STUDY ON CRITICAL THINKING SKILLS BASIC PROSPECTIVE STUDENTS PRIMARY SCHOOL TEACHER

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Abstract

The purpose of this research is (1) identify and explain the categories of student teachers think the level of primary school; (2) illustrate and describe the critical thinking skills teacher candidates; (3) illustrate and describe the basic mathematical problem-solving skills. This type of research is a mixed research methods and the sample is limited (total) 39 teacher candidates (students) Study Program Elementary School 1st semester of academic year 2016/2017. The data collection is done by observation, questionnaires, interviews, and tests. Data were analyzed descriptively persentatif. Conclusions obtained (1) the level of critical thinking students are mostly located in the moderate category level thinking. and a small portion at the level of thinking both categories on problem solving systems of linear equations and linear inequality.

Keywords: critical thinking, math problems.

1.INTRODUCTION

1.1 Background of the Study

Education formal education is one of the important and major part in accelerating the process of improving the quality of teacher resources. Primary School Teacher Education as an educational institution in particular will produce teachers in primary schools. In the hands of these teachers learners gain basic knowledge that will initiate and underlying processes berkehidupan skills (life skills) in a society that will be developed later. The quality of education attainment in the context of the intellectual life of the nation, and the development of character, among others, the cultural aspects of scientific thinking, critical thinking, creativity, and independence work.

Citing what was proposed by Jacob and Sam (2008) which defines 4 stages of critical thinking process below, namely:

1. Strategy, which is the stage at which students are thinking openly in solving problems.
2. Clarification, which is a stage in which students define problems correctly and clearly so easy to understand;
3. Asessmen, the stage in which students find questions are important and need to be solved within the given problem;
4. Inference, which is the stage in which students make conclusions based on the information and solutions that have been done.

Paul (2008) said that "critical thinking is that mode of thinking-about any subject, content, or problem - the which the thinker improves the quality of his or her thinking by skillfully taking intellectual standards and imposing up on them". Based on the above quote, critical thinking is the direct action done alone, self-discipline, monitor yourself, and think that corrected itself.

Mc.Peck (1981) states critical thinking is specific. Mc.Peck definition of critical thinking is "critical thinking is specific to a particular discipline, and that it depends on a thorough knowledge and understanding of the content and epistemology of the discipline". According to critical thinking can not be taught freely in a particular subject field. Mc.Peck stressed the importance of the principles and critical thinking skills that are subject-specific, which means that the principle applied only to the particular discipline. According Mc.Peck beroikir process that includes critical is inductive generalizing the principle of critical thinking on the contents and structure of the disciplines.

Siegel (1990) emphasize the concept of a strong relationship between critical thinking rationality. Siegel defines critical thinking as "critical thinking means to be 'appropriately moved by reasons', and to be rational is to believe and act on the basis of reasons". In this view, critical thinking is based on the thought, at least in principle neutral, consistency, ill-handedness and lack of honesty. Siegel conception about maintain critical thinking

assessment component of reasoning (reason assessment component) and the components of a critical attitude (critical attitude component). Critical thinkers who have reasoning assessment component must be able to assess their skills in reasoning and justifying beliefs, claims and acts appropriately. Critical thinker must have a good understanding, the ability to use the principle of the subject - specific and subject-neutral (logical) influential in assessing reasoning.
Maintain critical thinking assessment component of reasoning (reason assessment component) and the components of a critical attitude (critical attitude component). Critical thinkers who have reasoning assessment component must be able to assess their skills in reasoning and justifying beliefs, claims and acts appropriately. Critical thinker must have a good understanding, the ability to use the principle of the subject - specific and subject-neutral (logical) influential in assessing reasoning.

The purpose of critical thinking is based on morals. Critical thinking of someone just for the developing world more baik.Berdasarkan five main views about critical thinking above, Mason (2008) suggests there are three important aspects of critical thinking, namely (1) the critical reasoning skills (such as the ability to assess a proper reasoning), (2) characters, namely (a) a critical attitude (skepticism, a tendency to ask questions probe) and a commitment to express those attitudes, and (b) the orientation of moral motivating critical thinking, (3) substantial knowledge in specific areas, namely (a) the concept of critical thinking (a sufficient condition and a necessary condition), and (b) certain discipline, where one is able to think critically. Critical Thinking Skills in mathematics Wood, Williams, & Mc.Neal (2006) defines mathematical thinking as a mental activity that involves the abstraction and generalization of mathematical ideas.

Furthermore, Williams in 2000 to make the hierarchy of cognitive activity of students who describe mathematical thinking when solving mathematical problems. Hierarchy begins with understanding (comprehending), applying (applying), analysis (analyzing), analyzing synthetic (synthetic analyzing), analyze-evaluation (Evaluate-analyzing), synthesizing (synthesizing), and evaluating (evaluating) (Williams, 2003) , High-level thinking in mathematical thinking can be seen with the following characteristics.

1. Understanding (comprehending) is a process to identify the context of abstract or recognize the procedure to be applied in a new context. According to Wood, Williams, & Mc Neal (2006) cognitive activity at this level is to understand the concepts included in strategies / ideas that have been learned / known.
2. Apply (applying) is applying something abstract in the context of known, implement procedures that have been studied previously. According to Wood, Williams, & Mc Neal (2006) cognitive activity at this level is to apply mathematical ideas in strategic thinking.
3. Analyze (analyzing) is applying something abstract in a new context, build on the ideas that have been known to solve the problem rather complicated, recognize the need for

more information. According to Wood, Williams, & Mc.Neal (2006) cognitive activity at this level is to apply a mathematical procedure known in a new context, resolving non-routine, Themselves familiarize with the problems using a special numerical examples, and systematization of the results of numerical and seek pattern.

4. Analyze-synthetic (synthetic analyzing) is looking for a relationship between two different ways of completion the which has the same purpose, works in reverse, using more than one way of solving, explaining that more information needs when there are only a number of Provided information to solve the problem. According to Wood, Williams, & Mc. Neal (2006) cognitive activity at this level is to extinguishing and compare the two methods of settlement; connecting diverse representations, operations and Assumptions; using more than one way to solve the problem; produces generalizations that are independent (small invention); analysis of the case / establish the principle that Gives instructions to establish new rules.
5. Analyze evaluation (Evaluate analyzing) is seeing the results of a variety of different perspectives to assess the reasoning In These results. According to Wood, Williams, & Mc. Neal (2006) cognitive activity at this level is to connect the settlement with the aim of identifying strengths and weaknesses of the argument, using the ideas together to make a decision, Evaluate Whether the methods / results Obtained reasoned and efficient
6. synthesize (synthesizing) the process of integrating abstract things to develop in-depth understanding of new mathematical, combining the concept of creating the original concept. According to Wood, Williams, & Mc. Neal (2006) cognitive activity at this level is to formulate mathematical arguments to explain the pattern found, explore issues from multiple perspectives rather than just focus on the completion of specific, incorporating concepts to create mind / new ideas, and explore issues to develop a deeper understanding of new sustainably.
7. Evaluate (evaluating) is to check the consistency of the findings, finding limits the approach and get to know other Contexts to implement new ideas. Think high level (higher order thinking) makes learners to interpret, analyze or even Able to manipulate the information in advance so as not monotonous. According to Krulik & Rudnick in Siswono (2009) that, in general, thinking skills levels consists of four items, namely: memorization (recall thinking),

In Ennis (1996), critical thinking is grounded and reflective thinking with an emphasis on making decisions about what to believe or do. Critical thinking indicators derived from

critical activity according to Ennis there are five, namely (1) is able to formulate the problem issues; (2) be able to uncover the facts needed to solve a problem; (3) able to pick an argument

Then Ennis (2011) states that there are 12 indicators of critical thinking skills that are summarized in five stages as follows. 1. Clarification basic (basic clarification) This stage is divided into three indicators: (1) to formulate the question, (2) analyzing arguments, and (3) ask and answer questions. 2. Give reasons for a decision (the bases for the decision). This stage is divided into two indicators: (1) assess the credibility of sources of information and (2) observe and assess reports on the results of observation. 3. Summing (inference). This stage consists of three indicators (1) preparing and assessing deduction, (2) make the induction and assess induction, and (3) evaluate. 4. Further clarification (advanced clarification). This stage is divided into two indicators: (1) define and assess the definition and (2) identifying assumptions. 5. Alleged and integration (supposition and integration). This stage is divided into two indicators (1) suspect, and (2) blends. Table 2 illustrates the ability to think as mentioned above.

Yildirim and Ozkahraman (2011) defines that critical thinking: critical thinking is the process of searching, Obtaining, evaluating analyzing, syntesizing and conceptualizing information as a guide for developing one's thinking with self-awareness, and the ability to use this information by adding creativity and taking risks. Problem solving ability is a general purpose math learning. View of problem solving as the core process and major in mathematics curriculum means that the learning process and prioritize problem solving strategies do students in solving a mathematical problem.

The existence of a problem generally encourage students to be able to solve the problem immediately, but do not know directly how to solve them. Solving the problem is very important and requires a high level of thinking, but can actually be learned. Nugent and Vitale in Fahim & Pezeshki (2012) describes in problem solving involves identifying issues, exploring alternative solutions, implement alternatives or solutions chosen, and bring about a result as that conclusion.

Polya (1981) states "problem solving is a skill that can be taught and learned". Problem solving is a skill that is taught and learned bias. Polya (1981) developed a four-step problem-solving is understanding the problem or issue (understand the problem), plan your troubleshooting (make a plan), implementing plans solving (carry out a plan), and recheck the breakdown (look back at the completed solution). By using these steps to solve the problem by Polya students are expected to more coherent and structured in solving mathematical problems. The idea of the problem-solving measures formulated by some experts that John Dewey, George Polya, and Krulik & Rudnick. Carson (2007) describes the steps in solving problems according to some experts are presented in Table 1 below.

Table 1 Comparison in Troubleshooting

STEP IN PROBLEM SOLVING	John Dewey (1933)	George Polya (1988)	Krulik and Rudnick (1980)
	Confront Problem	Understanding the problem	Read
	Diagnose or Define Problem	Divising a plan	Explore
	Inventory Several Solutions	Carring out the plan	Select a Strategy
	Test Consequences	Looking back	Solve review and extend

Table 2 Comparison in Troubleshooting

No.	indikator	Sub indikator
1	Formulate questions	• Formulate the problem • Formulate criteria for consider the answers • Condition of thinking
2	Analyze argument	• Conclusion • Sentences question • Sentences is not the question • Handle an inaccuracy • Structure of an argument • Summary
3	Asking and answering question	• Statement • Facts
4	Assessing credibility resources consider membership	• Attractiveness of the conflict • Suitability of resources • Use appropriate procedures • Risk to reputation • Give reasons
5	Observations and assess reports the results of observations	• Bit allegations • Short time between observation and report • Result of observation • Result of observation • Evidence right • Good access • Technology • Result of observation
6	Make deduction and assess deduction	• Cycle logic Euler • Logic • Interpretation

7	Make induction and assess the induction	• Common • Conclusions and hypothesis • Mengemukakan hypothesis • Experiment • Conclusions fit the facts • onclusions from the investiga
8	Evaluate	• determine the outcome of consideration based on the background facts • determine the outcome of consideration based on the result • determine the outcome of consideration based on the application of the facts • determine the outcome of consideration
9	Defining and assessing the definition	• form definition • Strategi make definitions • to provide further explanation • handle unrighteousness intentional • definition contents
10	Identify assumption	• not question • argument
11	Guess	• reasons and other assumptions
12	integrate	• inclination and ability in make decisionWhen students critical thinking in math, they make decisions

Because conditions and based on the research targets just as the exploratory study of 12 indicators of previous researchers chose only 6 (six) and is deemed sufficient to describe the purpose of this research. There fore indicators in Table 3 below were used in the study.

Table 3. Indicators Critical Thinking Ability of Mathematics

NO.	INDICATORS	SUB INDICATORS
1 .	formulate questions	• Identify or formulating the problem. • Asking and answering questions • Determine facts
2.	Observe and assess reports	• observation using evidence / correct
3.	Make induction and assess induction	• observation using evidence / facts right

4.	further explanation Blending.	• Drawing conclusions fit the facts
5.	Blending..	• Integrate tendency troubleshooting.
6	Make conclusions	• ability to make decisions /conclusion of the whole process problem solving

Based on the study of theory about the category-level thinking above the researchers determine which categories of levels of thinking to critical thinking is the category-level critical thinking 0 (KTBK 0), the category-level critical thinking 1 (KTBK 1), category-level critical thinking 2 (KTBK 2), and critical thinking level category 3 (KTBK 3). The elements in each KTBK namely: the category of lowest-level thinking (KTBK 0) is memorization skills (recall thinking). Level 1 is thought KTBK basic skills (basic thinking) includes an understanding of concepts such as the concept of addition, subtraction and so included in the application questions. High-level thinking skills category is the ability to think critically (KTBK KTBK 2 and 3). unssur elements in this category by Ennis (1993) that is capable of: (1) formulating the problem issues; (2) reveal facts; (3) select a logical argument; (4) detecting bias with different viewpoints; (5) draw conclusions.

Under the provisions of the generated criteria used by the notation / designations on data analysis as follows.

1). KTBK 0, no appropriate answers to critical thinking indicators according to the Ennis (memorization skills).

2) KTBK 1, the answer according to two or three indicators of critical thinking by Ennis meiputi basic skills (basic thinking) such as understanding the concept of addition, subtraction and so on, including the application.

3). KTBK 2, the answer according to four indicators of critical thinking according to Ennis.

4). KTBK 3, the answer according to five-six indicators of critical thinking.

According to the National Council Teaching in Mathematics (2000) one of the core standards of learning mathematics is learning to solve the problem. Ifamuya & Ajilogba (2012) suggests that solving problems related to the effort required in achieving a goal or finding a solution when there is no existing direct settlement. One general problem-solving model is developed by Bransford was quoted as saying by Wena (2009) as a step-by-step problem-solving and learning strategies are: (1) Identify the problem; (2) Defining the problem; (3) Looking for a solution; (4) Assess and evaluate the influence.

1.2. Problem Formulation

Based on the experience of researchers for this teaching, students having difficulty mastering linear programming material correctly. The material is one of the topics in the course of Elementary Mathematics. Critical thinking and should have looked into their activities each lecture. After graduation exam conducted stretch at 30-45 percent that can pass both categories on the subjects mentioned above. Another phenomenon also appears when the midterm and final college students lack the confidence to solve problems, conduct cheat,

bringing record-small, ask for the answer key of a friend when the exam, less able to use the available time to the right during the exam, the least among students can do all the questions during the exam. On the basis of this phenomenon, penelitianya question is How is the category-level critical thinking new students who start college especially student teachers in primary schools in the course of basic math?. Categorization of critical thinking adapted to the theory that dijelakskan Ennis before.
The problem needs to be known early to determine the direction and achievement of learning prospective elementary school teachers so that policies related to the quality of graduates can be set.

2. RESEARCH METHODS

2.1 Type and Research Subjects

According to the research questions of this type of research is qualitative descriptive study describe His category of critical thinking of students studied. The subject of this research is the first semester students of academic year 2016/2017 were as many as 39 students of the first semester considerations used in selecting the study subjects were college students have been able to communicate his idea and meet the criteria of the process of critical thinking in solving mathematical problems.

According to Lofland cited by Moleong (2014) in the main data source is a qualitative research interviews, tests, and additional data such as documents. Data and sources of data in this research is a problem-solving test data on progaman linear, interview data and observation. Written tests and interviews were conducted with the aim to get valid data. If there is consistency between the written test and interview data obtained is valid. Data validation techniques used triangulation method. Data analysis technique conducted by: (1) data by categories the level of critical thinking (KTBK) based on indicators of critical thinking in Ennis; (2) analyze each KTBK based four-step problem-solving Polya; (3) analyze the factors which influence the process of critical thinking of students studied.

2.2 Research Instruments

The research instruments include interviews and tests solving linear programming problems. Two questions given to students to work on the validated content is suitable for lectures, and consulted with the validator lecturers are on the course. Validation is directed to the suitability of the instrument with a story about the two problems, mathematical context, syllabus, and the context of the mathematical language used.
An assessment of the matter of the two questions given using the following criteria: (1) matter not pose a double interpretation, (2) matter can be proved, (3) the limitation of the problem is clear, and (4) the formulation of questions using interrogative sentence. Assessment of the language of the given problem, using the following criteria: (1) use the language in accordance with the rules of good and true, (2) formulation of the problem using words known student, (3) the formulation of the question communicative, (4) the formulation of the problem use the correct sentence.
Interviews guided by a structured interview guide researchers. However, guidelines or a list of questions is not standard, meaning that it can change according to the circumstances at the time of the interview. This interview guideline only serves as a guide and may change according to the current state of implementation of the interview. Because the question taught not fixed but can be developed at the time the interview was conducted.

2.3. Data Analysis

Data from the study can be said to be valid if there is a comparison or triangulation performed on the data obtained. The validity of the data need to be known so that the conclusions obtained are not biased. According Maleong, triangulation is a technique that utilizes data validity checking something else outside these data for the purpose of checking or as a comparison against the data.

Denzim forward four kinds of triangulation, which consists of:
1). Triangulation with resources

Triangulation by triangulation by comparing source and check again trust the information obtained through time and different tools

2). Triangulation method

In using the triangulation method, there are two strategies, namely checking the degree of confidence in the results of several techniques of data collection and checking of the degree of confidence multiple data sources using the same method.

3). Triangulation with investigator

Investigator triangulation triangulation is done by utilizing other researchers to check the degree of confidence of the data.

4). Triangulation with the theory

Triangulation with the theory of triangulation conducted by that certain factors can not be checked the degree of confidence with one or more theories. In this study, researchers used a technique authenticity of data by using traingulasi with primary sources is done by comparing data from interviews with critical thinking test result data While the category of critical thinking of students studied and analyzed by matrix indicator on thinking categories as shown in Table 4 below.

Table 4. Matrix KTBK and indicators of levels of thinking student

Indicators Category Level Critical Thinking (KTBK)	KTBK 3 (Very Critikal)	KTBK 2 (critical)	KTBK 1 (Self-Critical)	KTBK 0 (Not Critical)
1. Formulate a question	√	√	√	√
2. Perform observations and assess reports	√	√	√	√
3. Make the induction and assess induction	√	√	√	-

4. Defining and assessing definition	√	√	√	-
5. Integrating / generalization.	√	√	-	-
6. Make conclusions	√	√	-	-

3. RESULTS AND DISCUSSION

3.1. The results of analysis based on each indicator

Results of the test of critical thinking to the 39 students who obtained through about 1 given system of linear equations. Six indicators were observed determined weighting score of 1.5 per indicator, so the maximum score of 6 indicators x 1.5 = 9. (score one question). If the first indicator of all students answered correctly by the total scores: 39 x 1.5 = 58.5. The test results show among 39 students obtained 34 (87.17%) students were in either category to formulate the question, 23 students (58.97%) are in the category of pretty and, 10 students (25.64%) are in the category of less , Recap of data on the implementation of the scientific study obtained data shown in Table 5 below.

Table 5. Data Recap Implementation of Learning Critical Thinking Ability of Mathematics (N = 39 students).

Indicators	N (correct answer)	Total Score	average	value Category
formulate questions	34 (87,17%)	51	87,18	good
Observe and assess reports	30 (76,92 %)	45	76,92	good
Make induction and assessinduction	26 (66,67%)	39	66,67	enough
Defining and assessing definition	22(56,41 %)	33	56,41	enough
Blending.	18(46,15 %)	27	46,15	Less
make conclusions	16 (41,02 %)	24	41,03	less
Average		36,50	62,39	enough

Table 6. Data Recap Implementation of Learning Critical Thinking Ability of Mathematics (N = 39 students)

Indicators	N (correct answer)	Score	Total	Value Category
formulate questions	33	49,50	84,62	good
Observe and assess reports	27	40,50	69,23	Enough
Make induction and assess induction	16	24	41,03	less
Defining and assessing definition	18	27	46,15	less
Blending	12	18	30,77	less
make conclusions	9	13,5	23,08	less
Average		28,75	49,15	less

Analysis of test results using the provisions KTBK on solving the problem number 1 is obtained results in Table 7.

Table 7. Results KTBK students based on tests

PROBLEM 1.

KTBK	Many students	Presentation (%)
KTBK 0	0	0
KTBK 1	24	61,54
KTBK 2	12	30, 77
KTBK 3	3	7,69

The results of the calculations in Table 7 shows that the levels of critical thinking, students tend to be in critical thinking level 1 or KTBK 1. There was no student with KTBK 0. This means that students have been able to in the above categories KTBK TBK 1 0 Students with as many as 24 or 61 , 54 percent. With KTBK 1 meets the criteria of two or three indicators of critical thinking by Ennis is to formulate the problem issues, uncovering the facts, or to detect bias.

Students with KTBK 2 as many as 12 students with a percentage of 30.77%. Students with KTBK 2 meet the criteria of the four indicators of critical thinking by Ennis is to formulate the problem issues, uncovering the facts, choosing a logical argument, and detecting bias. Students with KTBK 2 consists Students with KTBK 3 3 or 7.69%. This group meets all the

criteria according Ennis indicators of critical thinking is to formulate the problem issues, uncovering the facts, choosing a logical argument, detect bias, integrate and draw conclusions on the problem being solved.

Analysis of test results using the provisions KTBK on solving the problem number 2 is obtained results in Table 8.

Table 8. Results KTBK students based on tests
PROBLEM 2.

KTBK	Many students	Presentation (%)
KTBK 0	0	0
KTBK 1	28	71,79
KTBK 2	9	23,17
KTBK 3	2	5,14

The results of the calculations in Table 8 shows that the levels of critical thinking of students tend to be in critical thinking level 1 or KTBK 1. There was no student with KTBK 0. This means that students have been able to in the above categories KTBK TBK 1 0 Students with as many as 28 or 71, 79 percent. With KTBK 1 meets the criteria of two or three indicators of critical thinking by Ennis trpenuhi is to formulate the problem issues, uncovering the facts, or to detect bias.
Students with KTBK 2 as much as 9 students with a percentage of 23.17%. Students with KTBK 2 meet the criteria of the four indicators of critical thinking by Ennis is to formulate the problem issues, uncovering the facts, choosing a logical argument, and detecting bias. Students with KTBK 3 consists of students with KTBK 3

4. DISCUSSION

Activity mengidentifiksi formulate problems and they always start although less understanding. This is done to test in solving mathematical intuition. A project to identify and formulate problems conducted to determine the initial problem solving and working steps based on the theory / formula-owned, while the activity obsesrvasi and assess the report carried out to determine the fundamental elements on the problems encountered

Therefore, to improve the quality and quantity indksi and definitions in mathematics learning need to do activities that can increase students' cognitive abilities, such as conducting exploration, elaboration, and confirmation or doing constructivist learning problem to be solved. Integrating activities and make conclusions is an activity that most difficult students do well despite the student category. These activities run well when students have to have a comprehensive ability of mathematical knowledge, so that they are able to review an issue from many sides. While membut conclusion can be implemented when the student has to have the ability to assess the job right or wrong and have good verbal communication skills. Therefore, in the learning of mathematics students also need to be given the opportunity and trained to convey ideas, through presentations in class.

Results of research on students who have implemented learning mathematics missouri project showed that only a portion of the indicator has been executed. Activity formulate problems,

observation, induction, define sufficiently the attention of students in mathematics, although not always done. So the thing to do is to make math learning can encourage these activities are always carried four students, especially when students conduct critical thinking for problem solving. Whereas, to integrate activities and make conclusions from troubleshooting though also frequently carried out students, but the quality is still limited. Students in this category still feel less confident when they do two such activity. It is highly influenced by the cognitive abilities that have been owned by the students.

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Results of research on students with the category of "less" on all indicators show that the implementation of the critical thinking skills of mathematics shows that the low quantity and quality. Almost all activities menerpakan all six components of critical thinking been difficult to apply the student. The procedures performed is still a lot to have a clear direction. The initial step to end sometimes they do, but do not pay attention to the sequence expected They had trouble solving problems due to cognitive abilities (mathematical knowledge) are extremely limited.
According to Hacker and Dunlosky (in Ghasempour, 2013), the teacher should ask questions in turn contributed to the development of thought and critical thinking skills. Ann Brown (in the Darling-Hammondl, 2003) describes three road-directed learning of mathematics, namely: (1) planning approaches to the task, including identifying problems, selecting strategies, organize thoughts and predict the outcome; (2) monitor the activity during learning, through testing (testing), revise (revising), and evaluate the effectiveness of the strategies used; and (3) Checking the results, melaluai reevaluate the results by specific criteria on the efficiency and effectiveness.

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