclosure and conceptual beliefs.</p>		<p>After introducing basic concept of electrical charged in this step, students are given some questions to concept disclosure and conceptual beliefs. There are two questions that describe and disclosure their conception about ellectrical charge. And the second question, students are asked about conceptual beliefs</p>

	<div style="text-align: center; background-color: #0056b3; color: white; padding: 5px; font-weight: bold;">Part II. Text Confrontation Confidence Conception</div> <p style="text-align: center;">Look at the Picture below, then you answer the questions!</p> <div style="display: flex; justify-content: space-around; align-items: center;">  <div style="text-align: center;">  <p>Solid</p> </div> <div style="text-align: center;">  <p>Liquid</p> </div> <div style="text-align: center;">  <p>Gas</p> </div> </div> <p style="text-align: center;">Material objects (solid, liquid and gas) are made up of particles, compound and molecules. But since compounds and molecules are composed of atoms, the smallest particles of matter are atomic.</p>		
<p style="text-align: center;">Part II. Text Confrontation on Confidence Conception</p>	<p>The first page in part of text confrontation confidence conception describes atom in solid, liquid and gas by animation.</p>	<p style="text-align: center;">Animation of atom movement in substance</p>	<p>The atom is the smallest constituent of a body. Solid, liquid and gas have different atomic characteristics. The animation media describes how the different movements of atoms on an object. Solid atoms relatively incompressible and particles stay together and tend to vibrate against each other. The atoms of the bonded liquid are more tenuous than solid, relatively incompressible and change shapes in</p>

response of outside force. Whereas the bonded gas atoms are the most tenuous among the others and their movement is collided between particles, easily compressible and change shapes in response of outside force.

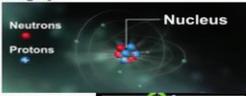
Part II. Text Confrontation Confidence Conception

An atom is made up of atom's nucleus and electrons. There are protons and neutrons at atom's nucleus. Any object there will be protons, neutrons and electrons. There is nothing in it that does not electrically charged particles.

The second page in part of text confrontation confidence conception explains electrical charge.

Structure of atom figure

Atoms are electrically neutral; the positive charges (protons in the nucleus of the atom) cancel out the negative charges (electrons surrounding the nucleus in outer shells). The electrons are viewed as orbiting a nucleus, a core

		<p>containing protons and electrically neutral particles called neutrons. The force that keeps the electrons orbiting the nucleus is supplied by electrical attraction.</p>
		<p style="text-align: center;">Part II. Text Confrontation Confidence Conception</p> <p>Click Video Link below, then observe the phenomenon that is shown thoroughly</p> <p style="text-align: center;">This is New York city, everything here in the picture is matter</p>  <p style="text-align: center;">http://www.youtube.com/MrsimpleScience</p> <p>Click Video Link below, then observe the phenomenon that is shown thoroughly</p>  <p style="text-align: center;">www.monkeysee.com</p>
	<p>This page show phenomenon in daily life to give confrontation confidence conception.</p>	<p>Video 1 (source: http://www.youtube.com/MrsimpleScience)</p> <p>Video 2 (source: www.monkeysee.com)</p> <p>In this page is shown two videos that make confrontation confidence conception. The first video describes about definition of matter. All of the matter is made up of atoms. If we could zoom with super microscope we would see everything is composed by atom. Matters is the term for any kind of material. Anything that has mass</p>

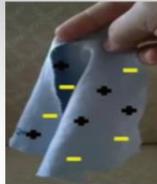
			<p>and takes up space is matter. Matter exist in different physical forms under different conditions, for example as ice (solid water), as liquid water and as steam.</p> <p>And the second video shows and explanation about atom. Atom is composed of atoms. Solids are made of densely packed atoms while gases have atoms that are spread out.</p> <p>We're going to cover basics like atomic structure and bonding between atoms. These subatomic particles include nucleons and quarks. The three basic parts of an atom: electrons, protons, and neutrons. Electrons are the smallest of the three particles that make up atoms. Electrons are found in shells or orbitals that surround the nucleus of an atom. Protons and neutrons are found in the</p>
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		<p>nucleus. They group together in the center of the atom.</p>
		<p>Part II. Text Confrontation Confidence Conception</p> <p>What do you observe in the picture or different from the conception or thought you have so far about the neutral object?</p> <p>If you think different, do you still believe in the truth of your conception or thought that you have so far? will you retain the conception you have or want to replace with a new conception that matches the phenomenon you observe?</p> <p>Answer</p> <div style="border: 1px solid blue; height: 100px; width: 100%;"></div>
	<p>The last page in second part is question confidence conception after observing animation structure of atom</p>	<p>This page students are asked to answer questions to check their concept beliefs after described the concept of electricity charge. The first question about checking the concept before getting an explanation on this VSMMCCText media. The second question of clarifying the confidence conception, after the students observed video and</p>

			<p>explanations of the concept of electricity charge whether the student remains or want to change the concept that is believed.</p>
		<p style="text-align: center;">Part III. Scientific Explanation</p> <p>Learn about the following exposures carefully!</p> <p>In an atom the number of protons equals the number of electrons. Protons are positively charged particles whereas electrons are negatively charged electric particles. Magnitude of proton is $1,602 \times 10^{-19}$ C and magnitude of electron is $-1,602 \times 10^{-19}$ C. The number of electrons or protons on an atom is indicated by the atomic number (A)</p> <p>Z is chemical element, A is atomic number and M is atomic mass. Example:</p> ${}^A_Z M$	
<p>The first page in part of scientific explanation is explaining about component of atom</p>			<p>The number of protons, neutrons, and electrons in an atom can be determined from a set of simple rules.</p> <p>(1) The number of protons in the nucleus of the atom is equal to the atomic number (Z).</p> <p>(2) The number of electrons in</p>

			<p>a <i>neutral</i> atom is equal to the number of protons.</p> <p>(3) The mass number of the atom (M) is equal to the sum of the number of protons and neutrons in the nucleus.</p> <p>The number of neutrons is equal to the difference between the mass number of the atom (M) and the atomic number (Z).</p>
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Part III. Scientific Explanation	 <div style="background-color: #4CAF50; color: white; padding: 5px; text-align: center; font-weight: bold;">Part III. Scientific Explanation</div> <p>Example:</p> ${}_{28.086}^{14}\text{Si}$ <p>Silicon atomic has atomic number 14, it is identical number of proton or electron of atomic silicon is 14.</p> <p>Since the number of protons and electrons in an atom is equal, an atom is electrically neutral because the amount of positive charge and negative charge on an atom are the same.</p>	
	The second	Atoms have no overall

	<p>page in this part explains how to determine atomic number of proton and electron</p>		<p>electrical Charge. That means that there must be a balance between the positively charged protons and the negatively charged electrons. Atoms must have equal numbers of protons and electrons.</p>
	<div style="text-align: center; background-color: #008000; color: white; padding: 2px;">Part III : Scientific Explanation</div> <p>Since objects are composed of neutral atoms, they are essentially electrically neutral. As an example:</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  <p>Plastic straw</p> <p>Neutral = the amount of positive charge is equal to the amount of negative charge</p> </div> <div style="text-align: center;">  <p>Woolen fabric</p> <p>Neutral = the amount of positive charge is equal to the amount of negative charge</p> </div> </div>		
<p>Third page explains number of electron and proton in neutral object</p>	<p>Illustration of neutral object in plastic straw and woolen fabric</p>		<p>Illustration electricity charge in plastic straw and woolen fabric describe that number of proton and electron is balance in neutral object. The amount of charge on a single proton is equal to the amount of charge possessed by a single electron. A proton and an electron have an</p>

		<p>equal amount but an opposite type of charge. Thus, if an atom contains equal numbers of protons and electrons, the atom is described as being electrically neutral. On the other hand, if an atom has an unequal number of protons and electrons, then the atom is electrically charged. Any particle, whether an atom, molecule or ion, that contains less electrons than protons is said to be positively charged. Conversely, any particle that contains more electrons than protons is said to be negatively charged.</p>
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		<p style="text-align: center;">Part III : Scientific Explanation</p> <p>The object can be electrically charged if there is a transfer of electrons from one object to another, one of them by rubbing.</p>  <p>When a plastic straw is rubbed in a woolen fabric, there will be a transfer of electrons from wool to a straw. As a result of moving some of the electrons into a straw, then the current straws have a charge imbalance, where the number of electrons is more than the number of protons. Now the straw is said to be negatively charged. Instead the fabric will be positively charged due to electron deficiency due to moving to a straw.</p>
	<p>The fourth page describes how objects become charged by rubbing</p>	<p>Figure straw plastic is rubbed by woolen fabric</p> <p>If we define the net charge of an object to be the neutral object. When two originally uncharged or neutral objects come into close physical contact (as when rubbed, or two pieces of tape are stuck together), the electron clouds of the atoms on the surfaces of the two objects become somewhat intermingled. When the surface separated, the atoms on one surface sometimes pull away some extra electrons, leaving the other with deficit of electrons. The</p>

surface with the excess of electrons will thus have a small negative net charge, while the other has a small positive net charge.

Part III : Scientific Explanation

After the scrubbing, the results are as shown below:



Plastic straw

Negative charge = the amount of negative charge is more than the amount of positive charge



Woolen fabric

Positive charge = the amount of positive charge is more than the amount of negative charge

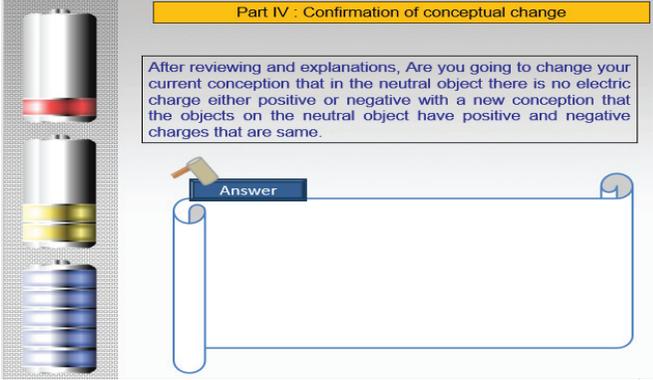
This page explains changing charge two object after rubbing

Figure plastic straw and woolen fabric which different charge.

Kinds of materials are more prone to lose electrons while other materials are more prone to capture extra electrons. Plastic straw molecules are slightly more able to capture and hold electrons than fur or cloth molecules are, so when a plastic straw is rubbed with cloth or wool fabric, the

		<p>straw ends up with a net negative charge. The imbalance between these materials does not have to be very large, even if only about one in every million surface molecules gets an extra electron, the plastic straw will accumulate an obvious net charge.</p>
	<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #008000; color: white; margin: 0;">Part III. Conception-Changing Statement</p> <div style="display: flex; align-items: flex-start;"> <div style="flex: 1;">  </div> <div style="flex: 2; padding-left: 10px;"> <p>What conclusions can you draw after reading the exposure and looking at the above pictures of neutral objects and electrically charged objects? Is that conclusion a new conception to you?</p> <div style="border: 1px solid blue; padding: 10px; margin-top: 10px;"> <p style="background-color: #000080; color: white; display: inline-block; padding: 2px 5px;">Answer</p> <div style="border: 1px solid blue; height: 60px; width: 100%; margin-top: 5px;"></div> </div> </div> </div> </div>	
	<p>The last page in part of scientific explanation is conclusion after read scientific explanation.</p>	<p>After being given a scientific explanation of the neutral object, the students are assigned to conclude what they</p>

			<p>have read based on what they understand about the neutral and charged objects. Students are asked if the conclusion is given as a new conclusion or a concept change.</p>
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<p>Section IV. Conception, Reinforcement and Enrichment Statement</p>			
	<p>The last page explains reinforcement and</p>		<p>In this page, student is given question as confirmation of conceptual change.</p>

	enrichment statement of neutral object concept		neutral objects has described microscopically, then students are given the question that whether students feel new concepts that neutral objects have no electric charge either positive or negative. And the proton number equal electron number on the neutral object.
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