Effectiveness of a Teaching Material: News-Based Teaching of Mount Ungaran

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Abstract. The news-based teaching is a teaching material that contains news integrated with the results of exploring the biodiversity on Mount Ungaran for high school students in Biology subject. Teaching materials were prepared based on the results of the needs analysis. Early observation of High School 12 Semarang students showed that Biology learning sources were still insufficient to achieve basic competence. This study aimed to develop valid news-based teaching material of Mount Ungaran Biodiversity using the research and development (R&D) method for effective cognitive, psychomotor, and affective learning outcomes. The research method subjected the students of High School 12 Semarang to explore the biodiversity news of Mount Ungaran on the websites. Also, the students searched the information from Research & Development (R&D). The results showed that (1) news-based teaching material on Mount Ungaran biodiversity was valid and appropriate as a learning source (96%), (2) and it was effective to improve the students' cognitive, psychomotor, and affective learning outcomes of biodiversity topic.

Keywords: news-based teaching, teaching materials, learning strategy, high-school students, teacher's creativity.

How to Cite: Nuryani, S., Rahayuningsih, M., Irsadi, A., & Fibriana, F. (2023). Effectiveness of a Teaching Material: News-Based Teaching of Mount Ungaran. *Biosaintifika: Journal of Biology & Biology Education*, *15*(1), 125-133.

INTRODUCTION

Learning sources are essential components in learning activities, through the process of being studied, scrutinized, studied, and used as material, which students will master in learning them (Hermawan *et al.*, 2018). In Biology class, learning sources can improve the student's academic achievement (Ong'amo, 2017); for example, books, natural surroundings, printed and electronic media, or other relevant learning sources (Permendikbud, 2016). News is an exciting tool for teaching and learning sources. Head *et al.* (2018) stated that in the current digital era, it is effortless to get news. Students can access the news through peer discussions, printed or electronic media (magazines and newspapers), social media (Twitter and Facebook), radios, television channels, or podcasts. Mushtaq and Benraghda (2018) stated that social media is booming among young people around the world. The positive impact of social media among students is actually higher than the negative impact. Teachers and students can use social media as a means of information and communication to facilitate and improve the learning process

In the Indonesian high school curriculum, especially in Biology class, the biodiversity topic is interesting for developing a unique teaching material. For instance, the High Senior School 12 Semarang has been applying some teaching materials to improve students' understanding of this topic. The teacher has been implementing the biodiversity of Mount Ungaran, which lies in that region and has a high potential for biodiversity. Mount Ungaran is rich with several protected wildlife and various kinds of flora with various benefits. These biodiversity potentials can help students to learn biodiversity topics since they are accessible and nearby students. The environment around students is a learning source that can be optimized for achieving high-quality learning outcomes (Rahayuningsih *et al.,* 2017;2019).

Mount Ungaran has abundant biodiversity consisting of flora and fauna. There are several taxon that are easily recognized by the people of Mount Ungaran. These taxons are: flora (100%), butterflies (98.41%), birds (96.83%), mammals (93.65), dragonflies (90.48%), frogs/toads (82.53%), and reptiles (73.02%). There are 47 protected species, among others: Javanese hawk eagles, whreated hornbill, langurs, porcupines, anteaters, and python. The people of Mount

Ungaran use many plant groups such as pine, orchid, and fern (Rahayuningsih *et al.* 2020).

The results of search, analysis and classification of news about Mount Ungaran, found 23 headlines from 17 online media sources. The classification results obtained 4 materials of the concept of biodiversity, 5 materials of threat, 12 materials of conservation and 2 materials of benefit. The results of the analysis and classification of news about Mount Ungaran can be used as a learning resource on biodiversity materials (Nuryani *et al*, 2021)

Based on a preliminary study conducted in Senior High School 12 Semarang regarding approaches, methods, and learning resources, the conclusion informed that the students need contextual and up-to-date teaching materials on biodiversity. The limited learning resources caused learning outcomes on biodiversity material for the academic year of 2018/2019. Two classes with classical completeness only reached 54.05%, while the minimum classical completeness determined by the school was 85%.

Learning on biodiversity topics in Senior High School 12 Semarang has never used news as a learning source. Sources for learning biodiversity apart from utilizing the environment also use the Biology X textbook and some accompanying books on Biology class as the teaching materials. However, the presentation of the figures of the two learning sources is less attractive, i.e. mostly using black and white colors, and some figures are unclear. Also, the examples presented in the two learning resources are not contextual and not up to date. As ideal textbooks, the book authors must add some contextual examples. The easiest way to add them is by contemporary learning of actual news or events.

Ardiyanto (2013) stated that using actual news or events as a learning source has allowed students to see actual events and gain direct experience in everyday life. They could understand the phenomena related to the learning subject and easily understand the teacher's lessons. Utilization of actual events as learning resources must be supported by learning innovations carried out by the teacher. The news-based teaching method is one learning innovation that utilizes news as a source of learning. The news-based teaching method is also a learning method that provides facilities for students to interact with learning resources based on science news. Presenting science news in learning can open students' insights and sensitivity to

problems that occur around them. News-based teaching could be conducted by applying five syntaxes, namely: (1) circle of knowledge, (2) reading to meaning, (3) comparison, (4) double entry, and (5) synectic (Kartini,*et al*, 2018).

Purnamasari (2012) stated that news excerpts presented in learning could improve students' ability to provide advice and seriousness in completing assignments through the news-based teaching method. Kartini (2018) explained that the news-based teaching model in natural sciences affects familiarizing scientific literacy, creativity, and critical thinking. Also, Muthwa (2020) states that news-based teaching material on reproduction improved student learning outcomes. Therefore, the study on the effectiveness of news-based teaching material on the learning outcomes in Biology class of High School 12 Semarang on the Biodiversity of Mount Ungaran is crucial to study. It is also essential to expose the local nature and biodiversity to the students via this approach to improve their environmental awareness.

METHODS

Research design

The research was conducted at SMA Negeri 12 Semarang (Senior High School 12 Semarang), Indonesia. The target was the students in Biology class who studied Biodiversity topic. This research used the research and development (R&D) design, which aimed to produce news-based teaching material on Mount Ungaran biodiversity. The R&D research design was applied in 10 steps, including (1) potential and problems recognition, (2) data collection, (3) design and production, (4) review and validation of the product, (5) revision I, (6) initial implementation, (7) revision II, (8) final implementation, (9) revision III, and (10) final product (Sugiyono, 2014). Then, the data sources in this study were collected from (1) potential and problem identification results in schools, (2) validity data of news-based teaching material, and (3) data on the effectiveness of news-based teaching material.

Data collection

Data collection was performed using questionnaires, observation, interviews, and documentation. The data were obtained from the results of exploration and initial interviews as

preliminary research related to curriculum, methods, learning sources, and teaching materials. Field exploration was also carried out in several areas of Mount Ungaran, such as Bandungan, Medini tea plantations, Ngesrepbalong, Limbangan, and Gunungpati. Field exploration was carried out to obtain data in the form of information, images, or drawings as the source of teaching material.

Then, the feasibility test of news-based teaching material was performed by sending it to the experts, including content and media experts from the postgraduate program of Universitas Negeri Semarang (UNNES). They assessed and validated the material based on the review process. Subsequently, the student and teacher responses after using the teaching material for studying were also measured. The teaching material validation employed the instruments with assessment aspects referring to the 2014 National Education Standards Agency of Indonesia with some modifications. The experts validated the product with the following analysis techniques (Widoyoko, 2014):

$$P = \frac{f}{N} \times 100\%$$

where P = percentage of aspects, f = value obtained, N = *number of* value obtained.

Table 1. Criteria for the validity of teaching materials

Score interval (%)	Criteria
$85 \leq \times \leq 100$	Strongly valid
$65 \leq \times < 85$	Valid
$45 \leq \times < 65$	Not valid
$25 \leq \times < 45$	Totally invalid

User responses consisted of the responses of students and biology teachers. Responses were measured using student response questionnaires and teacher response questionnaires. The questionnaire of students' responses to the appearance and presentation of teaching material was of 14 indicators. At the same time, the teacher's response questionnaire consisted of 3 aspects, including material aspects, languange aspects, appearance, and implementation, with 15 indicators. The percentage of student responses and teacher responses was calculated using a modified formula from (Widoyoko, 2014):

$$NP = \frac{Sum\ of\ obtained\ score}{Sum\ of\ maximum\ score} \times 100\%$$

Table 2. Criteria for the validity of teaching materials

Score interval (%)	Criteria
$85 \leq X \leq 100$	Strongly valid
$65 \leq X < 85$	Valid
$45 \leq X < 65$	Not valid
$25 \leq X < 45$	Totally invalid

The effectiveness of teaching materials could be observed in students' cognitive, psychomotor and affective learning outcomes. The domain effectiveness indicators on cognitive, psychomotor, and affective are based on classical completeness. The classical completeness indicator based on the achievement of students' minimum cognitive, communication, and affective skills is 75%. Determination of cognitive, communication, and affective classical completeness is if $\geq 85\%$ of students have met the Minimum Completeness Criteria (MCC) score of 75. Learners' classical completeness could be calculated using the following formula:

$$P = \frac{\sum n_1}{\sum n} \times 100\%$$

Where P = classical learning completeness score, $\sum n_1$ = number of participants completing individual learning (percentage $\geq 85\%$), and $\sum n$= total number of students.

RESULTS AND DISCUSSION

News-based teaching material on the biodiversity of Mount Ungaran

Two expert validators tested the feasibility of teaching materials based on the validity test, including content and media validators. The material expert validation instrument consisted of 11 criteria from 4 aspects: knowledge aspect, language aspect, presentation technique aspect, and presentation completeness aspect. The media expert validation instrument consisted of 12 criteria from 3 aspects: teaching material size, teaching material cover design and teaching material content design. The cover of teaching materials can be seen in Figure 1.

Figure 1. Teaching material covers, left: front cover and right: back cover

As mentioned before, the material content and media were initially validated. The results of the validation analysis of teaching materials by material experts and media experts are presented in Table 3.

Table 3. Recapitulation of expert validation analysis of teaching materials news-based teaching

Expert validator	Percentage	Criteria
Material content	92	Strongly valid
Media	100	Strongly valid
Average	96	Strongly valid

The expert validation recapitulation of teaching material shows an average percentage of 96% with strongly valid criteria. Assessment of teaching material by the experts used the instruments with four components of validity, including knowledge dimension, language, presentation techniques, and completeness of presentation. The scores of knowledge dimension, language, presentation techniques, and completeness of presentation were 87.5%, 93.73%, 87.5%, and 100%, respectively. The instrument for media expert validation included the teaching material's size, the teaching material cover's design, and the content's design, where each component scored 100% (strongly valid).

The material content expert validator provided notes on the validation results. Some mistyping, punctuation, and grammar in writing were found and needed to be revised. Also, they suggested that adding subtitles for each page should be more specific for discussing each material and natural ecosystems and artificial ecosystems along with examples. The revision was needed to fulfill the criteria of good teaching material, Camelia, *et.al* (2017), that Teaching Materials that are considered good must meet various criteria, including the contents according to the curriculum, the presentation is systematic and can help students achieve learning goals

The feasibility of teaching materials based on student responses can be seen in Figure 2.

The results of the feasibility test analysis showed that the presentation aspect obtained 92% and the material content aspect obtained 88%. The average was 90%, with strongly valid criteria. The news-based teaching material was tested for feasibility based on responses from students as users. The responses were from students who used the teaching material through the learning process of biodiversity topic. The feasibility test used a questionnaire as an instrument. The instrument consists of two aspects, including the presentation and material content, with 14 indicators. Presentation aspects included readability of writing or text, clarity of images, suitability of images with events, descriptions of images, attractiveness, and suitability of images with biodiversity topic. Aspects of presenting the material included the relationship with the biodiversity of Mount Ungaran, interest in biodiversity material, the role of teaching materials in adding insight, sequence of material, easy-to-understand sentences, the role of teaching materials in completing assignments, the role of teaching materials in motivating to discuss, the role of teaching materials in inspiring to preserve the environment. Yuswanti (2015) stated that using appropriate images would motivate students to learn. Hariadi (2016) stated that image-based teaching materials make students more active.

Cahyono *et al.* (2018) stated that using images closely related to the subject matter would obtain maximum learning outcomes. Hermawan (2012) stated that well-designed teaching material with complete, exciting content and illustrations or pictures would motivate students to use them as learning sources. Lubis & Sormin (2019) stated that the teaching materials developed are adapted to the characteristics of students and can answer or solve difficulties in learning.
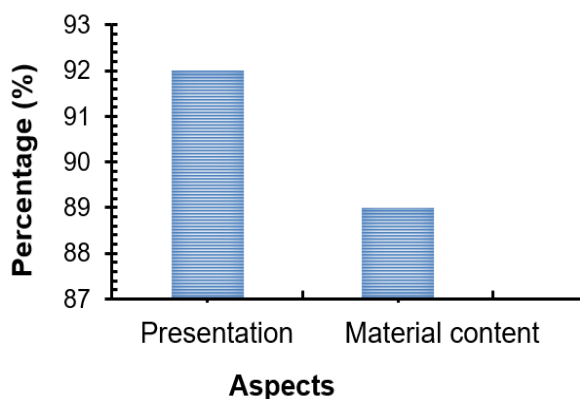

Figure 2. Analysis of teaching material based on student responses

The feasibility of teaching materials based on teacher responses can be seen in Figure 3
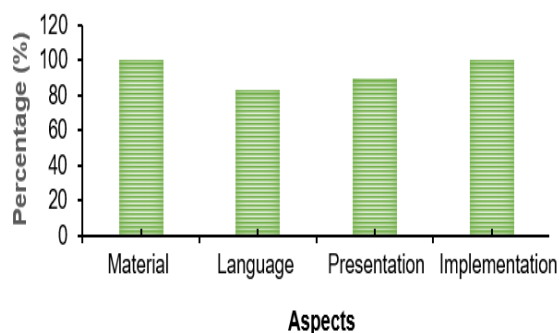

Figure 3. Analysis of teaching materials based on teacher responses

The feasibility test analysis of the teacher's response showed that the material aspect scored 100%. The language aspect scored 83%, and the presentation aspect scored 93%. The implementation aspect scored 100%, and the average percentage is 93%, with strongly valid criteria. The results of the due diligence analysis based on the teacher's response to teaching material showed that the percentage of material aspects was 100%. Material aspect indicators

included suitability of material with basic competencies, suitability with students' thinking levels, increasing knowledge to achieve competencies, and material in contextual materials. This result follows the principle of developing teaching materials issued by the Directorate of PSMA (2010) that teaching materials must be relevant to the demands of standard and basic competencies. Prastowo (2012) states that material in good teaching materials can provide explanations and knowledge to students.

The percentage of language aspects was 85%, with indicators including language following the standard grammatical rules, communicative, effective, and efficient. The percentage of presentation aspects was 93%, with indicators including the suitability of images with descriptions, easy-to-read writing, and conformity of images with concepts. The implementation aspect was 100%, where the indicators included teaching material that could provide direct learning experiences with easy-to-implement learning activities and provided motivation for students to learn. This result was corroborated by Rozalia *et al.* (2017), stating that teaching materials can help students explore their knowledge, are not fixated on teacher explanations, and create an active and communicative learning atmosphere. Image-based *handouts* can motivate students to be enthusiastic in the learning process.

Effectiveness of news-based teaching materials on the cognitive level

The results of the analysis of the effectiveness of news-based teaching material on the cognitive level were obtained from the pretest and post-test scores. The analysis results were conducted with 36 students in class X MIPA. The results of the analysis of effectiveness at the cognitive level are provided in Table 4.

Table 4. Results of the effectiveness analysis of news-based teaching material on the cognitive level

Aspect	Pretest	Post-test	Information
Average	62	82	Effective
The highest score	85	100	
Lowest value	35	45	
Number of Students	36	36	
The number of students who achieved the MCC	16	32	
% Number of Students Score ≥ MCC	44	89	Effective

The effectiveness of news-based teaching material on biodiversity at the cognitive level through the post-test showed that 89% of students had fulfilled the MCC, which means that classical completeness was achieved. The results of the cognitive value analysis showed that the average pretest score was 62, with the highest score being 85 and the lowest score being 35. The number of students who fulfilled the MCC was 16 out of 36, so the percentage of classical completeness was at least 44%. The average post-test score was 82, with the highest score of 100 and the lowest score of 45. The number of students who fulfilled the MCC was 32 out of 36, so the percentage of classical completeness was at least 89%. From the results of this analysis, there was an increase in the percentage of classical completeness of at least 45%. This result is similar to Sunarya's research (2018) which stated that post-test scores are better than pretest scores because the students have already received the lesson, making it easier to work on the questions. Risqi and Bintari (2015) stated that providing teaching materials in the learning process improves student learning motivation and increases knowledge to better prepare students for post-tests. Widiana and Wardani (2017) stated that teaching materials that contain knowledge, attitudes, and skills that are manifested in written and verbal forms used in learning make students able to master basic competencies in their entirety to improve learning achievement. Pei-Ying Tsai, et al (2013) Science knowledge for critical reading of science news enhances cognitive learning. In addition, from a cognitive aspect, linking science knowledge with critical reading of science news can increase the capacity for understanding and application. From the aspect of the dimension of knowledge, it also improves factual, conceptual, and procedural knowledge learning.

The analysis showed that the percentage of classical completeness in post-test scores was 89%. It means the minimum classical completeness percentage determined by the school was $\geq$ 85%. Thus, it can be concluded that the teaching material was effectively used on biodiversity material at the cognitive level. The effectiveness of news-based teaching material on biodiversity topic at the psychomotor level through communication skills was obtained from group presentation activities. The presentation was carried out after the students had a group discussion. The results of the analysis of the effectiveness can be seen in Table 5.

Table 5. Results of the effectiveness analysis of news-based teaching material on the psychomotor level

Aspects	N1	N2	N3	Average	Description
Average	77	84	85	84	Effective
The highest score	94	94	94	94	
Lowest value	0	0	0	0	
Number of Students	36	36	36	36	
The number of students who achieved the MCC	31	32	34	34	
% Number of Students Score $\geq$ MCC	86	94	92	92	Effective

The results showed that news-based teaching material on the psychomotor level through communication skills represents that 92% of students fulfilled the MCC, which means that classical completeness had been achieved. The average value of communication skills in presenting the biodiversity (N1) concept was 77%. Whereas the average value of communication skills in the presentation of material on biodiversity threats II (N2) was 84%. The average value of communication skills in presenting material on biodiversity conservation efforts III (N3) was 85%. The average of the three was 84%. The highest average score was 94, the lowest score was 0, and the number of students who fulfilled the MCC was 92%.

Sugito et al. (2017) stated that presentations could improve students' communication skills, self-confidence, responsibility, and courage. Syaipudin (2020) stated that communication is essential because it is a primary human activity. With the existence of human communication can interact with each other both between individuals and individuals with mass groups.

Marfuah (2017) stated that communication skills are an essential dimension for students to master in facing the 21st century. Communication plays a significant role in the learning process, namely building a learning atmosphere that encourages positive relations between teachers and students and students so that the goals are achieved. Dewi et al. (2019) stated that students' scientific communication skills could influence cognitive outcomes and help them understand the material.

The analysis showed that the percentage of classical mastery of communication skills was 92%. It met the minimum percentage of classical

completeness determined by the school, i.e., $\geq$ 85%. Thus, it can be concluded that teaching material was effectively used on biodiversity material at the psychomotor level through communication skills.

The effectiveness of teaching material on the affective level was assessed through collaboration skills obtained from group discussion activities. Each group conducted a discussion with the guide of each student's worksheets. Discussions were carried out through social media platforms between members of each group. Then the discussion process was documented and sent via e-mail. The results are presented in Table 6.

Table 6. Analysis of the effectiveness analysis of news-based teaching material on the affective level

Aspect	A 1	A 2	A 3	Average	Description
Average	81	82	84	82	Effective
The highest score	88	100	100	95	
Lowest value	0	0	0	0	
Number of Students	36	36	36	36	
The number of students who achieved the MCC	34	34	34	34	
% Number of Students Score $\geq$ MCC	94	94	94	94	Effective

The effectiveness of teaching material on the psychomotor level through collaboration skills showed that 94% of students fulfilled the MCC, which means that classical completeness was achieved. Collaboration skills were part of the affective assessment and, in this study, included aspects of responsibility and cooperation. Collaboration skills assessment techniques were carried out by students' peer assessments (assessments between friends). As stated in the High School Assessment Guide, Ministry of Education and Culture (2017), peer assessment (assessment between friends) employs students to assess each other's behavior. Assessment between friends can encourage student objectivity, empathy, appreciation of diversity and differences, and self-reflection. Assessment between friends can provide information to teachers about student behavior.

The analysis of the effectiveness of teaching material at the affective level through collaboration showed that the average score of collaboration I (A1) was 81, and the average value of collaboration II (A2) was 82. The

average value of collaboration III was 84, and the average of the three was 82. The highest average score was 95, and the lowest average score was 0. The number of students who met the MCC was 34, so the percentage of students who met the MCC was 94%.

News-based teaching material consists of 5 learning stages: circle of knowledge, reading to meaning, compare and contrast, double entry, and synectic, which requires each student to collaborate, have group discussions, and complete assigned tasks. Exist at every stage; each stage of learning included discussion activities between group members so that there was a process of interaction between students to exchange knowledge, ideas, and information, analyze and process information, trying to complete the task. Interaction between students will foster a sense of responsibility and cooperation to solve problems and complete assignments.

The teaching material was equipped with worksheets with the syntax of learning activities consisting of 5 stages: circle of knowledge, reading to meaning, compare and contrast, double entry, and synectic. When students worked on worksheets, they went through all stages. At the circle of knowledge stage, students and their groups carried out activities of reading and analyzing news about the biodiversity of Mount Ungaran in news-based teaching material with the principle of 5W + 1H. In the reading-to-meaning stage, students explored the meaning of the news, followed by taking the core of the news (cutting news). In compare and contrast stage, students identified the facts and opinions in the news. In the double-entry stage, students took one fact in the news, then made a work such as a poem, slogan, or poster. At the synectic stage, students must present or present their work or assignments.

In presentation I, students presented the results of discussions on a worksheet I about biodiversity and expressed their poetry. In presentation II, students presented the results of discussions on worksheet ii about threats to biodiversity and expressed a quote. In presentation III, students presented the results of discussions on worksheets III about efforts to conserve biodiversity and expressed a quote and a poster according to the theme in the worksheets. With this presentation activity, students tried to present the results of their discussion and work as best as possible.

Student activities in learning during the

presentation include: (1) one group presented a video presentation, and another group observed the performance of the presenter group, (2) after the presentation ended, several question sessions were opened, (3) some students asked questions suggestions and criticisms of the appearance of the presenters' group, (4) the presenters' group provided answers to questions, suggestions, and criticisms, (5) closing the presentation and discussion activities.

Akcay *et al.* (2017) stated that popular daily newspapers and magazines could be used as a source of information, questions, new topics, and problems for teaching and learning science in schools. Bharucha (2017) said that newspapers could describe the application of science and local issues and develop scientific literacy. Scientifically literate people are not only learners in school but are lifelong learners.

It is supported by the research of Dewi *et al.* (2020), which stated that collaboration skills are the ability to exchange ideas and feelings between students, can increase learning motivation, activeness, and understanding of the material being studied. Redhana (2019) said that the collaboration of several people or units is vital because one person cannot produce a superior product. It requires collaboration from various parties. Muiz *et al.* (2019) stated that collaborative learning helps students develop psychological and social relations, trains cooperation and responsibility, and improves problem-solving skills.

The analysis showed that the percentage of classical mastery of collaboration skills was 94%. It means it has met the minimum percentage of classical mastery determined by the school, i.e., $\geq$ 85%. Thus it can be concluded that the news-based teaching material on Mount Ungaran biodiversity was effectively used at the affective level through collaboration skills

CONCLUSION

Based on data analysis and discussion, the news-based teaching material on Mount Ungaran biodiversity was valid and suitable to use based on the expert validity, pretest, and student and teacher responses. Also, the teaching material effectively improved the students' cognitive, psychomotor, and affective abilities. This research only mapped the biodiversity material of high school class X. Future research could be performed to develop source supplements similar to learning with broader biology material. This teaching material could be used in other high schools with characteristics equivalent to the high school where this research was conducted.

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