Brain-based Learning in Textbooks: An Effort to Harmonize Emotion and Cognition in Learning History

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Abstract--- Brain-Based learning builds a learning design where emotions, cognition, reflection, social, and physical performed in harmony. Here lies the significance of combining brain-based learning and history textbooks. Researchers made brain-based learning as the theoretical basis of creating history textbook models. This research analyzed the influence of the history textbook model on the emergence of the brain-based learning aspect itself. The main limitation of this issue of research is how much the influence of a brain-based learning textbook based on the cognitive, social, reflective, emotional, and physical aspects of learners? The study used a pre-experimental approach with the design of one group pretest-posttest design. Neuroscience application to history textbook was effective to raise emotional, cognitive, and reflective elements but ineffective with social and physical learning system elements. Textbook effectiveness was highly determined by how teachers use it in the learning process. Teacher's role was enormous to give emotions to historical data in textbooks. The textbook was effective in providing history information, but it was the teacher's explanation that makes learners understand. The model textbook assisted students in relating various information, processing history information, assist them in thinking and interpreting history's events so that student's reflective thinking emerge. Reflection allowed students to get more insightful and meaningful information. The harmonization of cognitive and emotional elements on textbooks made students focus on learning and remembering historical facts. Students assessed the textbook as unchallenged and discourage for physical activity, cooperation and active participation and build history empathy.

Keywords--- Brain-based learning, history textbook, memorizing, mind map

I. Introduction

Does the textbook affect the learning process? Research that addressed textbooks on the learning process has been done for years by researchers (Alharbi, 2015). Dickson et al. (2005) has shown textbooks contribution to students' learning patterns and perceptions. Likewise, Landrum et al. (2012) assessed the textbook which affected student's scores during the exam. Even, Radović et al. (2020) has shown that interactive-designed textbooks can encourage innovative thinking, the effectiveness of knowledge acquisition, and students' creativity. But there are also findings that show

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textbooks do not affect the learning process such as Durwin & Sherman (2008) that show textbooks have no significant effect on students' understanding. However, educational practitioners believed that textbooks were one part of the Learning Resource and were an important part of curriculum implementation. Textbook existence is an integral part of achieving critical and nation's creative attitudes.

Then what kind of textbooks that can improve learning quality in the classroom? The main points of various research emphasized the importance of the presentation and the writing of the textbook (Radović et al., 2020). The models and approaches used in textbook writing will relate to the material and purpose of learning the subjects. Textbooks development must be able to adapt to the era development, including scientific developments.

History textbooks should be able to build student cognition skills as well as encourage other aspects such as social, emotional, reflection, physical, and various abilities. History textbooks should be able to reveal historical events that can be studied critically and meaningful so that students can learn from them (e.g. Foster et al., 1996; Myskow, 2018; Dwijendra, 2020). However, after all these times, the textbooks have made students immersed in a sea of facts. Consequently, the students became boring to read and exacerbated with the textbook's condition where the language is arid and less emotive. Such a perspective causes the emergence of a feeling of boredom, uninterested in the history field, and feels that the history study as a useless burden, and the danger of giving low reading power among students. Whereas "reading" is one of the absolute requirements in learning history (Monte-Sano, 2011).

Here is the significance of implementing neuroscience (brain-based learning) in history textbooks preparation. In brain-based learning, every aspect developed must be designed so that it involves the same mind, heart, and body (Malkawi & Alkhatib, 2020). Research on brain-based learning acts as a propel to investigate the intricacies of how the brain learns optimally (e.g. Grover Vijay Kumar, 2015; Nummela, 2014; Rodriguez, 2012). Brain-based learning came from neurological research that caused the development of brain-based learning highly regarded as a "new paradigm of teaching". Neuroscience carries out a biological-based mechanism to explain why this learning practice works and may suggest additional new approaches to the world of education (Schwartz et al., 2019).

The research focuses on creating a history textbook model by using the principles of brain-based learning. The brain-based learning implementation in textbooks is hoped to help establish the harmonization of cognition and emotion and other aspects of history learning. The research problem's main limitation is how much influence of a history textbook that based on brain-based learning on the cognitive, social, relational, emotional, and physical aspects of learners? This research does not stop on the statistical data of the magnitude of textbook influence but also seeks to connect with in-depth observation of learning activities in the classroom.

Brain-based learning is a way of thinking about the learning process, which is a strategy engagement based on the principles derived from one understanding of the brain (e.g. Winter, 2019; Al-Balushi & Al-Balushi, 2018). The learning system functions so that the learning process runs more effectively and both students and teachers feel greater excitement in teaching and learning. There is no stand-alone learning system. The actions of each system affect other systems as part of a larger whole.

The emotional learning system is a learning system that attempts to create a class that is conducive to students' emotional safety and personal relationships with students. The emotional system is personal, self-centred, and internal (e.g. Faria et al., 2015; Stanley & Sethuramalingam, 2015; Pathak & Mathew, 2017). The social learning system is a

desire to be a part of the group, to be respected, and to enjoy the attention of others. The social system focuses on interactions with others or interpersonal experiences (e.g. Leng & Jiang, 2016; Hornecker & Buur, 2006). The cognitive learning system is the system with the most attention received because the system is related to reading, writing, counting, and all other aspects of academic skills development (Yang et al., 2013). While the physical learning system is learning-oriented to the active participation of students and kinaesthetically (movement or action) (Connell et al., 1987). The physical learning system enjoys challenging academic assignments and teachers train, inspire, and support active participation for success. Thus, the system requires active involvement through meaningful projects. Lastly, reflective learning systems require students to understand themselves, and that can be developed through a trial of various learning (e.g. Pearson et al., 2018; Ahonen-Eerikäinen et al., 2008).

Research linking Brain-based learning with historical textbooks has not been done intensively. Research on brain-based learning since the 1990s began intensive. Researchers such as Armstrong, Crowell, Caine, Goleman, Jensen, and Sousa are pioneers in the brain-based Learning movement (Connell, 2009). Teacher education in the United States and several other countries has begun implementing brain-based learning and is followed by other countries around the world, including Turkey, Chile, the United Kingdom, and Thailand who also use brain-based learning techniques in Their school (Connell, 2009).

The majority of research on Brain-based learning is aimed at optimizing learning and learning processes, such as Máčajová-Sr (2013) on 21st-Century Learning, Ghazal et al. (2015) about the study behaviour, Trníková (2014) on the connectedness of Brain-based learning and inclusive education, as well as AbuZaudeh & Hamed Al Astal (2014) which examines the use of brain-based learning with computer applications in the children's compound intelligence of Palestine, as well as the research of Razavi & Ebadati (2015) on Computer use to analyse the brain for the benefit of the disabled. O'Grady (2011) on neuroscience is geared towards designing and delivering programs that are systematically effective in the educational world. The influence of brain-based learning on the motivation of children in learning science (e.g. AKYÜREK & AFACAN, 2013; Samsudin et al., 2020). Li et al., (2015) develops virtual learning tools tailored to brain principles combined with innovative educational techniques to teach science.

Meanwhile, the research direction of historical stextbooks discusses more historiography issues and minimal review of their use in class. Burkitt (2019) discusses the voices of the victims of Japan's ever-overlooked imperialism. Carretero et al. (2002) discuss the comparative narrative contained in Spanish and Mexican textbooks on the history of Spain in the Americas post-arrival Columbus 1492. In Indonesia, did a political influence on drafting the Suharto textbook. Fukuoka (2018) is reviewing Japan's historical textbook controversy in three levels, international, domestic, and internal Japanese society. Bentrovato & Wassermann (2018) examined the process of social reconciliation of recorded textbooks in South Africa after political expiration Apartheid while Christodoulou (2018) reviewed the process of revision of history textbooks in Cyprus directed at Peace education and social reconciliation post-conflict with Greece. (Emerson, 2018) describes the connectedness between textbooks, education, and violence in Pakistan while (Ide et al., 2018) studied school textbook relationships with conflict and peace.

II.   Method

Research approaches

This research uses a few steps to test the model textbook: first, creating a model-based brain-based learning textbook design. Second, field Testing at the school. The study used a pre-experimental approach with the design of one group Pretest-posttest design. The draft includes a group that is observed at the pretests stage which is then followed by treatment and posttest (Creswell, 2013). Researchers conducted 8 (eight) observations at the school with Pretests at the first meeting, 7 (seven) treatments using the model textbook, and the end of the meeting was held posttest. The design will be compared to the before and after treatment given. Pre-experimental research with the design of one group Pretest-posttest design was chosen because this research does not use the control variables and selected samples are not random. The school selection is based on the reality that the teacher has used the approach of brain-based learning in historical learning, Brain-based learning in this research using the brain-based learning paradigm Barbara Given, which is the learning system cognitive, social, emotional, reflective and physical, as such, the design of this research will measure those five aspects, before and after use of model textbooks.

The subject of this study students in two classes, namely one social class (35 students) and one science class (35 students). The data collection techniques used in this research are observations and polls. All these techniques are expected to complement in obtaining the necessary data. Data obtained is quantitative data and qualitative data. Quantitative data is obtained from the questionnaire and exam results. The questionnaire and test were conducted before treatment and after no treatment. Qualitative data obtained through the data of observation results.

How is the history textbook designed?

The textbook was developed based on the theory of brain-based learning Barbara Given, Eric Jensen, and Toni Buzan. The book Model developed is an application of cognitive, social, emotional, physical, and reflective learning systems. In the process of lowering the theory, the authors discuss with the publishers who are experienced in creating and designing textbooks. In publishers, researchers discuss with editors, Layouter. and designers. After the initial model of the textbook is found, the next step is the process of writing the textbook. It took about three months to design and write the textbook. Once that's done, the next process is to insert the script into the pre-designed Adobe InDesign format. This is where the editor, Layouter, and designer started. Once the book has been inserted into the format, the book is printed and then used in class.

Of the five aspects of learning, researchers apply it in several forms entered into the historical textbook. The application of neuropedagogy in historical textbooks include Quotes History, Time Line, brief Info, Wisdom history, reversed figures, Mind Map, caricature history, Humor history, Mystery History, Contemporary issues, If History, and Memorizing strategies (e.g. Budi Santosa & Insan Fauzi, 2018). The elements are placed in the main part of the book and are partly placed as enrichment. The following will be outlined in these applications: historical Quotes contain the words of pearls drawn from historical figures. The words at Historia's quotes can give motivation, stimulate thinking, and touch students' emotions. Thus, the power of the quotes of Historia is on his words. Time Line is included in the graphic media. Time Line with sequential timelines can help students understand historical events in a real and sequential order so that students can build true historical understanding in a given time concept.

The wisdom of History and behind the Figures is the application of learning systems for cognitive, emotional, social, and reflective. The condition of the textbook that the language is dry and less emotive, laden with a cargo of facts (numbers, names of actors, the scene, and the course of events) described in the dry making the book a little text containing events that can be studied and has meaning that can be taken a lesson by the students. As a result, students feel saturated by reading a textbook. The wisdom of history and behind the figures is an attempt of presenting a story that stirs the emotions of the students. Emotions speed up the thinking and let us remember the reaction of the body against the world.

Mind map developed by Tony Buzan. A Mind map allows students to arrange facts and thoughts in such a way that the workings of the natural brain involved since the beginning (Casco, 2009). Caricature History is the application of learning systems for cognitive, emotional, and reflective. Caricature drawing is part of the cartoon depicted in the form of fictitious or deformation of a figure that has a certain purpose to satirize, criticize, encourage or suggest to its object target. The teacher can ask students to choose a caricature or images contained in the textbook and asked the students to give views on image and caricature of them. Caricature and the selected image should be able to drain the emotions of the students.

Humor history contains a variety of stimuli attention to laughter; incongruity, impropriety, cuteness, and innocence. The mystery of history and contemporary issues contains the material history of the controversy and invite debate. Controversial issues in the teaching of history can improve critical thinking skills in the students. If history contains short questions that ask the reader to decipher the history if what is happening is backward to the reality of what happened. This column is to teach students to be critical thinking and creative thinking. Memorizing is the application of learning systems for cognitive and emotional. One form of the approach developed by Eric Jensen in Brain-Based Learning is memorizing or techniques to remember. The results of the study revealed that subjects-different subjects demand different ways of storing and recalling information.

How did the Learning Process design?

This section will outline some ways of applying the approach of brain-based learning from Barbara Given and Eric Jensen on the book text so that it can help teachers to optimize the teaching and learning process. Many strategies, including the teaching of the whole brain, can and should be employed in the classroom to activate the brain and improve learning on students (Calhoun, 2012). The following principles of learning history that optimize the use of the approach of Brain-based Learning, namely:

First, create a comfortable atmosphere with the give of humor friendly and minimize anxiety academic. The Humor in the book text is utilized by teachers by asking students to read it. Teachers can also use other parts of the textbooks that contain elements of humor. Humor will help learners change the pattern of fear and anxiety into confidence and anticipation full of hope.

Second, teaching with emotion and expressive. Classroom management becomes easier because the kids are in a good emotional state will act less and more pay attention (Trníková, 2014). Teachers utilize the column behind the figures and the wisdom of history as well as quotes to bring up the emotional aspect of students. Learners must be in a state of positive and calm so that learning can be run optimally occur (Phillips, 2005).

Third, connect the learning with the actual information. The brain will more easily remember the facts and skills if it is built the linkage information is contextual. The information will be stored in the relationship with the state and the association information in the past (Phillips, 2005). Columns contemporary issues and if the history in the textbooks used by the teacher to connect the material with the information the actual.

Fourth, create a mind map (summarize the material textbooks). The Mind map is an application of the system of learning cognitive, emotional, and reflective. Mind map developed by Tony Buzan. A Mind map allows students to arrange facts and thoughts in such a way that the workings of the natural brain involved since the beginning (Casco, 2009).

Fifth, students are encouraged to express his feelings about the content of the readings in the textbook and the teacher invited the students to tell personal things that are associated with the material. Students are invited to dig up information in textbooks or other learning sources and is stimulated to express his / her opinion about the opinion of the strongest which they value, or they have their own opinion. With Question and answer, the teacher elaborates on the views and feelings of the students when it became a historical figure in particular.

Sixth, create mnemonics or give techniques to remember. The strategy given is done by making the words a kind of abbreviation or acronym which is collected by the students or use the one already available in textbooks. The aim is that the students quickly remember. Seventh, teachers use a caricature or images contained in the textbook and asked the students to give views on image and caricature of them. Eighth, the Teacher gives the task of academic challenge through projects that are meaningful and provide opportunities to gain real experience alone, with friends, in small groups. BBL also established that learning is increased when students are taught using the strategy of research-based learning (Connell, 2009).

Ninth, the teacher made questions that elaborate on the reflective thinking of students about historical events specific. Tenth, the teacher creates a Timeline, if the timeline will help to understand the concept of time, then the world map will help understand the concept of space (Weger & Pratt, 2008). It is precisely here seen that the study of history related to the second element, the time and place are what make history particularize and what makes the social activities of a man unique.

The Validity and Reliability of The Instrument

The items of a test are the accuracy measure that is owned by the grain of the item in measuring what should be measured through the grain of the item. One way to find out the validation of the items of a test is with the program SPSS 21. Such testing is carried out to obtain, construct validity (construct validity) and the validity of the content (content validity). To test the validity of the content, use of expert opinion (judgment experts), and construct validity through test instruments. that is to correlate between the item scores of the instrument with the formula of Pearson Product Moment. Furthermore, the value of the t-test is compared with the t-table. if the t-test is greater than t-table, it means the difference was significant, so that the instrument declared invalid.

In this research activity, a pilot test instrument was conducted on 30 respondents. To find out whether the questions and statements on the questionnaire are valid or not is by comparing the t value with the value of t-table, for n-2, and significance α of 5%. If the correlation of each factor is positive and the magnitude of the above t table then the item question it is said has a validity of good construction. The value of t table the two sides is equal to the 2009 Results

of the validity test on the variables studied can be seen in the appendix. The results of the validity test by using SPSS 21 shows that there 29 questions are that are not valid as many as 75 questions declared valid.

The reliability test will be done on the instrument pre-test in the validation using SPSS 21.00. Reliability testing of the instrument intended to obtain the level of confidence of measurement or instrument can be used several times to measure the same object, would yield the same data. Reliability test using SPSS Statistics 21 and obtained results in Table 1.

Table 1

Reliability Test

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Item
.933	.937	104

To find out whether the question or statement on the questionnaire is reliable or not is by comparing the value of Cronbach's Alpha with the value of r table (product-moment), for n-2 and significance α of 5%. If the value of Cronbach's Alpha is greater than the table value of r product moment, then these variables reliable. The R-value table of the two sides is equal to 0.2732. From Table 1 above outlined that the instrument is declared reliable because of having the value of Cronbach's alpha above r table. Thus a System of emotional learning System, social learning, learning System, cognitive learning System, physical learning System reflective be reliable so that the research instrument is a questionnaire that can be used more than once by the same respondents, or the questionnaire has the constancy or reliability of, or the instruments have consistent results if used repeatedly at different times.

Data Analysis

The researchers conducted the data analysis with the T-test or the t-test used to test the truth or falsity of the null hypothesis. T-test dependent is the testing where the absence of a significant difference between the values of the variables of the two samples paired or correlated. The function of the t-test dependent is to compare the average of two groups in pairs of two. Sample pairs can be interpreted as a sample with the same subject but having 2 treatments or different measurements, i.e. measurements before and after the use of history textbooks based on brain-based learning.

In this research is conducted the hypothesis examination. The hypothesis is produced based on researchers' predictions through the study of a variety of references before the research is done. The hypothesis is a temporary answer for problems and research questions. Data processing in this study is to examine the hypothesis truth that made.

Hypothesis:

Total

$$H_0 \quad : \quad \mu_{pre} \text{ total} = \quad \mu_{post} \text{ total} \quad = \quad \mu pasca \text{ total}$$

(no difference in the total score at the time of pre and post use book text)

$$H_1 \quad : \quad \mu_{pre} \text{ total} \neq \quad \mu_{post} \text{ total} \quad \text{(there is a difference}$$

of the total score of the component at the time of pre and post use book text)

Components:

- $H_0 : \quad \mu_{pre} \text{ emotional} = \quad \mu_{post} \text{ emotional}$ (there is no difference in the total score of the emotional component at the time of pre and post use book text)

$H_1 \quad : \quad \mu_{pre} \text{ emotional} \quad \neq \quad \mu_{post} \text{ emotional}$ (there is a difference of the total score of the emotional component at the time of pre and post use book text)

- $H_0 : \quad \mu_{pre} \text{ social} = \quad \mu_{post} \text{ social}$ (there is no difference in the total score of the social component at the time of pre and post use book text)

$H_1 \quad : \quad \mu_{pre} \text{ social} \quad \neq \quad \mu_{post} \text{ social}$ (there is a difference of the total score of the social component at the time of pre and post use book text)

- $H_0 : \quad \mu_{pre} \text{ cognitive} = \quad \mu_{post} \text{ cognitive}$ (there is no difference in the total score of the cognitive component at the time of pre and post use book text)

$H_1 \quad : \quad \mu_{pre} \text{ cognitive} \quad \neq \quad \mu_{post} \text{ cognitive}$ (there is a difference of the total score of the cognitive component at the time of pre and post use book text)

- $H_0 : \quad \mu_{pre} \text{ physical} = \quad \mu_{post} \text{ physical}$ (there is no difference in the total score of the physical components at the time of pre and post use book text)

$H_1 \quad : \quad \mu_{pre} \text{ physical} \quad \neq \quad \mu_{post} \text{ physical}$ (there is a difference of the total score of the physical components at the time of pre and post use book text)

- $H_0 : \quad \mu_{pre} \text{ reflective} = \quad \mu_{post} \text{ reflective}$ (there is no difference in the total score reflective components at the time of pre and post use book text)

$H_1 \quad : \quad \mu_{pre} \text{ reflective} \quad \neq \quad \mu_{post} \text{ reflective}$ (there is a difference of the total score reflective components at the time of pre and post use book text)

III.   Results and Discussion

Processing and data analysis in this study were using the statistics assistance. The data obtained from the results of the research is raw data that needs to be processed so that it becomes meaningful. The study results data are

quantitative, which will be processed further through statistical techniques. Table 2 will describe the analysis based on a total score per component of the pre and post use of the model book.

Table 2

Reliability Test

			Mean	N	Std. Deviation	Std. Error Mean
P air 1		pra_emosional	68.1400	7 0	5.75347	.81366
		pasca_emosional	71.5400	7 0	5.53361	.78257
P air 2		pra_sosial	22.9600	7 0	2.18492	.30899
		pasca_sosial	23.8400	7 0	2.05397	.29047
P air 3		pra_kognitif	91.7200	7 0	7.57288	1.07097
		pasca_kognitif	99.3600	7 0	8.40253	1.18830
P air 4		pra_fisik	7.0400	7 0	1.21151	.17133
		pasca_fisik	7.2400	7 0	1.37855	.19496
P air 5		pra_reflektif	88.9000	7 0	7.35472	1.04011
		pasca_reflektif	95.3200	7 0	7.58473	1.07264
P air 6		pra_total	278.7600	7 0	20.30438	2.87147

	Mean	N	Std. Deviation	Std. Error Mean
pasca_total	297.30 00	7 0	22.90820	3.23971

The table data illustrates a comparison of the scoring average of each of the components of brain-based learning, namely the learning system, emotional, social, cognitive, physical, and reflective before and after the use of the textbook model. From table 1.2 can achieved information that almost all the components of an emotional learning system, social, cognitive, physical, and reflective showed increasing after treatment. The cognitive learning system has an increase in the value of the highest (7,64), followed by reflective (6.42), emotional (3,4). Meanwhile, the social and physical elements increased relatively small, i.e. 0.88 0.20.

The T-test is used to measure the effectiveness of the book model. The value of α used in the analysis is 5%. Criteria: Reject H0 if p-value (significance) ≤ α. Output the results of processing the data shown in Table 3.

Table 3

The Results of the Analysis T-Test

		Paired Differences						f	ig. (2-tailed)
		Mean	Std. Dev	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
air 1	pra_emosional - pasca_emosional	-3.4000	7.84 545	1 .10951	-5.62965	-1.17035	3.064	9	004
air 2	pra_sosial - pasca_sosial	-.88000	2.89 010	. 40872	-1.70136	-.05864	2.153	9	036
air 3	pra_kognitif - pasca_kognitif	-7.6400	10.7 9826	1 .52710	-10.70883	-4.57117	5.003	9	000
air 4	pra_fisik - pasca_fisik	-.20000	1.98 977	. 28140	-.76549	.365 49	.711	9	481

air 5	pra_reflektif - pasca_reflektif	- 6.4200	10.3 2747	1 .46053	- 9.35504	- 3.48496	4.396	9	000
air 6	pra_total - pasca_total	- 18.540	28.9 8994	4 .09980	- 26.77885	- 10.30115	4.522	9	000

From Table 3, it is seen that the significance value for the pair 6 is 0.00. Because of the value of significance (p-value) ≤ α (0.05), then Reject H0. Thus, with an error rate of 5%, it can be concluded that there are differences in the average total score overall at the time of pre and post using the textbook. Thus, it can be concluded that there is a different and more of the elements of brain-based learning in the form of the elements of the emotional, social, cognitive, physical, and reflective before and after using the textbook the history of the model. This indicates that elements of a textbook history including: quotes history, a timeline, info at a glance, the lessons of history, behind the figures, a mind map, a caricature of history, humor history, mysteries of history, contemporary issues, If history, and the strategy of Memorizing effective in eliciting the elements of brain-based learning.

Furthermore, the Table 3 it is seen that significance value for the pair 1,2,3,5 is 0.004, 0.036, 0.00 and 0.000. Because all significance values (p-value) ≤ α (0.05), then Reject H0. Thus, with an error rate of 5%, it can be concluded that there are differences in the average total score of the components of emotional, social, cognitive, and reflective at the time of pre and post using the textbook. Thus, it can be concluded that after measured separately, there is a difference and more of the elements of brain-based learning in the form of the elements of the emotional, social, cognitive, and reflective before and after the use of history textbooks based on brain-based learning.

Then, in Table 3, it is seen that the significance value for the pair 4 is 0.481 Because the value of significance (p-value) > α (0.05), then Accept H0. Thus, with an error rate of 5%, it can be concluded that there is no difference in the average total score of the physical components at the time of pre and post using the textbook. Thus, it can be concluded that after measured separately every part, there is not much difference in the appearance of the elements of brain-based learning in the form of a learning system physically before and after using the textbook history-based brain-based learning.

Table 1 and Table 2 show that emotional, cognitive, and reflective elements have an average which higher than the social and physical elements. The physical learning system element shows the average value of the lowest compared to the other components. This indicates that the textbook model after being measured was effective in raising the emotional, cognitive, and reflective elements in brain-based learning, but not with the learning system, social and physical elements. Although the history textbook model is designed to pay attention to the balance of cognitive, emotional, affective, physical, and reflective aspects, the emotional element is more dominant than other aspects. It is aimed to balance the cognitive aspect which is always dominant in history textbooks. Nevertheless, the data showed that cognitive elements remain dominant in the learning process compared to other aspects.

Statistical data shows that the textbook model is effective in three aspects, namely cognitive, emotional, and reflective, but not effective in the physical aspect and the social. The factors that cause this can be understood if

connected to the data of observation. The following will be described some of the aspects that appear in the learning history where emotions and cognition is directed to run in harmony.

First, during observation, emotional elements such as anxiety academics do not appear at all. The mood of the class during the observation appears full of carefree and does not look tense and anxious. Every student that comes to the class will greet by the teacher with friendliness, the teacher calls the students with the nickname of guys to eliminate the emotional obstacles between him and the students. In the neuroscience perspective, the relationship between the brain's emotional (amygdala and hippocampus) and reasoning sections of the brain (frontal cortex), for example, has shown that when it is disturbed, such as stress or fear, learning can be disrupted. The amygdala is considered associated with the storage of memory and emotional experience both in imaging human and animal research (O'Grady, 2011). Many fun classes will build on positive suggestions to the lesson and the teacher.

Second, the proper emotional aspects make students become more focused in the study because emotions help us focusing on make sense things and encourages attention, and then the attention encourages the learning (Moghaddam & Araghi, 2013). The students' emotional aspects observed from the behaviour that appears during the learning process. At the time of going to start learning, the students are very noisy and the teacher several times have asked the students to stop talking, but it failed. The teacher then showed the Raffles book (Governor-General of British in Java 1811-1816) entitled "History of Java" while explaining the book mentioned in the textbooks. Students respond almost simultaneously saw the book and seemed fascinated with the thickness of the book. But the class's condition remains hustled and bustled. When the teacher states that this book is a beautiful gift from someone (a special man), all the students become silent and smile because it considers such a gift is something romantic. The teacher stated in teary eyes and said that the book was a gift from his father who Studied Post Graduate in Solo.

The words of the teacher that touches the feelings will make the students get carried away and be able to focus on learning. It is significant for educators to know how they can influence the emotional state of their students. From observations in the classroom, the emotions of the teachers transmitted to the students. The teacher's cheerful delivery makes the atmosphere of the class became excited. This can be understood because the teacher's action will activate the mirror neurons of the brain. The mirror neuron system can be seen from the students' ability to read the mood and expression of the teacher. Directly, the textbook model did not appear in stimulating the emotional side of students, but with the role of the teacher involving textbooks in the class, the emotional response of students becomes visible.

Third, humor builds up the courage students to ask questions, to facilitate students to understand the material and their way of thinking to history to be more creative. The textbook helps the teacher to increase the frequency of humor with the humor columns of history. The teacher explained the material history with expressive and full of jokes. In several meetings, the teacher asked students to read the humor of history in textbooks, but only a small part that laughs. But when the teacher explains and tells back expressively, most of the students laughed.

When the teacher asked about the commodity which was traded by Dutch, the students answered pepper, cloves, and nutmeg. The teacher also explained that Indonesia product's quality at that time considered a high-quality one with a different period now where the coffee just inferior to the Japanese. Students asked about the Kopi Luwak of Good Day (one of the coffees brand) were already marketed since VOC. The question was greeted by the vigorous laughter of the other students because they see it as a very ridiculous question. The courage of the students to the issue

of humor with free but politely indicated they were comfortable with the condition of the class. When the student uses his emotions as the mind in learning, he will feel learning history is more fun (Bornstein, 2014).

Humour makes serious history material easier to understand and to remember. Humor increases retention so that the positive feelings resulting from the laugh will increase the chances of students remembering what he had learned (Sousa, 2015). When the teacher explained about the dissolution of the VOC in 1799 and the explanation of the Napoleonic wars in Europe and its impact on the acquisition of archipelago by the French under the leadership of Herman William Daendels, the students laugh so loud because of the coincidence in the class some students are named Herman. The other example when teachers explain the cause of the failure of the attack of the Kingdom of Mataram to the VOC in Batavia (now Jakarta) is the supply of food is interrupted. Then the teacher also explains the resistance against the VOC made by Mataram, the background of the emergence of such conflicts, namely the ambition of Mataram that wants to unite Java to collide with the interests of the VOC in Batavia (now Jakarta). The teacher explained that the invasion of Mataram failed because the Javanese Kings want to be free from Mataram, the supply of Mataram in terms of food, and the distance to Batavia, which is quite far.

One of the students asked the teacher; "Why not use GO-Jek and Grab so that the message can GO-Food and Grab Food (the start-up Company in Indonesia)". Actually, in the casual ambiance of humor that was delivered by the teacher, the thinking process of the students become more creative. One expressed his opinion to the teacher that the issue of Mataram can overcome with Go-Jek or Go Car. The student statement made the students in class laugh. But behind the ridiculous statement and ahistorical kept ways of thinking that the problems which were experienced at the past can be solved with the presents' findings. Students think seriously about the material submitted by teachers and assessed that accommodation issues in the war could be solved in this modern world. It seems that the ability to think depends heavily on the condition and emotional state. This can be understood because laughter causes the release of endorphin in the blood and trigger the frontal lobe of the brain that improves focus on learning (Sousa, 2015).

Fourth, the history quotes contained in the textbook model stimulates an emotional response and encourage students to think. They always fell silent for a moment when the teacher read quotes in the textbook model. When students ask about why the fighters of Indonesia continue to fight against the Dutch though always inferior in armament, then the teacher read out the quotes contained in the textbook, if we never try, we never know. Students were silent when the teacher described the never give up's mentality that should be owned by the youth in facing life challenges. Teachers can influence students with positive words chosen.

The words are very touching the students at the research's school because most of them came from a middle-class economy family. Most students were part-time working to meet the needs of the family and the needs of their school and never give up's mentality as part of their daily lives. Example quotes that existed in the textbook encourage students to make the quotes their own as part of their efforts reflecting the historical material they are learning. On some occasions, at the beginning of learning or at the end of the lesson, the teacher asked the students to share the quotes that they have and know.

Fifth, the textbook model helps the student to relate various information, processing history information, help in thinking and interpreting historical events, so the student's reflective thinking appears. A reflective learning system leads students to understand themselves. The importance of learning systems for reflection, namely: develop the skills

and understanding of self-reflection, inner dialogue positive, learn from mistakes, and recognize your strengths and weaknesses. The process of learning history allows every learner for understanding, appreciation, developing the value-the value of history becomes a value itself, and using the knowledge and historical value to develop a national life of his people.

When the teacher asked about If History, i.e. what if the Dutch did not come to Indonesia, whether there is a Country named Indonesia? The students stunned and a lot of students who answered no maybe there is Indonesia state and Indonesia has probably still shaped the kingdom that much. One of the statements of the students who appear in learning is students ' opinions stating that the bad things (colonization) sometimes her upcoming something good. Reflection allows students to get more in-depth information and meaningful.

The shape of another reflection that is seen in learning is students' ability in understanding historical events by making an analogy. The analogy to make students better understand the events of the past. In the columns of Contemporary Issues, the authors provide various examples to understand historical events by making an analogy. Teachers often make the analogy in the classroom so that students understand what it conveys. The analogy is usually with the linking aspects of the past with the present is known by the students. An example is the system of monopoly which performed VOC, the teacher read out the column if the history in the textbooks outlining the analogy of Mc Donald's and VOC's with a system of extirpation. Mc Donald's chooses to throw away food rather than share so that the price still stays awake while the VOC burns the result of spices in the Moluccas abundant to maintain the selling price as well. The impact on the students. When the teacher explained about the VOC, then students commented that the VOC is a company engaged in the field of spices similar Indofood company (a company in Indonesia, which is engaged in the field of food international), the student analogized the VOC and indomie (one of the products of instant noodles from Indofood company).

The aspect of self-reflection it seems that a lot of appeared in the process of learning to use the textbook model. When the Teacher explained the difficulties of the barter system in the exchange which ultimately make the human build system money. A student commented that money is a tool of negotiation that is universal and ultimately change a lot of things. Learning history allows students to get the meaning of the various events and life of the figures because the brain is designed to draw meaning from the experience.

When the teacher explains the bankruptcy of the VOC and is associated with the philosophy of the wheel of life continues to spin anywhere in this world come and go, the power and the glory come and go, leaders and the company as good as any, there's time to get down. The VOC went bankrupt because the salaries are small so a lot of corruption so the British never raise the salary of 20-fold because the small salaries lead to corruption. Of the students who commented that corruption turns since the first occurred in Indonesia and the corruption turns out to destroy everything. The meaning indeed is not contained in the material of history, but rather the results of how the students associate the material history with experience and previous learning (Sousa, 2015).

When describing the VOC, the teacher outlines the importance of entrepreneurial spirit in the younger generation. However, the students even commented that they've been commonly told rather than asking maybe the thing that's been happening since the time of the VOC. When describing the resistance of Thomas Matulessy and Martha Christina (age 18 years), teachers described how should the character of young people (give examples of teenagers who

fought against the Dutch). An interesting comment from the students is the phrase that the number of resistances showed Indonesia is a nation that does not want to be oppressed and critical.

Sixth, with the system learning the cognitive and the emotional, historical facts be more easily remembered by students. One of the sections in the textbook model that may help students are mnemonic. The Mnemonic in the textbook helps students to recall various historical facts. One form of the approach developed by Eric Jensen in Brain-Based Learning is memorizing or techniques to remember. In the textbook listed the rights of Octroi (the privilege of the VOC to trade in Indonesia) to make abbreviations. In the next few meetings, mnemonic more created by the students better by making the abbreviation, the description, and there is a form of song.

The memory will be the fact the historical events and historical figures are part of the memory declarative either episodic or semantic. Mnemonic in textbooks trying to connect between the memory explicitly (declarative) with emotions. The textbook model serves a variety of mnemonic-shaped stands for, the association, and songs. Abbreviations and associations in the mnemonic deliberately designed to be familiar to students. For example, the mnemonic of the teachings of Sun Yat-Sen (Father of Nationalist China), San Min Chui (Nationalism, Democracy, and Socialism) to be Ndeso. Ndeso is Java language which means people of the countryside. Such words familiar in the students because it is often uttered by Tukul Arwana (one of the famous comedians in Indonesia). The mnemonic for the prime minister of Indonesia years 1950-1959 along with the policies presented in a song by borrowing the rhythm of the song Garuda Pancasila (one of the national songs in Indonesia).

Pattern considering the be connected with familiar things is so that there are emotions in the process of considering such historical information. The basic components of brain-based learning are our emotions affect our ability to learn. Our brains strive to make connections between intellect and emotion. A lot of research addressing the linkages between emotions with memory (Sousa, 2015). In the brain, emotion and cognition can be distinguished but cannot be separated. Neuroscience emphasizes on the need to develop a holistic view of the classroom, taking into account the physical dimensions and effective learners if cognitively they are to act optimally (Moghaddam & Araghi, 2013).

In addition to the use of the mnemonic, practice questions in the textbooks are also designed not only ask cognitive things but also emotional. An example is a question, "What are you feeling see photos of Romusha (forced labor of the colonial era the Japanese? The question is not only about what romusha? Why Japan issued a policy Romusha? but students asked about his feelings about the romusha. Answer-students ' answers did not show his true feelings, they just commented, "Japan cruel", "Poor", "sadis banget ya" (Very sadistic). It does not appear exploration of the depth of the question emotional in the textbook when the textbook has been displaying statistical data of the victims romusha, the testimony of romusha each life, as well as photos of evidence of the suffering of romusha. It seems that the opinion of the Naisbit about the loss of empathy due to the use of technology, it appears (Christofero, 2000). But different when the story romusha is narrated by the teacher, the emotional response of students appeared. The role of the teacher is very great for turn on and give emotion on the data history in the textbooks.

Seventh, balancing the cognitive aspects and emotions in the learning history does not successfully help students who have difficulty to understand and think like the people at that time. The emotional aspects of learning are not effective to build empathy. Whereas historical narrative, as well as the tasks in the textbook, are directed so that

they have empathy towards what is perceived and thought of by historical figures. Teachers support the process of building empathy with often ask questions about what is perceived and thought of students when it became a historical figure when experiencing certain events. It is intended that they are trained empathy with the historical context.

In the perspective of neuroscience, empathy supports the social behavior of adaptive cooperation and the behavior of mutual help among (Weisz & Zaki, 2018). Empathy resulting from the process of social interaction and culture (e.g. Burkitt, 2019; Gilam & Hendler, 2016) but also empathy should also be understood as a process related to a specific context is also the motives of the individual (Weisz & Zaki, 2018). Empathy relates to an individual process to understand the feelings of others, consider the internal condition of other persons, including respect to their welfare (Weisz & Zaki, 2018). However, empathy is not the response of the automatic against the other person but depending on the context and who is the target of empathy is because the nature of empathy does not arise if the suffering is of people who are not part of his group or even his enemies.

From the point that it can be understood why the story of the figures and events of history in textbooks and the narrative teacher does not build empathy in students? They do not have the immediacy of emotional and cognitive with historical figures and events of history. Their knowledge of historical figures is not a lot even most of them do not know. Their emotional response when read and heard the stories of historical figures such as spontaneous course and for individual students not to feel consider important they understand the feelings of historical figures such. This needs to be followed up with further develop the new patterns in the teaching of history so that empathy can emerge. Empathy for the historical figures is intended that the students make them modeling in building his personality

Eighth, students can express feelings and appreciation towards historical figures if there is a connection with him. It seemed to contradict the findings on the point earlier about not the emergence of empathy in students on a historical figure. They emotionally associate figures and historical events with what they experienced and felt. The emotional aspect makes the students have a unique point of view about the figures and events of history. An emotional approach makes the perception of the history of the students is heavily influenced by what students experience and feel at this time. Disappointment and their anger at the state of themselves influence how their point of view about history. Research brain-Based Learning confirmed that although all students can learn with the same pattern from the teacher each brain is unique and every student has the perception of themselves (Connell, 2009).

An example is the view of the students regarding the figure of Kartini (Figures of women's emancipation in Indonesia/died 1904). Most of the students believe that Kartini is a figure that plays a major role in the advancement of the education of women in Indonesia so that the dignity of women became more respectable. But the most unique is the opinion of Kartini because he from small to high-SCHOOL age this feels not taken care of by his mother. The mother of these students is busy working from morning until night. Female working students' value is one form of the emancipation of women who fought for Kartini. Besides, students are linking the VOC and EIC with the textile companies to place their parents' work. They are of the view that the behavior of the VOC monopoly and oppressive just the same with the company textile that squeezes the power of their parents with low wages. The side of excessive emotion can destroy rational thinking because the feeling very influences the assessment process in man. The experiences of students produce a strong emotional reaction, which is encoded by the amygdala and stored together with the events cognitive, and that eventually will set the self-concept and change the way students perceive themselves and reality (Sousa, 2015).

Another example is when the teacher explains the resistance of the people of the Moluccas towards the Portuguese, and asked Why they fight? Students answer because of the factors of the monopoly and the killing of Sultan Khairun. One of the students commented about the attitude of the Portuguese who are not knights because of the killing of Sultan Khairun when the Sultan wanted to negotiate. However interesting that some students commented that the who like to start twisting from the back it turned out already happened a long time ago and said it was an act of a coward that cannot be forgiven. The students laughed because his friend connects the killing of Sultan Khairun with the world their courtship. Humour is critiquing yourself very effectively applied in adolescents (Sousa, 2015).

Ninth, the textbook model after measured, it is not effective in evoking elements of brain-based learning in the teaching of history on the aspect of a learning system, social and physical. The task in the textbook graded students are not challenging and do not encourage students to move physically. Teachers are aware that too many challenges can make a student give up, while challenges that are too little will cause boredom (Inocian & Lasala, 2014).

The textbook model is designed by giving the task of field research on the history of the immediate environment of the students. Besides, the tasks in the textbook are directed at the display in role play. Indeed, it is rather difficult to design a learning history that involves motion kinesthetic. Physical motion a well-planned range at the time of the role of the checkered pattern learning system the physical learning history in the future.

Also, the textbook model is less effective in encouraging the students to want to cooperate and actively participate. The textbook model rated students do not encourage them to better understand themselves, others, and the environment as a basis to cooperate and interact with other people. Whereas the textbook is designed to display the material history that emphasized the importance of cooperation. The material of the national movement of Indonesia (1900-1942) directed and confirmed the cooperation of various organizations of the movement and also stressed the failure of the defeat of the Dutch in the war is because of the low cooperation between the figures of the fighters. Questions and tasks directed to work together plus learning in a class directed at cooperative learning. Students see the process only to the extent of the "duty" of teachers to be done together and not conceived as a process to train and accustom them to always cooperate.

IV. Conclusion

Neuroscience application on history textbooks is effective in raising the emotional, cognitive, and reflective but not with the learning system, social and physical elements. An effort to balance the emotions, cognition, reflection, social and physical on a textbook is still ineffective because the cognitive element after having measured remains dominant compared to the other aspects.

The textbook effectiveness heavily determined by how teachers use them in the learning process. Reciprocal interactions between the teacher and the textbook will maximize the textbook usefulness. The textbook model did not appear in stimulating the emotional side of students, but with the role of the teacher that involved textbooks in class, the emotional response of students become visible. The textbook helps the teacher to add the humor frequency of humor that makes the material history of serious easy to understand and to remember.

Teachers' role is very significant to turn on and gives emotion on historical data in the textbooks. The reason is that teachers' emotions contagious to students, and teachers can affect students with positive words chosen. Textbooks are effective in providing history information, but it was only through the teacher's explanation that it made them understand. The reading book process is more meaningful when related to the teacher's explanations because of many things in the textbook invites' questions.

The textbook model assists students in relating various information, processing history information, help them in thinking and interpreting historical events, so the students' reflective thinking students appear. Reflection allows students to get information more in-depth and meaningful as well as the students' ability in understanding historical events by making the analogy.

Harmonization of the cognitive and the emotional elements in the textbook make students focus on study, giving a better chance to remember the facts of history, and learning history more fun. The remembering pattern given in the textbooks related to things that are familiar with the students meant that there are emotions in the process of considering such historical information. The cognition and emotion harmonization on the learning process make historical facts easy to remember. The absence of anxiety academics will help to improve students' ability to think because the thinking process is very dependent on the mood and emotional state.

Students assessed the textbooks as unchallenging and discourage them to be physically active as well as discourage students to cooperate and actively participate in learning. The textbook model failed in helping students who have difficulty to understand and think like the people at a past time. An emotional aspect in the textbook ineffective to build empathy in history because students do not have the emotional and cognitive closeness with historical figures and historical events. Students can express their feelings and appreciation towards historical figures if there is a connection with them.

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