Effect of Six Hats Thinking Technique on Development of Critical Thinking Disposition and Problem Solving Skills of Nursing Students

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Abstract

Background: Six Thinking hats is a time-tested, proven, and practical thinking tool that acts as a role-playing model. It is as a team-based problem solving and brain storming technique that can be used to explore problems and solutions and uncover ideas and options that overlooked by a homogeneously thinking group. On the same line, it separates the components of thinking in order to do them properly as there is no one brain ideal for all types of thinking. Also, it provides a framework to help people think clearly and thoroughly and directs thinking attention in one direction at a time. Edward de Bono identified 6 types of one-dimensional personalities or Thinking Hats, while the average person will often imbue qualities from several of these 6 types. Participants put on hats in turn to indicate directions of thinking, possibly more than once but not necessarily all of them, the color of each is related to a function. Method: exploratory descriptive design was used with two tools used in data collection” California Critical Thinking Disposition Inventory” and “Six Hats problem solving Application questionnaire”.

Results: There were statistical significant differences between both groups of students in relation to critical thinking disposition and problem solving skills in post assessment phase in the favor of study group (p < .001). Conclusion: In the current study, the six hats technique was used in training of nurse students to improve their critical thinking disposition and the skills of problem solving, which facilitates productive critical thinking, collaboration, communication, creativity and enables each person's unique point of view to be considered in problem solving

Keywords: six hats, critical thinking disposition, problem solving skills

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1. Introduction

Many people think from analytical, critical, logical perspectives, and rarely view the world from emotional, intuitive, creative, or even purposely negative viewpoints. As a result, their arguments do not make leaps of imagination, they underestimate resistance to change, or they fail to draw contingency plans. Critical thinking is reasoning that offers new ways of looking at problems coming at them from the side rather than from the front to foster change, creativity, and innovation. One tool of lateral thinking, the Six Thinking Hats technique, was devised by de Bono in 1985 to give groups means to reflect together more effectively by six hats with six colors. It is suggested that chemical settings in the brain may be different when we are being creative, being positive, and being negative. [1,2,3]

Six Thinking hats is a time-tested, proven, and practical thinking tool that acts as a role-playing model. It is as a team-based problem solving and brain storming technique that can be used to explore problems and solutions and uncover ideas and options that overlooked by a homogeneously thinking group. On the same line, it separates the components of thinking in order to do them properly as there is no one brain ideal for all types of thinking. Also, it provides a framework to help people think clearly and thoroughly and directs thinking attention in one direction at a time. Also, it facilitates productive, critical thinking, collaboration, communication, and creativity and enables each person's unique point of view to be considered and assign each member of the team a different, one-dimensional “Thinking Hat” for the duration of the problem solving or brainstorming session. [4,5,6]

Edward de Bono identified 6 types of one-dimensional personalities or Thinking Hats, while the average person will often imbue qualities from several of these 6 types. Participants put on hats in turn to indicate directions of thinking, possibly more than once but not necessarily all of them, the color of each is related to a function; as white hat is concerned with analytical and objective thinking, with an emphasis on facts and feasibility, it focuses on the data available, looks at the available information then see what is needed information and finally look for gaps in knowledge and fill them. Red hat is concerned with
emotional thinking, subjective feelings, perception, and opinion, it looks at problems using intuition, gut reaction, and emotion, try to think how other people will react emotionally and understand the responses of them. While, blue hat is concerned with structured thinking, high-level overview of the situation which is the big picture and see everything from a distance. [5,6,7]

Black hat is concerned with critical, speculative, skeptical thinking, focused on risks, identifying problems in a pessimist looking to see it cautiously and defensively and highlights the weak points and fatal flaws in a plan to eliminate them before embarking on a course of action Yellow hat is the optimistic viewpoint that helps to see all the benefits, values of the decision and give the best-case scenario and positive outlook on things and expecting the best outcome. Finally, green hat which concerned with creative, associative thinking, new ideas, brainstorming ideas out of the box without concern for feasibility, it is a freewheeling way of thinking, in which there is little criticism of ideas.[6,7,8]

Critical thinking organization defined critical thinking as "the mode of thinking about any subject, content, or problem in which the thinker improves the quality of his or her thinking by skillfully analyzing, assessing, and reconstructing it. Critical thinking has many skills include cognitive and affective skills. Cognitive skills include many skills as; interpretation in which accurately interpreting problems from common information source while analysis is examining ideas in problems and subjective data. Also there is inference that includes queering claims, assessing arguments and reaching conclusions, as well as explanation which include; clearly explaining and defending the reasoning in which an individual arrives at specific decisions. Finally, evaluation which includes evaluating information to ascertain it is probable trustworthiness or not. [9,10,11]

On the same vein, there are affective skills which include; open- mindedness as having an appreciation of alternate perspectives and willingness to respect others point of view, inquisitive include; curious and enthusiastic in wanting to acquire knowledge, wanting to know how thing work. Also there is truth seeking that include; courageous about asking questions to obtain the best knowledge even if knowledge may fail to support one's preconception, while systemic; include valuing organization and a have focused approach to problems of all levels of complexity and finally self-confident which include trusting one's own reasoning and inclination to utilize these skills. [12,13]

On the other vein, there are critical thinking disposition which is an attribute or habit of mind that is integrated into one's beliefs or actions to effectively solve problems and make decisions as a product of thinking. Also it is personal disposition or habit that influences a decision or the ability to control one in order to resolve problems related to professional situations. Critical thinking disposition is the spirit of criticality or the tendency to think critically that has the characteristics of inward curiosity, the sharpness of the mind, the perseverance of developing reason, and the need for reliable information. So, it will encourage someone to apply the competence of critical thinking in every aspect of life. [14,15,16]

There are three basic components of critical thinking disposition which are willingness, sensitivity, and ability. Teacher should help learners to build their own knowledge through inquiry processes, both independently and mentally, in order to perform these processes, they require the willingness, sensitivity, and ability to solve the problems encountered, thus thinking critically as a skill component of lifelong learning can be done well. Critical thinking disposition has specific seven indicators: truth-seeking, open mindedness, analyticity, systematicity, self-confidence, inquisitiveness, and maturity. The seven indicators map out cognitive skills and tendency to behave. In this connection, the critical thinking disposition reflects a person's attitude toward a critical thinking skill. A person with a critical predisposition will show high curiosity, intellectual enthusiasm, dedicated to suggesting an action, desperate for important information, and having a tendency to use critical thinking skills compared to individuals with low critical thinking tendencies. [17,18]

Problem solving is a process consists of understanding the problem, then devising a plan, carrying out the plan and finally looking back for evaluation. Problem solving has specific process which includes firstly, assessment of the problem to identify its existence then collect data and organize it. Secondly, analysis to identify the problem, its dimensions, aspects, related factors, causes, possible solutions and the priority of it. Thirdly, outcome identification as having a clear concise destination and direct correction by identifying the desired and undesired outcomes and possible strategies. Fourthly, planning by selection the alternatives that have best chance of success and least undesirable outcomes, then the pre-final is implementation of the selected solution or alternative. Finally, the evaluation of the problem solution if it successful or not and compare it with the desired outcomes, it is positive and negative aspects and the percentage of success. [16,17,18,19]

1.1. The Aim of the Study

Is to determine effect of six hats thinking technique on development of critical thinking disposition and problem solving skills of nursing students

1.2. Research Hypotheses

H1: Students who are subjected to six hats technique exhibit higher critical thinking disposition than those who do not.

H2: Students who are subjected to six hats technique exhibit higher problem solving skills than those who do not.

2. Materials and Method

2.1. Materials

Research design; A quasi experimental research design was used to conduct this study. 

Settings; this study was carried out at Nursing Education Department, Faculty of Nursing- Alexandria University.
Subjects: The subject of this study comprised 180 nursing students out of 300 undergraduate nursing students who were registered in "Educational strategies in Nursing course" during the first semester of the academic year (2019-2020). The subjects were assigned randomly into two equal groups; study and control, 90 students for each.

Tools: Two tools were used for data collection

Tool one: California Critical Thinking Disposition Inventory (CCTDI)

This tool was developed by Facione and Facione 1992 [20, 21, 22] to assess the critical care nurse students' critical thinking disposition. It consists of 75 items which were answered using a four point likert scale range from strongly agree to strongly disagree. The items divided into seven subscales: truth-seeking (12 items), open-mindedness (12 items), analytical (11 items), systematic (11 items), inquisitiveness (10 items), self-confidence (nine items) and maturity (10 items). The tool had eight scores: the seven subscale score and the overall score. The subscale score ranged from 10 to 60 which intercorrelated as following: from 60 to 51 had strong positive disposition, from 50 to 41 has positive disposition, from 40 to 31 had ambivalence disposition, from 30 to lower had negative disposition. The overall score of the tool ranged from 70 to 420 which interpreted as following: from 420 to 350 had strong positive disposition, from 349 to 280 had positive disposition, from 279 to 211 had ambivalence disposition, from 210 or less had negative disposition. The total scores were converted to scale score using CCTDI standardized table. The tool's reliability was calculated using Cronbach's Alpha test, it was reliable and the test coefficient value was 0.84.

Tool two: Six Hats problem solving Application questionnaire.

This tool was developed by the researcher after thorough review of the related literature [23, 24] to assess the nursing students' six hats problem solving skills. It consisted of 10 situations about using six hats technique during conduction a teaching session for patients. The total score was 45 grades which were interpreted as following: from 45 to 31 had high skills level, from 30 to 16 had moderate skill level and from 15 to less had low skills level. The higher the score the higher the students' six hats problem solving skills. The tool's reliability was calculated using Cronbach's Alpha test, it was reliable and the test coefficient value was 0.745.

2.2. Method

Official permission to conduct the study was obtained from the Dean of the Faculty of Nursing; Alexandria University, and the Head of Nursing Education department after explaining the aim of the study. Written informed consent was obtained from each nursing education student after explanation of the study's aim and assurance about the privacy, anonymity and confidentiality of the obtained data. The right to refuse to participate in the study was affirmed to nursing education students.

Tools' content validity was tested by a jury of five experts in the related fields and the necessary modifications were done. Tools I, and II were tested for their reliability and the tools were reliable. A pilot study was carried out on 10% of the sample size to ascertain the clarity and applicability of the tools and identify difficulties that may face the researcher during data collection.

The students were allocated randomly as: Study group; it comprised 90 nursing education students who received six hats thinking technique training during the Educational strategies course lecture. Control group: it comprised 90 nursing education students who received the traditional Educational strategies lecture. Data collection was carried out by the researchers during the first semester of the academic year 2019-2020 starting from September 2019 to January 2020.

2.3. Data Collection

The study tools were used twice; the first time as a pretest before the application of six hats training and the second time as a posttest after the application. The development of the six hats training program of critically care problem was done by the researchers. It was carried out through three phases: preparation, implementation and evaluation phase.

1. The preparatory phase: In this phase the researchers tried to find a real meaning to the new concept through adequate preparation of the researchers and content

a. Researcher preparation

- Reading the available evidences about six hats thinking technique either recent or old until the time of data collection from books, digital libraries and websites including the national and international researches related to the topic.
- Self-training on the six hats thinking technique

b. Content preparation

- The researchers developed six hats training program on Educational strategies course module.

2. The Implementation phase: In this phase the researcher performed pretest for both the study and control groups using the two tools to assess the Educational strategies nurse students' critical thinking disposition and problem solving skills. The application of the six hats training program took about 4 sessions in 4 weeks, 1 session/week; each session lasted for about 120 minutes (the time of the original lecture). It started in the first semester of the second academic year of the faculty of nursing 2019-2020. The training program was based on the integration between the six hats technique and Educational strategies nursing module.

3. The Evaluation phase: In this phase the researchers assessed the Educational strategies nursing students in both the study and control groups to evaluate their critical thinking disposition and problem solving skills using the two study tools at the end of the sessions.

2.4. Statistical Analysis

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp) Qualitative data were described using number and percent. Quantitative data were described using mean, standard deviation. Significance of the obtained results was judged at the 5% level.
Table 1. Distribution of the studied groups according to their demographic data

| Demographic data | Control group (n=90) | Study group (n=90) | Test of significance |
|------------------|----------------------|-------------------|----------------------|
|                  | No. | %   | No. | %   | X² = ------- | P = ------- |
| Age (years)      |     |     |     |     |             |            |
| 20               | 36  | 40.0| 36  | 40.0|             |            |
| 21               | 54  | 60.0| 54  | 60.0|             |            |
| Sex              |     |     |     |     | X² = ------- | P = ------- |
| Male             | 45  | 50.0| 45  | 50.0|             |            |
| Female           | 45  | 50.0| 45  | 50.0|             |            |
| GPA              |     |     |     |     | X² = 5.733  | P = 0.454  |
| A                | 10  | 11.1| 10  | 11.1|             |            |
| B+               | 39  | 43.3| 34  | 37.8|             |            |
| B                | 19  | 21.1| 20  | 22.2|             |            |
| B-               | 0   | 0.0 | 1   | 1.1 |             |            |
| C+               | 3   | 3.3 | 8   | 8.9 |             |            |
| C                | 19  | 21.1| 19  | 21.1|             |            |
| Computer skills  |     |     |     |     | X² = 0.955  | P = 0.954  |
| Excellent        | 3   | 3.3 | 3   | 3.3 |             |            |
| Very good        | 50  | 55.6| 52  | 57.8|             |            |
| Good             | 37  | 41.1| 35  | 38.9|             |            |
| English language skills |     |     |     |     | X² = 1.827  | P = 0.401  |
| Excellent        | 20  | 22.2| 13  | 14.4|             |            |
| Very good        | 34  | 37.8| 38  | 42.2|             |            |
| Good             | 36  | 40.0| 39  | 43.3|             |            |

Table 2. Comparison between the studied students according to their critical thinking disposition dimensions

| Items           | Study Group (n=90) | Control Group (n=90) | Test of Significance |
|-----------------|--------------------|----------------------|----------------------|
|                 | Before             | After                | Before              | After               | t² = Paired t test, tª = Student t test comparison between study and control group before intervention, tβ = Student t test comparison between study and control group after intervention |
|                 | Mean ±SD           | Mean ±SD             | Mean ±SD            | Mean ±SD            | t= Paired t test, tª = Student t test comparison between study and control group before intervention, tβ = Student t test comparison between study and control group after intervention |
| Truth seeking   | 39.59±6.148        | 54.41±3.795          | 38.84±6.541         | 38.94±6.473         | t²= 0.793, P= 0.429 |
| t= 21.85 P= 0.000* | t= 1.001 P= 0.320 |                     | t²= 19.56 P= 0.000* |
| Open-mindness   | 30.50±12.41        | 51.83±4.741          | 30.34±12.35         | 29.68±11.22         | t²= 0.087, P= 0.931 |
| t= 14.25 P= 0.000* | t= 2.164 P= 0.033* |                     | t²= 17.25 P= 0.000* |
| Analyticity     | 30.41±10.49        | 52.38±4.415          | 30.89±11.05         | 30.66±10.78         | t²= 0.299, P= 0.765 |
| t= 17.95 P= 0.000* | t= 1.000 P= 0.320 |                     | t²= 17.66 P= 0.000* |
| Self confidence  | 25.17±9.526        | 52.83±4.672          | 24.83±8.635         | 26.14±8.479         | t²= 0.251, P= 0.802 |
| t= 23.88 P= 0.000* | t= 3.708 P= 0.000* |                     | t²= 26.15 P= 0.000* |
| Maturity        | 30.36±8.757        | 51.82±4.969          | 30.33±8.750         | 30.33±8.750         | t²= 0.023, P= 0.982 |
| t= 19.25 P= 0.000* | t= ------ P= ------ |                     | t²= ------ P= ------ |
| Inquisitiveness | 34.53±10.81        | 50.18±6.994          | 34.12±10.60         | 34.12±10.60         | t²= 0.257, P= 0.798 |
| t= 11.24 P= 0.000* | t= ------ P= ------ |                     | t²= 11.99 P= 0.000* |
| Systematicity   | 29.77±9.670        | 50.08±6.158          | 29.77±9.643         | 29.93±9.583         | t²= ------ P= ------ |
| t= 16.25 P= 0.000* | t= 1.382 P= 0.170 |                     | t²= 16.78 P= 0.000* |
| Total critical thinking skills | 229.79±36.54 | 363.53±14.52 | 228.60±36.17 | 229.28±37.14 | t²= ------ P= ------ |
| t= 32.81 P= 0.000* | t= 1.348 P= 0.181 |                     | t²= 31.94 P= 0.000* |

* Significant p at ≤0.05.

Table 3. Comparison between the studied students according to their six hats problem-solving skills mean scores

| Items           | Study Group (n=90) | Control Group (n=90) | Test of Significance |
|-----------------|--------------------|----------------------|----------------------|
|                 | Before             | After                | Before              | After               | t² = Paired t test, tª = Student t test comparison between study and control group before intervention, tβ = Student t test comparison between study and control group after intervention |
|                 | Mean ±SD           | Mean ±SD             | Mean ±SD            | Mean ±SD            | t²= Paired t test, tª = Student t test comparison between study and control group before intervention, tβ = Student t test comparison between study and control group after intervention |
| 2.14±1.784      | 42.33±4.025        | 0.69±0.990           | 0.69±0.990          |                   |
| t²= 6.742, P= 0.000* | t²= 95.30 P= 0.000* |                     |                     |
| t= 82.87 P= 0.000* | t²= ------ P= ------ |                     |                     |

* Significant p at ≤0.05.
there were statistically significant differences between critical thinking disposition and English level and also between critical thinking disposition and problem solving after application of six hats training where \(p = 0.034*\), 0.000 respectively.

### 4. Discussion

Designing effective teaching does have to involve critical thinking skills so that it is normal that students need to consider it. Thinking critically means that students must judge, and think something carefully in order to evaluate and then finally decide whether something is acceptable or not. Teachers must act as a mentor who will guide students in honing their critical thinking skills using appropriate methods. The number of material students must teach requires the right method to guide them in thinking. Six Thinking Hats is a simple concept but appropriate to be applied in order to help students to think [26]. In this regard, the current study concerned with studying the effect of six hats thinking technique on development of critical thinking disposition and problem solving skills of nursing students.

Generally, developing the creative thinking skills is one of the major goals of modern education and the Six-Hats teaching method is one of the DeBono’s thinking model that aims for enhancing thinking and simplifying it at the same time. Six-Hats teaching method, which will be the major focus of this research-is regarded as one of the best creative thinking model, DeBono believes that this model is a great teaching method for thinking skills, because the students can - by this model-deal with one thing only at the same time, while changing their thinking style [27].

The current study finding reveals that there were a statistically significant difference between study and control groups and within study group before and after application of six hats training where \(p = 0.034*\), 0.000 respectively.

| Table 4. Correlation Matrix of the studied variables among the study group |
|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| **Critical thinking (Pre)**      | **Problem solving (Pre)**         | **Critical thinking (Post)**      | **Problem solving (Post)**        |
| **r**                            | **P**                             | **r**                            | **P**                             |
|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| **Problem solving (Pre)**         | 0.262                             | **Critical thinking (Post)**      | 0.076                             |
| **P**                             | 0.012*                            | **P**                             | 0.478                             |
| **Critical thinking (Post)**      | 0.053*                            | **Problem solving (Post)**        | 0.480                             |
| **P**                             | 0.012*                            | **P**                             | 0.003*                            |

\( r = \) Correlation coefficient \(*\) Significant \(p \leq 0.05\).

| Table 5. Predictors of critical thinking among the study group using regression analysis |
|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| **Critical thinking disposition** | **B**                             | **T**                             | **Sig.**                          |
| **(Constant)**                    | 293.471                           | 4.053                             | 0.000                             |
| **Sex**                           | 5.311                             | 1.630                             | 0.107                             |
| **Age**                           | 0.458                             | 0.144                             | 0.886                             |
| **Computer skills**               | 3.148                             | 1.195                             | 0.235                             |
| **English**                       | 4.857                             | 2.152                             | 0.034*                            |
| **Problem solving skills (after program)** | 1.671                           | 4.013                             | 0.000*                            |

\* Statistically significant at \(p \leq 0.05\).
dimensions of critical thinking disposition and total score. This finding is in line with study done by Ziadat, & Al Ziyadat, 2016 [28] which concluded that there are differences among the groups in favor of the experimental group, indicating the positive impact of the designed Six Hats Training Model and its effect in improving the creative thinking among students. The result of the present study is in full agreement with the outcome research done by Kivunjua, 2015 [29] on using De Bono’s Six Thinking Hats Model to Teach Critical Thinking and Problem Solving Skills Essential for Success in the 21st Century Economy the results reviled that there is significant relation between the six hats and critical thinking abilities. Similarly, Kenny (2003) [30] stated that six thinking hats technique might positively affect critical thinking and the ability to find solutions to the patients’ problems in nursing. Also Mostafa et al (2020) [31] findings revealed that the majority of nursing students agreed that using six hats model helped them produce creative ideas and improved their thinking systems.

On the other hand, a study done by Kalelioglu, & Gülbahar, 2014 [32] based on their quantitative analysis, the study concluded that discussing with different instructional techniques (Six thinking hats, Brainstorming, Role playing, Socratic seminar, anyone here an expert) did not cause any significant difference to critical thinking dispositions. The current study finding revealed that there is statistically significant difference between study and control groups and within study group before and after application of six hats training in the favor of study group after regarding six hats problem solving skills. The finding of the present study is in line with study done by Mostafa et al (2020) [31] Findings which supports that using and working with the six hats model in critical care nursing education is both powerful and easy to use. Additionally, it improves nursing students’ creative thinking skills, sharing their different ideas and thoughts, increased their interest and motivation and made them analyze and synthesize the knowledge they had. Thus, it allows them to solve nursing problems. Similar study done by [33] Chien, 2020 which reviled that participants had a positive attitude toward the technique because participants’ innovation, critical thinking, and problem solving were fostered. Also similar study done by Ku, 2011 [34] which concluded that the six hats thinking inspire the creative thinking and problem solving abilities of nursing students. Also Kenny (2003) [30] stated that six thinking hats technique might positively affect critical thinking and the ability to find solutions to the patients’ problems in nursing.

Also the results of the present study showed statistically significant differences between critical thinking disposition and English level and also between critical thinking disposition and problem solving after application of six hats training. The results are in line with study done by Kaya, Şenyuva, & Bodur, 2017 [35] which stated that the development of critical thinking skill is considered as a high level target in education and it requires a long period of time to develop and high degree of English level. Similar study done by Yang, 2013 [36] to investigate the relationship between the critical thinking disposition and problem solving ability as well as the influencing factors the problem solving ability in nursing students showed that A significant positive correlation was observed between the critical thinking disposition and problem solving ability. From the researchers’ point of view In the light of the present studies and the previous studies which reviled that there is significant relation between critical thinking and the used of six hats thinking , also there is relation between the problem solving and six hats thinking and finally there is a relation between critical thinking disposition and problem solving those relation reflect that there is a relation between critical thinking disposition, problem solving ability after using the six hats strategy.

5. Conclusion

The teaching of problem solving and critical thinking has become essential in nursing education today. Individuals who have critical thinking and problem solving skills feel the requirement to improve themselves and revise what they need learned. Individuals who haven’t gained this skill remain rigid in respect to what was learned and aren't generally creative and constructive. Consequently, there's a requirement to test the utilization of educational models that may teach creative and constructive thinking in nursing education. For these reasons it absolutely was thought that it might be important in this study to share the experiences gained using the ‘six thinking hats’ model in teaching nursing students and investigating its effect on their critical thinking disposition and problem solving. supported the study results the ‘six thinking hats’ model could be a method of learning that not only improved the students’ creative and critical thinking abilities; it also had a major effect on their problem solving abilities. within the future using this method in several areas of nursing education and sharing the results will have a positive effect on teaching. additionally, the system of thinking employed in the method won't only help the individuals in their professional lives but also will help them make the proper decisions in their personal lives.

6. Recommendations

Implement workshops and training courses for teachers to use hat thinking skills. Conduct further studies to measure the level of possession of the Six Hats skill by other subject teachers and to determine the extent of its application for imbalance correction.

Ethical Consideration

Written informed consent was be obtained from all nursing students after explanation of the study aim. confidentiality was assured. participation will be on voluntary basis. The nursing students had the right to withdraw from the study at any time without any penalties.

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