The Development of Liveworksheets-Based Electronic Student Worksheets (E-LKPD) to Improve Science Learning Outcomes

Nabeella Rachma Tika Ghaisani[1*], Novi Setyasto[1]

[1] Elementary School Teacher Education, Faculty of Education, Semarang State University, Indonesia

Abstract: The lack of use of Student Worksheets (known with LKPD) at SDN Demaan has an impact on student learning outcomes. This research is Research and Development which refers to the Borg and Gall model. This study aims to develop and test the feasibility, practicality, and effectiveness of liveworksheet-based E-LKPD. The population in this study amounted to 30 with 8 small-scale test subjects in VB class students and 22 large-scale test subjects in VA class SD Negeri Demaan. Data collection techniques used test techniques (pretest-posttest) and non-tests in the form of observations, questionnaires, interview results, and document data. The validation results by the material, media, and language expert validators show that the liveworksheet-based E-LKPD has met the valid criteria. Based on the results of the pretest-posttest, it is known that the E-LKPD based on liveworksheets is effective for improving student learning outcomes as indicated by the results of an increase in the average pretest score by 57 to, and 84 during the posttest and the n gain test results obtained <g> gain value of 0 .62 in the medium category. Based on the results of the response questionnaire that was distributed, a very positive response was obtained from teachers and students. From these results, it can be concluded that the E-LKPD based on liveworksheets is effective for improving science learning outcomes and is feasible and practical to use in the learning of class V students at SD Negeri Demaan.

Keywords: E-LKPD; IPA; Learning outcomes; Liveworksheets

Introduction

According to the Law of the Republic of Indonesia Number 20 of 2003 concerning National education, the function is to develop capabilities and shape national character in the context of educating the nation's life with the aim of developing the potential of students. In an effort to improve quality and quality education, the government has carried out curriculum development. In the regulation of the Minister of Education and Culture Number 22 of 2016, the process of implementing learning has been regulated in accordance with the 2013 curriculum, which states that the learning process carried out must be interactive, inspiring, fostering a fun, challenging, motivating students to participate actively and provide ample space. enough for initiative, creativity, and independence in accordance with the

talents, interests, and physical and psychological development of students. One of the learning content contained in the 2013 curriculum is Science.

Kelana & Wardani (2021) pointed out that science learning is not just knowledge acquisition, but a process of discovery that engages students in it. In line with the opinion of Sutrisna & Gusnidar (2022) which states that science is divided into four dimensions, namely scientific attitudes, processes, products, and applications. The purpose of learning science is to understand concepts related to science or the natural environment in order to increase curiosity about events in the natural surroundings and develop process skills to acquire knowledge in solving problems through "doing science" as well as developing insights, attitudes, values and the ability to apply science concepts and skills in everyday life (Kelana & Wardani, 2021).

Elementary science learning not only emphasizes students' science concepts but also emphasizes how students can find and develop these science concepts so that students have a direct learning experience (Dewi & Meilina, 2022).

In terms of implementing science learning, referring to the provisions of Permendikbud No. 22 of 2016 on process standards, natural science in primary schools must conform to the characteristics of students and natural science subjects. In learning, skills are acquired through observing, asking, trying, reasoning, presenting, and creating. The entire content of the material (topics and sub-topics) of subjects derived from skills must encourage students to carry out the process of observation to creation. In addition, in learning it is necessary to use and apply information and communication technology in an integrated, systematic, and effective manner according to the circumstances and conditions to increase the efficiency and effectiveness of learning.

Based on the explanation above, an educator is required to be able to utilize information technology creatively and innovatively in accordance with the situations and conditions of students in learning. The teacher is a determinant in packaging learning so it is very necessary in selecting the use of learning devices (Raupu et al., 2022). This can be done by utilizing technology as a learning tool, such as worksheets, especially in science learning. Natural Science is a science that deals with natural phenomena that occur in everyday life. This requires students to directly prove the events they experience in everyday life through practicum activities.

But in reality, there are still problems at the elementary school level, namely, there are problems in science learning where learning does not work according to the 2013 curriculum, namely Learning that is currently running still tends to be teacher-centered so students tend to be passive and there is no involvement of students in solving or finding learning problems. (Lestari et al., 2021). This occurs because the use of learning tools such as Student Worksheets (known with LKPD) has not been optimally implemented in science learning. Another problem that occurs in science learning is the use of LKPD which is still conventional or in printed form and does not attract students' attention (Kasmini et al., 2021; Nurafriani & Mulyawati, 2023). In addition, the problems that occur in schools are that students still have difficulty understanding science subject matter from textbooks and the LKPDs used by students do not meet the requirements as good and quality LKPDs because teachers only buy LKPDs from publishers so LKPDs have not been developed

according to characteristics of students (Amali & Kurniawati, 2019; Pawestri & Zulfiati, 2020).

The researchers at SD Negeri Demaan also found the above-mentioned problems in the V class. Based on observations, researchers found that teachers usually invite students to do simple experiments without using worksheets but directly evaluate students orally or using worksheets that come from student books. This makes only a few students actively involved in learning. The LKPD used is still conventional and there are no work instructions so it can confuse students in participating in learning activities. Students still tend to memorize science material without finding the science concept independently. Even though Science learning does not only emphasize science concepts to be memorized but places more emphasis on students so that they practice finding a concept creatively and are able to associate the concept with everyday life. Wi-Fi facilities and LCD projectors in schools are underutilized in the learning process. From the results of the questionnaire, it is known that most of the students already have personal cellphones and they often use them but have not maximized them for learning. The lack of utilization of learning tools such as LKPD makes students less active. Based on some of these problems, it has an impact on student learning outcomes. There are students whose grades are below the Minimum Completeness Criteria (Known with KKM) that has been determined in science learning. The results of the data recap of students' scores at SDN Demaan were known from 22 students, there were 16 students (73%) had not fulfilled the KKM and 6 students (27%) had fulfilled the KKM with the specified KKM being 70.

In carrying out learning the use of interesting LKPD has a very important function. LKPD is one of the teaching materials that play an important role in giving assignments that are in accordance with the material being taught, learning will be easier if equipped with learning tools in the form of specially designed LKPD (Rahayu, Ladamay, Wiyono, et al., 2021). In line with research conducted Husni (2020) revealed that the use of teaching materials in the form of LKPD can reduce the teacher-centered paradigm to become student-centered so that students will be more active in carrying out learning. Usually, LKPD can be found in printed form, but researchers will develop LKPD in digital form known as electronic LKPD or shortened to E-LKPD. Puspitasari (2019) explains that E-LKPD is teaching material that is presented in electronic form and contains information supplemented with pictures, videos, and animations intended for students so as to facilitate the implementation of interactive learning and its operation can be seen using mobile phones, laptops or computers. The advantage of developing E-LKPD is that in the

design of Electronic LKPD, you can insert animated videos, stories or text, and pictures, that you can also combine harmonious colors so that it doesn't bore children, besides that, it can be used individually or in groups (Kholifahtus et al., 2022; Rahayu et al., 2021). Based on this description, e-LKPD is a teaching material that can motivate students to understand learning in a more fun and practical way.

The development of this E-LKPD will use the help of liveworksheets. Liveworksheets is a platform in the form of a website that provides services for educators to be able to use or create interactive electronic worksheets that are used online (Fauzi et al., 2021; Prastika & Masniladevi, 2021). The advantages of liveworksheets are that on this website there are various types of questions that can be made such as multiple choice, ticking, connecting, listening-speaking, and drop-down so that they can motivate students to be passionate about working on them, while for teachers liveworksheets can save time and paper. In addition, the results of student work scores will automatically appear on student worksheets (Hariyati & Rachmadyanti, 2022; Nurbayani et al., 2021). From this description, liveworksheets is a website provided for educators to innovate to make and create worksheets that are interactive and interesting for student learning which can be accessed online. By using the help of liveworksheets in making LKPD, teachers are able to make the appearance and design of LKPD more attractive with pictures and videos in it so that students will be more enthusiastic about learning. This e-LKPD contains material about science content. The use of student worksheets in science learning is very important because science discusses natural phenomena systematically based on the results of experiments and observations made by humans (Kristyowati, 2018; Rahayu, Ladamay, Ulfatin, et al., 2021). In accordance with the nature of natural science, namely products, processes, attitudes, and technology. So, in science learning it is not possible for students to only gain knowledge (products), but students must be actively involved in learning such as finding knowledge, proving this knowledge through an experiment, and concluding it.

Based on research conducted by Nida et al (2023) stated that the E-LKPD design that was developed was very suitable for students because there were attractive colors and pictures. In addition, the developed E-LKPD can also make it easier for students and increase students' interest in learning because E-LKPD can be used anytime and anywhere easily by students. Research on the development of other E-LKPDs was conducted by Wati et al. (2021) with their research entitled "Development of Newton's Law-Based Interactive E-LKPDs Mobile Learning Using

Liveworksheets in High Schools" which explained that e-LKPDs can make the learning process practical, and has a potential impact on learning outcomes in the cognitive domain and learning motivation of students. LKPD development can be used as an alternative use of media in student learning. This LKPD has the advantage that it is more efficient because it does not need to use paper, and is more effective because it can contain various types of exercises such as drag and drop, join with arrows, multiple choice, essays, and learning videos, so students don't feel bored in participating in learning. (Rahayu et al., 2021; Widiyani & Pramudiani, 2021).

Based on this background, the researchers conducted a study to develop a real-time worksheet-based E-LKPD to enhance students' learning outcomes about object shape changes in the course content of V SD Negeri Demaan's natural sciences. The purpose of this research and development is to test the feasibility, practicality and effectiveness of the product being developed. The development of this E-LKPD can make it easier for students because it can be accessed anytime and anywhere. This E-LKPD contains material from various sources, both written, video, and audio. The development of this E-LKPD will later be inserted with experimental activities and video experiments that can be observed by students before conducting experiments.

Method

This type of research is Research & Development (R&D) research which will produce an e-LKPD based on liveworksheets to improve science learning outcomes on changes in the shape of objects in class V SD Negeri Demaan. In research and development of E-LKPD based on liveworksheets, researchers apply development according to the procedure developed by Sugiyono (2019), which consists of 10 steps, but researchers only limit it to step 8, namely trial use due to time and cost constraints. So, the steps in this study are: (1) potential and problems; (2) data or information collection; (3) product design; (4) design validation; (5) design revisions; (6) product trials; (7) product revisions; (8) trial usage. The research scheme can be seen in Figure 1.
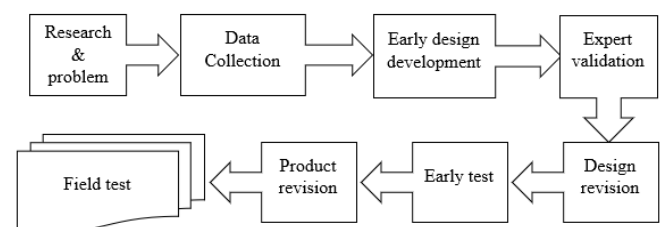
Figure 1. Modified from Borg & Gall Model

The potential and problem stages are carried out to find out the potential and problems that exist in schools by conducting interviews, observations, and document data in the form of learning outcomes of class V students at SD Negeri Demaan. The next stage is to collect data and information to plan products to be developed to overcome the problems found by distributing questionnaires to the needs of teachers and students. After analyzing the data through a need questionnaire, the next researcher carried out several product design activities in terms of design, materials, and language. The product design is adjusted according to the Basic competencies (known with KD) and the target to be achieved, that is, the content of the change of the V class science class material in KD 3.7. Analyze the effect of heat on changes in temperature and the shape of objects in everyday life. After designing the product, design validation is carried out to expert validators who are competent in their fields, in this case, media experts, material experts, and language experts by filling out the validation sheet prepared by the researcher in the form of a Likert scale.

The next stage is design revision, the product that has been assessed by the expert validator is then revised based on the input provided by the expert validator so that the product is ready to be tested. After the product was revised, the product was then tested on students on a small scale, namely in class VB, which consisted of 8 students using a purposive sampling technique based on different levels of cognitive abilities. In the product trial stage, learning was carried out using the liveworksheet-based E-LKPD and after carrying out the learning the teacher and students were asked to fill out a response questionnaire on the use of the liveworksheet-based E-LKPD. From the results of the teacher and student response questionnaires, it is analyzed, and if there is input it can be used as material for product revisions that have been tried out. The last stage is trial use where the product that has been developed is tested on a larger scale. The researcher conducted a trial of its use in the VA class for the 2022/2023 school year with a total of 22 students to determine the effectiveness of the product developed based on the learning outcomes obtained by the students.

The type of data used in this study is primary data. Primary data is data obtained directly when conducting research, in this case, namely qualitative and quantitative data. Qualitative data in this study were obtained from observations, questionnaires and teacher interviews conducted at Demaan Elementary School. The quantitative data in this study were obtained from the learning outcomes of fifth-grade students at SDN Demaan in the science content as well as the results of the pretest and post-test assessments.

The research design used was a pre-experimental design with a one-group pretest-posttest design model, that is, there was a pretest before being given treatment and a posttest after the study. The aim is to find out more certain treatment results because it can compare conditions before and after being given treatment (Sugiyono, 2019). Data collection techniques used test and non-test techniques, test techniques in the form of multiple-choice questions of 30 questions, and non-test techniques in the form of observation, questionnaires, interview results, and document data. To determine the feasibility of the product being developed, data analysis was carried out in the form of assessments from material, media, and language expert validators using a Likert scale. To find out the practicality of the product, a student and teacher response questionnaire was used after using the product developed on the Guttman scale. Then to find out the effectiveness of the product, data analysis was carried out in the form of a gain test based on the pretest and posttest values of students in large-scale trials.

Result and Discussion

Potential and Problems

Based on the results of the pre-research, several problems were found that the learning devices used by teachers still did not take advantage of technology such as the use of LCD projectors, WiFi facilities, and cellphones and laptops. In the experimental activities, the LKPD given by the teacher was still conventional and there were no work instructions which made students' confused in participating in learning activities. In addition, there are still many science learning outcomes in class V students who have not met the Minimum Completeness Criteria (KKM) where the KKM is set at 70 while out of a total of 22 students, only 6 students (27%) whose grades meet the KKM while the rest are totaling 16 students (73%) the value did not meet the KKM.

Initial Data Collection

The data collection was carried out by the researcher, namely using a questionnaire distributing the needs of teachers and students for the desired learning device. Based on the results of data collection, it is known that in the teacher's and student's books the material contained is not extensive. In learning the teacher has used learning media but it has not been optimal so that it has not attracted attention and motivated student learning. Teaching materials available in schools are not sufficient material needs. Teachers need additional learning tools to add to students' insights about material changes in the shape of

objects. It is necessary to develop learning tools in the form of attractive printed worksheets with color selection, use of images, and inserting videos to increase student interest in learning.

Teachers need technology-based LKPDs that use mobile media, namely liveworksheet-based E-LKPD with material that is appropriate to the student's environment and the language used in the E-LKPD is concise and clear so students will easily understand the material presented. The teacher provides input to provide more practice than theory so that students' understanding of the material lasts longer. Students need interesting learning devices. Students agree that learning uses liveworksheet-based electronic worksheets using mobile phones during learning. The material in the LKPD is accompanied by a video to increase students' understanding. Students agree that evaluation questions on LKPD are made in various forms such as multiple choice, short answering, matching and crossword puzzles.

Product Design

The E-LKPD is designed in accordance with KD and indicators to be achieved. The E-LKPD was developed with a concept consisting of writing, audio, video, and pictures according to student characteristics so that they can be easily understood by students. E-LKPD is made by preparing materials and creating designs through the Canva application. Material and design results will be entered into liveworksheets to be edited again regarding the addition of audio, video, and answer keys for evaluation questions. The final product will be stored on the web and can be shared with students via a link, so it requires an internet network to use it. The E-LKPD sections consist of:

Figure 4. KD, indicator, and learning goals

Figure 5. Material presentasion
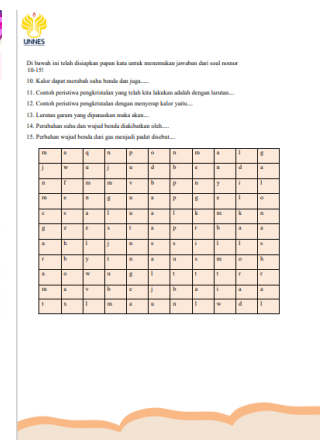

Figure 6. Experiment activities

Figure 7. Summary sheet

Figure 2. Cover

Figure 3. Instructions

Figure 8. Evaluation

The steps in designing a product include (1) preparation of materials, formats and layouts for customized material designs; (2) product design creation; (3) application of liveworksheets in making E-LKPD.

Feasibility of Liveworksheets Based E-LKPD Products
Design Validation

At this stage the researcher will carry out product validation to competent media expert validators, namely lecturers in the educational technology study program, material experts, namely science subject lecturers in the elementary school teacher education study program, and linguists, namely lecturers in the Indonesian language and literature education study program. to test the feasibility of the product. After being assessed by the validator, there will be input related to the product that the researcher has developed so that the researcher can revise the product being developed.

Table 1. Results of Expert Validator Assessment of E-LKPD based on Liveworksheets

Eligibility Aspect	Validation Index (%)	Information
Appereence	100	Valid
Content	87	Valid
Language	81	Valid

Table 1 shows that the validation results provided by the validator have valid results because they obtain a value above 80% which is included in the very feasible criteria (Arikunto, 2018). E-LKPD based on liveworksheets is declared valid in its entire content or material, display or media, and language and is ready to be tested. this is in line with research by Dewi & Meilina (2022) that the validation results of the E-LKPD development from the design expert team obtained a score of 84% and the materials expert team obtained a score of 85% in the very feasible category. This shows that the LKPD products developed are feasible and can be used as additional alternative teaching materials in the science learning process in elementary schools. In another study conducted by Purwaningrum & Leksono (2022) that the results of validation from the development of digital-based LKPD carried out obtained a score of 92.6% from media experts and a score of 92% from material experts so that the LKPD was declared fit for testing with revision conditions.

Design Revision

Researchers revised the design according to suggestions from media, material, and language experts. The advice given by the media expert validator is in the form of completing the cover with an academic identity, adjusting the choice of font color with the background,

and setting the media so that it can be accessed full screen. The advice given by the material expert validator is in the form of adjusting the assessment questions and adjusting the questions to the learning objectives as well as adjusting the arrangement of the material so that the display is not too dense. The suggestion given by the language verifier is to adjust the writing of the thesaurus according to the material verifier, that is, to improve the rules of sentence editing.

Figure 9. Cover before revision

Figure 10. Cover after revision

Figure 11. Instructions before revision

Figure 12. Instructions after revision

Figure 13. Arrangement of teaching material before revision

Figure 14. Arrangement of teaching material after revision

Figure 15. Before revision

Figure 16. After revision

Figure 17. Innapropriate use of image

Figure 18. Image change
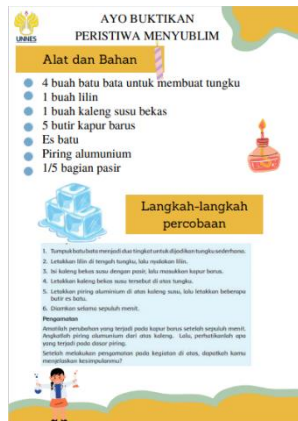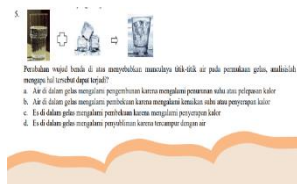

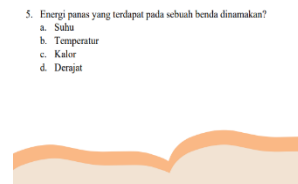**Figure 19.** Question are not accordance with the goals learning

Figure 20. Question according with the goals learning

Practicality of E-LKPD Based on Livework Sheets (Product Trials)

In this trial, there were 8 VB class students with heterogeneous selection based on the ability level of students, namely 2 students with low scores, 2 students with moderate scores, and 2 students with high scores. After the students have done the learning, the students and the teacher are given a response sheet that contains 14 questions with a Guttman scale which must be filled in based on their experience using the product that has been developed by the researcher. The questionnaire has assessment criteria: (1) Assessment with very positive criteria if the value is 76% -10%, (2) Positive criteria if the value is 51% -75%; (3) Negative criteria if the value is 26% -50%; (4) Criteria are very negative if the value is 0% -25%. Calculations to measure the percentage of teacher response questionnaire answers are as follows (Formula 1).

$$NP = \frac{R}{SM} \times 100\% \qquad (1)$$

To test the practicality of the E-LKPD based on liveworksheets, a questionnaire was distributed to the responses of teachers and students which had 3 aspects, that is content or material, media quality, and language which were then divided into 7 indicators, namely accuracy, completeness, suitability, interest, appearance, usability, and the use of language in the product being developed.

Table 2. Results of Teacher and Student Responses to Liveworksheets-based E-LKPD

Respondent	Evaluation	Information
Teacher	100%	Very positive
Student	100%	Very positive

Table 2 shows that the results of teacher and student responses to the liveworksheet-based E-LKPD have very positive results because they obtain scores above 75%. So that the E-LKPD based on liveworksheets can be practically used in learning activities. The E-LKPD based on liveworksheets was stated to be very positive and practical based on 14 questions on a Guttman scale. Because all questions received a score of 1, there were no product revisions in the small-scale trial.

Table 3. Results of Teacher and Student Responses to Liveworksheets-based E-LKPD

Respondent	Evaluation	Information
Teacher	100%	Very positive
Student	94%	Very positive

Table 3 shows that the results of teacher and student responses to the liveworksheet-based E-LKPD have very positive results because they obtain scores above 75%. The E-LKPD based on liveworksheets was stated very positively based on 14 questions. Because almost all questions received a score of 1, it shows that the liveworksheet-based E-LKPD received a very positive response. This is in accordance with the research that has been conducted which explains that the teacher and student response questionnaires to the developed E-LKPD obtain results above 70% so that it shows very positive results, which means that the E-LKPD is practical for use in learning (Asmaryadi et al., 2022; Pada & Larutan, 2021; Yuniati et al., 2022).

The Effectiveness of Liveworksheets Based E-LKPD Products Usage Trial

Large-scale trials using liveworksheets-based E-LKPD on natural science lesson material on changes in the shape of objects to determine the effectiveness of products based on student learning outcomes. The design used was a pre-experimental design with a one-group pretest-posttest design model, that is, there was a

pretest before being given treatment and a posttest after the study.

Table 4. Students' Pretest and Posttest Results in the Usage Trial

Test type	Average	Average difference
Pretest	57.81	26.32
Posttest	84.13	

Based on Table 4 it is known that the average student learning outcomes show an increase of 26.32 in large-scale product trials. The data shows that there are differences in the learning outcomes of students regarding the content of science lesson material for changes in the shape of objects in the VA SDN Demaan class, there are differences before and after using the E-LKPD based on liveworksheets. To find out the criteria for increasing the pretest and posttest averages, an N-gain analysis was carried out by comparing the difference between the SMI and the pretest.

Table 5. Average Test Results (N-gain)

Average difference	N-gain	Criteria
26.6	0.62	Medium

Based on Table 5 it is known that the average difference is 26.6 in large-scale product trials. This shows that the value of the VA class students at SDN Demaan experienced an average increase of 0.62 and is included in the medium criteria. This increase in average indicates that the use of liveworksheet-based E-LKPD used in the natural sciences lesson material on changes in the shape of objects in the VA class of Demaan Elementary School has succeeded in increasing student learning outcomes. This is in line with research conducted by Sari & Suryanti (2022) which shows that the developed LKPD can improve learning outcomes in class V material for changing the shape of objects at SDN Sambikerep 2 Surabaya with an N-gain score in the "high" category.

The application of E-LKPD in improving learning outcomes has also been proven by Amalia et al. (2022). Based on the research conducted, it was found that there was an increase in student learning outcomes after using the liveworksheet-based E-LKPD in the "high" category. This shows that liveworksheet-based E-LKPD is feasible and effective to be applied in learning because it can improve student learning outcomes.

Conclusion

Based on the results of the research that has been done, it can be concluded that the E-LKPD based on liveworksheets can improve the science learning outcomes of class V SDN Demaan in material changes in the form of objects. This is evidenced by the results of the product validation assessment obtained an average of 89.3% in the very feasible category. Data analysis on students' pretest and posttest scores increased with an average difference of 26.6 and an N-gain of 0.62 which is included in the medium criteria. This proves that the E-LKPD based on liveworksheets is feasible, practical, and effective for improving the learning outcomes of fifth-grade students in the natural sciences subject matter of changes in the shape of objects.

Author Contributions
Nabeella contributes to conducting research, developing products, analyzing data, and writing articles. Novi Setyasto as a supervisor in research activities to article writing.

Conflicts of Interest
The author declares that he has no conflict of interest.

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