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## **Development Of Natural Science (Ipa) Comic Media On Global Warming Material**

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**Abstract** Natural science (IPA) comic media can be used to increase student's motivation and interest in global warming material. This study aims to produce IPA comic media on Global Warming material. This research consists of Analysis, Design and Development. IPA comic media developed was the material of junior high school in VII class about Basic Competencies (KD) 3.9 analyzing climate change and its impact on ecosystems which consist of 3 meetings. The analysis, design, development, internal validation and first trial were carried out in Laboratorium Pendidikan Biologi FKIP Universitas Riau. External validation and second trial was conducted at SMP IT FIS Pekanbaru. IPA comic media were validated based on five aspects of developing comic learning media such as Simplicity, Emphasis, Balance, Cohesiveness, and Comic Design. IPA science comic media on Global Warming material produced in this study was very valid category, so it is suitable to be used as a source of independent learning to increase student's interest in reading.

Keywords: Comic media; Natural Science; Global Warming.

### **1. Introduction**

The 21st century, known as the age of knowledge, is the main foundation in various aspects of life. One of them is education aspect. Education in the 21st century places more emphasis on student's ability to think critically, able to connect science with the real world, mastery in using information technology, communicate and collaborate. For this reason, students' interaction with learning resources largely determines the quality of learning.

Curriculum 2013 requires that learning not to be results oriented but based on process. Natural Sciences (IPA) as one of the subjects in junior high school arranged in curriculum 2013 is a process that includes the tendency of attitude or action, curiosity, habit of thinking, and a set of procedures that was a scientific approach. Therefore, the delivery of learning science or natural sciences at least focus to the formation of knowledge in students' mind.

Science learning is essentially inseparable from teaching materials and used media. In addition, the learning process requires a development in conveying a message to students. However, the reality is not same with government expectations with regard to learning that leads to the development of knowledge, attitudes and skills.

In fact, students' interest in reading was currently very low. This can be proven through research conducted by the Programme for International Students Assessment (PISA) Team through the Research and Development Agency of Indonesia National Education Ministry showing that reading skills of 15-years-old children in Indonesia were currently low. It was proven that around 37.6% of them could only read without being able to know the meaning, and 24.8% could only associate the text with a piece of knowledge information (Firman, 2007). Besides the low students' interest in reading, it was also proven by the results of surveys in the field that the learning process carried out by teachers

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in schools still often use the leatoring method, and the media used by teachers is still not varied. This can be seen from the results of the questionnaire given to three schools in Pekanbaru, namely SMPN 1 Pekanbaru, SMP 5 Pekanbaru and SMP IT FIS Pekanbaru that teachers more often use direct object media (22.3%), pictures (20.6 %), power point (18.3%), video (16.9%), torso (13.2%) and comics (8.7%).

One factor causing the low students' interest in reading textbooks is because the textbooks that currently using are mostly main textbooks. Although there are some additions of illustration variants, it had not enough influence on increasing students' interest in reading. Low reading interest causes activeness and low learning outcomes. The complexity of the teaching materials delivered makes students less interested in reading science textbooks including biology books. Students tend to be interested in reading picture story books (like comics) rather than textbooks. This is due to the fact that comics have a coherent and orderly story line making it easier for students to remember the material information presented. From this facts, there was idea to combine the appeal of comics and textbooks, so the students will be interested in reading.

Comic are media images that usually present pictures or cartoons that express the character and plays a story in a tight order. Comic are often associated with images that are designed to provide emotional connections to readers (Hamida et al., 2012). The creative presentation makes it easier for readers to understand the material presented. This comic research results have the same development criteria as Arsyad's (2014) that the criteria for developing a comic as a visual medium include comic designs with simple and easy-to-read interrelated words; concise, clear, dense and easy sentences to understand, interrelated elements in visual media as a whole and comprehensive unit, the emphasis on the part that is the center of student attention. In addition to the above principles, the development of comics as a visual medium is also considered in terms of shapes, lines, textures and colors.

The comic that will be developed is a science comics (IPA) that are adjusted to the Basic Competencies (KD) in the curriculum. In this case the authors chose Global Warming material. Based on survey results in several schools in Pekanbaru, as many as 83.20% of students responded that global warming material was very suitable to be developed in the form of comic media. Global warming material is difficult and important material, so it needs an alternatives to attract students' desires in learnig by developing comic as a learning materials. Based on this background, the science comic media was developed in the subject of Global Warming.

## **2. Methodology**

This research was conducted in Kampus Pendidikan Biologi Jurusan PMIPA Fakultas Keguruan dan Ilmu Pendidikan (FKIP) for analysis, design, development, and validation by lecturers then the first trial, second trial, and and validation by teachers was conducted at SMP IT FIS Pekanbaru. The research was conducted in July to November 2018. The type of this research was research development that this research was used to design and develop IPA comic media on global warming material. The model that used in this study was ADDIE model which consists of 5 stages such as Analyze, Design, Developement, Implement and Evaluate. This research was carried out until the third stage, namely the development stage. This comic media was developed based on the aspects of simplicity, emphasis, balance, cohesiveness, and comic design.

The following were the steps to develop a IPA comic media on Global Warming material to produce the product.

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1. Analyze

This research begins with the analysis phase, namely: analyzing the curriculum 2013, analyzing the student, and analyzing the subject matter that suitable for the comic media including the suitability of comic media to support learning on global warming material and the potential for material development as comic media.

2. Design

This stage was the stage of making comic media framework in accordance with the main competencies and basic competencies that contained in the curriculum 2013. The design stage of making comic media was as follows:

- a. Syllabus and RPP Design

Before comic were developed, RPP were designed in accordance with the learning material. The RPP becomes the basic reference in designing comics that will be developed.

- b. Learning Media Design

Comic that will be made have some criterias including full color pages that consisting of a cover page, introduction of characters, table of contents, chapter titles, achievement indicators of competence, content, training, and sources. The size of this comic is 14.8 cm x 21 cm with Times New Roman letters and font size of 14 pt. Comic that will be made was adjusted to the main competencies and basic competencies in the curriculum 2013.

The learning material was taken from Curriculum 2013 textbooks and the language used was the daily language of students. This development comic design was a modification design by Syaiful Rohman Hakim (2013) which consisted of four steps in the designing and making this science comics. The four steps were:

- Character selection

The character designed in this comic was a figure who had a concern for the surrounding environment and had knowledge about global warming. The figure of Mr. Hasan was a teacher figure for other figures because this figure had a positive impact on other figures.

- Story Making

The storyline in the comic was made in accordance with the characters. The learning materials developed in the comic media is Global Warming material. The plot was designed according to events in daily life that were associated with learning materials about Global Warming material.

The plot was adapted to people's daily lives. The presence of Pak Hasan played a role in giving advice about the importance of protecting environment so that global warming will not occur. This comic also contained the moral values of friendship, family, and mutual cooperation among the characters.

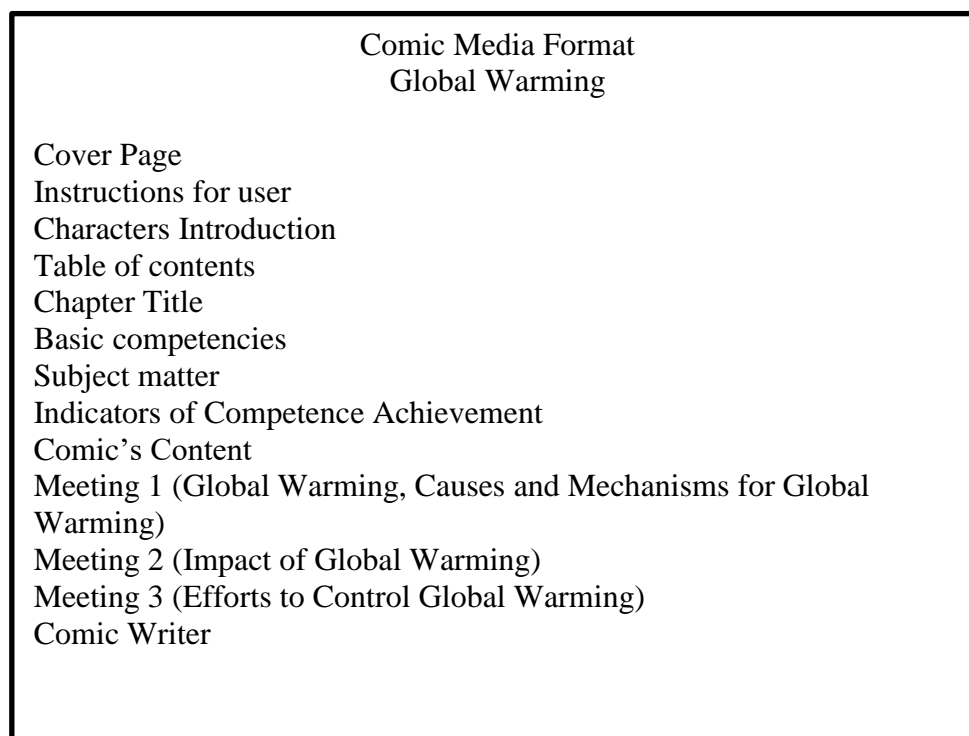
- Making comics

Comic was drawn manually by hand, then images that have been designed were scanned and inputted to the comic-making application program, Paint Tool Sai, to create a comic framework. Then, the comic designed using the Adobe® Photoshop® CS5 application to create the characters and background stories.

- Script writing  
In the process of writing a script, the storyline and dialogues between the characters was added to the pictures that have been designed into a comic, so it become a unified comic unit using a photo processing computer application program, namely Adobe® Photoshop® CS5. The manuscript was made using Times New Roman letter and font size of 14 pt.
3. Development
- Comic media that had been developed was validated by a validator that includes material experts and media experts. Then, the results of the validation revised by the researchers and conducted the first trial. First trial was conducted on 10 students of biology education in first semester, then it revised based on the results of the trials, the suggestions, and the inputs on the IPA comic media. Furthermore, second trial was conducted on 20 students of SMP IT FIS Pekanbaru. The results of second trial is used for revising the comic to be comic media product.

### 3. Results and Discussion

This science comic media developed from basic competencies (KD) 3.9 which is analyzing climate change and its impact on ecosystems. After being analyzed, the material that developed as a comic media is global warming. The format of the comic media that will be developed as follows:



**Figure 1.** Format of Global Warming Comic Media

The comic media framework was developed into a comic draft. Then, it was validated, revised and tested. Validation in this study consist of five aspects that assessed by the validator such as: simplicity,

emphasis, balance, cohesiveness, and comic design. Validation results by the validator about the simplicity of comic can be seen in Table 1.

**Table 1.** Validation Results on Simplicity Aspects

No	Items	Average	Category
1.	The content of media encourage students' curiosity, willing to learn, and willing to find new information	3,80	SV
2.	The choice of word in the translation of material was simple and easy to understand	3,40	SV
3.	Comic sentences lead to understanding concepts	3,20	V
4.	The use of the word does not contain multiple meanings	3,40	SV
5.	The accompanying text is not too long	3,20	V
6.	The suitability of the words with students' languages	3,60	SV
<b>Average</b>		3,43	SV

Note: V = Valid, SV = Very Valid

Table 1 showed that the validation results of simplicity aspects have function to present systematic material, so that students will not be confused in understanding the material. Explanation of the material should start from the general explanation to the specific explanation in sequence. In addition, the clarity of material must have to measure and see the simplicity and clarity language used in comic.

This science comic media developed using easy understanding word, which used simple texts and students' daily language. This is accordance with Purwanto's (2013) statement that sentences or words in comic language are made as simple as possible, concise, clear and compact, so that it was easy to understand the contents of comics. The language integratedly was used to convey the informations about subject matter by cartoons. It used daily language that was often used by students in everyday life. According to Heru Dwi Waluyunto (2005), it was undeniable that comic book preparation also requires grammar commonly used by students in their daily lifes. The developed comic used Bahasa Indonesia as the language. It also aims to introduce students to use Bahasa in their daily lifes properly.

The lesson material was presented with not many compound sentences, but with communicative and easy understanding languages for the students. The contents of comic material can increase students' curiosity like willing to know and willing to find new informations, so that there is a match between mastery the subject matter with objectives to be achieved and an optimal learning that leads to understanding concepts. The results of validation by the validator on aspects of emphasis, balance, cohesiveness, and comic design can be seen in Tables 2, 3, 4, and 5 below.

**Table 2.** Validation Results on Emphasis Aspects

No.	Questions	Average	Category
1.	The contents of the material are clear and can stimulate student's thinking	3,60	<b>SV</b>
2.	Involving events that are around students' environment	3,80	<b>SV</b>
3.	Conformity the concept with the subject matter	4,00	<b>SV</b>
4.	The suitability of the material with the basic competencies in the applicable curriculum	3,80	<b>SV</b>
5.	There is an emphasis on important concepts	3,40	<b>SV</b>
6.	Conformity of the concepts described with the concepts put forward by experts	3,60	<b>SV</b>
<b>Average</b>		3,70	<b>SV</b>

Note: SV = Very Valid

Table 2 showed that this aspect focus on how the concepts of the material presented and captured by students. The concepts of the material presented related to the basic competencies to be achieved. Competency achievement indicators contained in the applicable curriculum. Comic was designed in accordance with the material indicators created.

The material contained in this comic was Global Warming. The material contained in this comic has been adjusted to Curriculum 2013 textbook issued by the Ministry of Education and Culture (2013) and Biology Science book written by Irnaningtyas. The concept of subject matter presented in this comic related to natural events. The scope of material presented in this comic media is in accordance with the learning objectives to be achieved. In addition, the presentation of material related to students' daily lives, so it makes students can understand the lesson easily because it is easy to see the application of concept in their daily lives, students can engage their thoughts with their experiences, and students can link the activities carried out with the impacts.

The concept of material accentuate the material presented in the form of comics. The accentuation was given by using measures, relationships, perspectives, or colors that serve to focus student attention on learning material. Azhar Arsyad (2004) states that the emphasis on concepts serves to focus attention on learning material. For this reason, writing on the concepts contained in comics need a different color than other dialogues so students know which concepts they need to pay attention. With the emphasis aspect on the concept of comic, students will more easily understand the material to be learned during the learning process.

**Table 3.** Validation Results on the Balance Aspect

No.	Questions	Average	Category
1.	The theme of the picture is interesting and in accordance with the level of students' thinking	3,60	<b>SV</b>
2.	Comic drawings showed dynamic impression	3,20	<b>V</b>
3.	The portion of words and pictures in the comic was balanced	4,00	<b>SV</b>
<b>Average</b>		3,60	<b>SV</b>

Note: V = Valid, SV = Very Valid

Table 3 showed that the aspect of balance or the chosen pattern should occupy the display space which gives a balance perception even though not entirely symmetrical. Things that need to be considered in balance were symbols, words, and images used in the media. In the developed comic media, the portion of words contained in the comic was balanced according to students' thinking. This illustrates that the portion of words and images used in the comics already illustrate the contents from the author to the reader. The depiction of the portion of words presented through illustrations illustrates the contents of the comic design. If comic had many words compared to pictures, there will be boredom in students to read the comic and vice versa. If there are too many images compared to words then it can also interfere students' attention to observe which should be considered. In the comics development, images and text complement each other so that nothing is more emphasized. This means that the comic that were arranged were in accordance with the interesting pictures theme and in accordance with the level of students' thinking. The picture in the comic serves to foster students' interest and motivate them towards learning. The comic that was developed was the subject of global warming with the theme "What happened to our earth?". So, the theme can attract students' attention and be able to create clear and communicative messages that are in accordance with the students' thinking. The pictures are made based on daily life so that in reading comics students seem to be in the story. The learning process that was traversed becomes meaningful, can rise students' curiosity in learning, and can foster students' active roles. According to Sudjana and Rivai (2009), the pictures in the comics were conveyed and expressed in simple drawings, with symbols and characters that were easily recognized and understood quickly and can foster students' active roles.

**Table 4.** Validation Results on the Cohesiveness Aspect

No.	Questions	Average	Category
1.	Unity of story line	3,20	<b>V</b>
2.	Science materials can be well organized	3,40	<b>SV</b>
3.	The elements contained in comics were interconnected in functional unity	3,40	<b>SV</b>
4.	The use of comics was flexible, effective and efficient	3,20	<b>V</b>
<b>Average</b>		3,30	<b>SV</b>

Notes: V = Valid, SV = Very Valid

Table 4 showed the cohesiveness aspect refers to the relationships that exist between the elements which when observed will function simultaneously. These elements must be interrelated and united as a whole, so that the overall visual can be recognized and can help the understanding of its contains. In addition, the natural science (IPA) material that is in accordance with the curriculum 2013 was an integrated natural science material where linked for each material, so that it becomes a unified material.

Natural science (IPA) materials can be well organized. This means that the comic media that have been designed were developed in accordance with the science learning of junior high schools in the curriculum 2013. According to Trianto (2017) science learning emphasizes direct experience to develop competencies, so that students are able to understand the natural surroundings through the learning process in the presence of this comic media the material can be well-organized.

The elements contained in comics are interconnected in functional unity. This explains that the components used in comics are interconnected in functional unity according to the developed material. In comic learning media, all the elements in comics are a medium for delivering learning material.

Comic consist of pictures and text that have a story line. This was in accordance with the statement of Heru Dwi Waluyunto (2005) that the storyline in comics made the contents of comics easier to follow and remember, so that messages conveyed through comics were stored in long-term memory.

**Table 5.** Validation Results on Comic Design Aspects

No.	Questions	Average	Category
1.	The cover page and comic chapter had interesting pictures, colors and font shapes	3,80	SV
2.	The title of the story was interesting and motivating students to read	3,60	SV
3.	Comic font types and sizes were suitable and easy to read	3,60	SV
4.	The distance between panels with other panels was neat and helps in understanding the story line	3,60	SV
5.	Comic drawings lead to concepts	3,60	SV
6.	Display images, photos and colors stimulate interest in learning	4,00	SV
7.	Comics arranged neatly systematically	3,40	SV
8.	Comic prints were clear, interesting and easy to read	3,60	SV
9.	The colors used in comics vary	3,80	SV
10.	Comics were presented in full	3,80	SV
11.	Comic size was practical and flexible	3,80	SV
<b>Rerata</b>		3,69	SV

Note: SV = Very Valid

Table 5 showed the aspects of comic design function to see the overall appearance of comics. The first thing to notice in a comic design was from the outermost appearance, which was a cover page that had an interesting picture, color and font. The comic media developed for the presentation of images clearly aimed to ensure that the material's message can be conveyed to students. Besides that, the pictures in the comics were accompanied by information to help students understand the picture.

The first comic design was from the outermost appearance, which was a cover page that had an interesting picture, color and letter shape. The more creative the comic appearance was designed, the more the image would resemble the object or event depicted. The illustrations on the cover page also serve as a sign to communicate the problems in the comic story without using words.

The initial appearance of an interesting comic will make the reader feel curious about the contents of the comic. The color selection on the comic cover is very important, so it must be not too flashy or less colorful.

The function of comic is to facilitate students' learning and to help in learning the material concepts with a variety of colors. Sudjana and Rivai (2009) also suggested that comics become more alive if they were processed by using the main colors freely. Learning comics that display images were very interesting, can increase students' interest in learning, and can familiarize students to read especially for students who are less interested in reading.



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The selection of paper used to print images is very important to produce good images. The interesting physical form of learning resources is expected to attract students' interest in reading, so they can find the message of the learning source.

Comic media that have been validated based on validators' suggestions and inputs were subjected to limited trials to see the readability of comic media. The trial was carried out in two stages. The first trial was carried out on 10 university students from the first semester of Biology Education FKIP Riau University and the second trial was carried out on 20 first year students of SMP IT FIS Pekanbaru. Respond questionnaire filled by respondents consisted of 12 items of statements covering aspects of simplicity, emphasis, balance, cohesiveness, and comic design.

Respondents in first trial and second trial gave positive responses to the comic media. This is due to the comic media being developed in a systematic, clear and easy materials to understand and has an appeal to the reader. This interest is a sign of students' interest in reading comics. Comic that were presented through images that fit the story line created contain material concepts conveyed through comics, so that it helped students understand the learning material. An interesting display of the language, the shape of letters, pictures, and the composition of comic will make students interested in reading.

Based on the results of the trials, the developed comic media is ready to be used as an additional source of learning for students in understanding Global Warming material.

#### **4. Conclusion**

From the results of this study it can be concluded that:

1. The results of natural science (IPA) comic media validation on Global Warming material were based on five aspects such as simplicity, emphasis, balance, cohesiveness and comic design in very valid category.
2. The results of first trial and second trial for junior high school students were in the very good category.
3. Natural science (IPA) comic media on Global Warming material that has been developed with very good categories and can be used as a learning resource.

#### **5. Recommendation**

The next research was suggested to continue the next stage of development research which were implementation and evaluation.

#### **Reference**

- Ahmad Rivai, Nana Sudjana. 2009. *Media Pengajaran*. Bandung: Sinar Baru Algensindo.
- Arsyad, A. 2014. *Media Pembelajaran*. Jakarta: Raja Grafindo Persada
- Firman, H. 2017. *Analisis Literasi Sains Berdasarkan Hasil PISA Nasional Tahun 2006*. Jakarta: Pusat Penilaian Pendidikan Balitbang Depdiknas
- Heru Dwi Waluyunto. 2005. Komik Sebagai Media Komunikasi Visual Pembelajaran. *Jurnal Nirmana*, Fakultas Seni dan Desain, Universitas Kristen Petra. 7 (1): 45-55

- 
- Khairuna Hamida, Siti Zulaekah, Mutalazimah. 2012. Penyuluhan Gizi Dengan Media Komik Untuk Meningkatkan Pengetahuan Tentang Keamanan Makanan Jajanan. *Jurnal Kesehatan Masyarakat*. <http://journal.unnes.ac.id/utu/index.php/kemas>
- Mahya, 2018. *Pengembangan Komik Sebagai Media Pembelajaran IPA*. Universitas Lampung
- Purwanto, D. 2013. Pengembangan Media Komik IPA Terpadu Tema Pencemaran Air Sebagai Media Pembelajaran Untuk Siswa SMP Kelas VII. *Jurnal Pendidikan Sains e-Pensa, Vol. 1, No. 1*, 71-76.
- Puspitorini, R. 2014. Pengembangan Media Komik IPA Berkarakter Sebagai Implementasi Kurikulum 2013 Untuk Meningkatkan Motivasi belajar dan Hasil Belajar Siswa Kelas VII. *Cakrawala Pendidikan*, Oktober 2014, Th.XXXIII, No.3
- Syiful Rohman Hakim, 2013. Pengembangan Komik IPA Terpadu Tipe *Shared* Untuk Siswa SMP/MTS Kelas VII. Skripsi. Thesis
- Tatalovi, M. 2009. Science comics as tools for science education and communication : a brief, exploratory study. *Journal of Science Communication*, 8(4) , 1-17
- Tejo N. 2013. *Membuat Media Pembelajaran yang Menarik* . Yogyakarta : UNY.
- Tianto, 2017. *Mendesain Model Pembelajaran Inovatif Progresif Dan Kontekstual Gramedik Digital Nusantara*. Ebook. Gramedia.com
- Tiemensa, Leone. 2009. Visual Literacy : to Comics or Not to Comics? Promoting Literacy Using Comics. Makalah disajikan pada World Library and Information Congress : 75<sup>th</sup> IFLA General Conference and Council, Italy 23-27 August 2009. Dalam Rhonda databased, (online), (<http://rhondalthonen.files.wordpress.com/2012/04tiemensa-1-2009->
- Tim Abdi Guru, 2013. *IPA Terpadu untuk SMP Kelas VII*. Jakarta: Erlangga
- Utariyanti, I. F. Z., Wahyuni, S., Zaenab, S. 2015. Pengembangan Media Pembelajaran Berbasis Komik Dalam Materi Sistem Pernapasan Pada Siswa Kelas VIII MTs Muhammadiyah 1 Malang. *Jurnal Pendidikan Biologi Indonesia, Vol. 1, No. 3*, 343- 355.
- Widyawati, A., & Prodjosantoso, A. 2015. Pengembangan Media Komik IPA untuk Meningkatkan Motivasi Belajar dan Karakter Siswa SMP. *Jurnal Inovasi Pendidikan IPA*. 1(1), 24-35. Diakses pada tanggal 14 agustus 2015, diambil dari situs <http://journal.uny.ac.id/index.php/jipi/article/view/4529>.
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