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# Dental Care Flip Model: Dental Health Education to Improve Dental Health Maintenance Behavior of Elementary School Students

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**Abstract: Background: One of the risk factors causing high oral health problems is knowledge, attitudes, and actions. To overcome these problems, media is used as a tool, with the Dental Care Flip model. It is hoped that it will be a solution to facilitate the education process so that it can help elementary school children to improve their knowledge, attitudes, and actions to maintain oral health: Produce a Dental Care Flip model that is feasible and effective in changing the knowledge, attitudes, and actions of primary school children's dental and oral health maintenance Methods: The study used the research and development (R&D) method: to create a feasible model with a research design using quasi-experimental (pre-post with control group design) to determine the effectiveness of the model. The sampling technique used purposive sampling, consisting of 31 intervention group children using the Dental Care Flip model and 31 control group children using flipchart, which was given for 10 days. Data were analyzed using the interclass correlation coefficient test, normality, Wilcoxon, and Mann-Whitney. Results: The Dental Care Flip model is feasible as a model in improving knowledge, attitudes, and oral health maintenance actions of elementary school children with a p-value = 0.000. This model is effective in improving knowledge (p=0.001), attitudes (p=0.000), and actions (p=0.000) compared to the control group Conclusion: The Dental Care Flip model is feasible and effective in improving the knowledge, attitudes, and oral health actions of elementary school children.**

***Keywords:*** *Dental Care Flip Model, Primary School Children, Oral Health.*

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## I. INTRODUCTION

Health development aims to increase public awareness, willingness and ability to achieve optimal health status[1]. Dental health as an integral part of general health has a significant impact on a person's quality of life as teeth play an important role in the process of digestion, speech and maintaining facial shape. Therefore, maintaining dental health from an early age is essential to ensure these functions remain optimal and pain-free which also contributes to general well-being and a better quality of life[2],[3].

According to the FDI World Dental Federation, states that tooth decay is the most common chronic disease experienced by the world community, about 3.5 billion people worldwide experience oral and dental disease. The prevalence of untreated permanent dental caries in individuals over five years of age is estimated to reach 28.7% or around 526 million cases[4]. While data on the prevalence of dental caries in Indonesia reached 89% of Indonesians experiencing dental caries and ranked sixth as a dental and oral disease in Indonesia[5].

In Central Java, although 99% of people already have their own toothbrushes and use toothpaste. However, the prevalence of dental caries is still high at 57%, reflecting the lack of awareness of the importance of oral health care. The main contributing factor is the low frequency and method of brushing teeth where only 5% brush their teeth in the right way and at the right time. In addition, 92% of the population does not utilize dental health services, indicating a lack of awareness and access to professional care. These factors increase the risk of caries complications, necessitating structured educational interventions on dental hygiene habits and utilization of dental health services[6].

From 6-12 years of age, the transition from primary to permanent teeth increases susceptibility to dental health problems. Primary teeth, which serve as a guide for permanent teeth, require good care to prevent decay or infection that can

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affect the development of permanent teeth. If not properly cared for, permanent teeth are at risk of decay even before they are fully erupted, so it is important to maintain the health of primary teeth to prevent negative impacts on permanent teeth in the future[7].

Dental health problems in elementary school children are influenced by improper brushing habits and high consumption of cariogenic foods. As many as 53% of children do not brush their teeth properly and 83% do it at the wrong time such as during morning and afternoon showers. This reduces the effectiveness of tooth cleaning coupled with consumption patterns of sweet and sticky foods such as candy and cookies that encourage the growth of caries-causing microorganisms. As a result, 43% of children have poor oral hygiene which increases the risk of tooth decay[8],[9].

The high prevalence of dental caries, which reaches 79%, is closely related to the consumption of cariogenic foods, of which 59% of children are fond of consuming. Classification of food by microorganisms produces lactic acid which damages tooth enamel, accelerating decay. Children with high sugar intake have a 92% greater risk of caries. Low understanding of the correct technique, frequency and timing of brushing exacerbates this situation, so intensive education and behavior change are needed to reduce caries rates in children[10].

The Ministry of Health has established the National Action Plan for Dental and Oral Health Services Towards a Caries-Free Indonesia 2030, in accordance with WHO recommendations[11]. However, achieving this target faces a big challenge considering the high prevalence rate and low knowledge of oral health maintenance such as how and the frequency of brushing teeth and high consumption patterns of cariogenic foods are the main obstacles. For this reason, more intensive and sustainable educational efforts are needed to increase understanding of the importance of maintaining oral health[10].

A person's awareness in maintaining oral health can be influenced by knowledge, attitudes which are the domain of behavior. Knowledge is mostly obtained through the senses of the eyes and ears. Information captured by the eyes and ears is intended to change attitudes and requires repetition so that the understanding process occurs in individuals. According to Middle Cook, repetition of information can help change attitudes so that children can determine attitudes that can lead to expected actions[12].

Improving dental health requires dental health education to achieve changes in the behavior of individuals, families, and communities in maintaining healthy behavior and environment, and playing an active role in improving health status. In addition, this education aims to form healthy behaviors that include physical, mental, and social aspects, so as to reduce morbidity and mortality rates. According to WHO, the purpose of health counseling is to change the behavior of individuals or communities in the health sector to achieve better conditions[13].

The right strategy to support changes in school children's behavior in maintaining dental health is to provide education using learning methods and adapted media[14]. Media has a significant role in influencing the course of the health education process. as a tool, media facilitates the delivery of material, especially in oral health education. Media that is well designed and involves various senses will make it easier for students to understand and remember information. In addition, the media must be arranged attractively so that it can increase student interest in learning and involvement in the educational process[15].

The appropriate use of methods and media greatly affects the effectiveness of dental health education. In accordance with Dale's Cone of Experience theory, the use of media that can involve many senses provides a richer experience so that information is more easily accepted and remembered. Media is not only a provider of information, but also a means of providing direct experience to students, helping them understand the importance of maintaining oral health in a more in-depth and enjoyable way[16].

Several media have been used in dental health education. One of them is flip chart media. However, this media still has shortcomings, namely that it is static because it only presents information in visual form without any interactive or dynamic elements so that students are more often passive recipients of information. This limitation makes it difficult for students to be actively involved in the learning process, both cognitively, affective, and psychomotor. In addition, conventional flipcharts are not designed to stimulate discussion, critical thinking or hands-on activities that engage students, making them less effective in creating a well-rounded learning experience[17].

To improve the quality of message delivery, a Dental Care Flip model was developed that integrates visual and audio elements to enrich the learning experience. This flipchart not only contains material about oral health maintenance but is also equipped with interactive questions that stimulate students' critical thinking (cognitive), build awareness and positive attitudes (affective), and encourage direct practice such as simulating brushing teeth with audio guidance (psychomotor). It is hoped that this innovation can create more holistic learning and actively involve students so that information about oral health maintenance is easier to understand, remember, and apply in everyday life.

Based on the above background, one of the solutions that will be carried out by the author to overcome the problem of dental health maintenance in elementary school children as well as development innovations from previous media is “Development of a dental care flip model as an effort to improve knowledge, attitudes, and dental health maintenance actions in elementary school students”.

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## II. RESEARCH METHODS AND SAMPLE

The study used the research and development (R&D) method: to create a feasible model with a research design using quasi-experimental (pre-post with control group design) to determine the effectiveness of the model. The sampling technique used purposive sampling, consisting of 31 intervention group children using the Dental Care Flip model and 31 control group children using flipchart, which was given for 10 days. Data were analyzed using the interclass correlation coefficient test, normality, Wilcoxon, and Mann-Whitney.

## III. RESULTS

### A. Univariate Analysis

The research subjects in this pilot phase totaled 62 primary school children in grades 4 and 5, consisting of 31 children from SDN Pedalangan 01 as the control group and 31 children from SDN Pedalangan 02 as the intervention group. An overview of the respondents is presented in the following table:

Tabel 1 Frequency Distribution of Characteristics of Respondents in the Intervention and Control Groups

| No | Variable | Intervention Group | | Control Group | |
|---|---|---|---|---|---|
| | | n | (%) | n | (%) |
| 1 | **Gender** | | | | |
| | Male | 13 | 41,9 | 14 | 45,2 |
| | Female | 18 | 58,1 | 17 | 54,8 |
| 2 | **Age** | | | | |
| | 9 years old | 2 | 6,5 | 3 | 9,7 |
| | 10 years old | 8 | 25,8 | 7 | 22,6 |
| | 11 years old | 15 | 48,4 | 13 | 41,9 |
| | 12 years old | 6 | 19,4 | 8 | 25,8 |

Table 1 shows the frequency distribution data of the characteristics of male subjects in the intervention and control groups, which were 41.9% (13 students) and 45.2% (14 students), respectively, while female respondents in the intervention and control groups were 58.1% (18 students) and 54.8% (17 students), respectively. Based on age, the frequency of respondents aged 9 years in the intervention and control groups was 6.5% (2 students) and 9.7% (3 students), respectively, while respondents aged 10 years in the intervention and control groups accounted for 25.8% (8 students) and 22.6% (7 students), respectively. respondents aged 11 years in the intervention and control groups were 48.4% (15 students) and 41.9% (13 students), respectively, and respondents aged 12 years in the intervention and control groups were 19.4% (6 students) and 25.8% (8 students), respectively.

### B. Bivariate Analysis

A bivariate analysis was conducted to test the differences between two variables using paired and unpaired variable effectiveness tests.

- *Normality Test*

The normality test aims to determine whether the data collected for each variable is normally distributed or not. The normality test in this study uses the Shapiro-Wilk method because the number of samples in this study is less than 50 samples.

Table 2 Normality Test of Data from the Intervention Group and Control Group

| Variable | *p-value | |
|---|---|---|
| | Intervention | Control |
| Pre-Test Knowledge | 0,000 | 0,006 |
| Post Test Knowledge | 0,000 | 0,000 |
| Attitude Pre-Test | 0,068 | 0,000 |
| Post-Test Attitude | 0,000 | 0,001 |
| Pre-Test Actions | 0,004 | 0,000 |
| Post Test Action | 0,000 | 0,000 |

Table 2 shows that most of the normality test results in the intervention and control groups show p-values <0.05, namely in the variables Pre-Test Knowledge, Post-Test Knowledge, Post-Test Attitude, and Pre- and Post-Test Actions, both in the intervention and control groups. Only the Pre-Test Attitude variable in the intervention group showed a normal distribution with a p-value of 0.068 (>0.05). However, based on statistical analysis principles, if one or more variables do not meet the normality assumption, the entire dataset is analyzed using non-parametric statistical tests. Therefore, the effectiveness test is analyzed using the non-parametric Wilcoxon and Mann-Whitney tests.

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➢ *Difference Test (Knowledge, Attitude, and Action)*

Table 3 Test of Differences in Mean ± SD of Children's Knowledge Within and Between Intervention and Control Groups

| Variable | Group | Mean ± SD Pre test | Mean ± SD Post test | Delta ± SD (Δ) | p-value |
|---|---|---|---|---|---|
| **Knowledge** | Intervention | 8,93 ± 0,77 | 12,80 ± 2,53 | 3,87 ± 3,03 | 0,000* |
| | Control | 10,19 ±1,72 | 11,58 ± 1,05<br>p = 0,001** | 1,38 ± 1,89 | 0,002* |

*Paired Test : *Wilcoxon
**Paired t-test : ** Mann Whitney

Table 3 shows that the results of the paired data test of children's knowledge in the intervention group reached a p-value of 0.000 (<0.05), which means that there was a difference in children's knowledge before and after education using the Dental Care Flip model. In the control group, the p-value obtained was 0.002 (<0.05), indicating a difference in children's knowledge before and after education using a flipchart. The results of the unpaired data test showed a p-value of 0.001 (<0.05), indicating that the Dental Care Flip model is more effective in improving children's knowledge compared to the flipchart. This is evidenced by the average change (Δ) in the intervention group being better than that of the flipchart used in the control group, with the intervention group at 3.87 and the control group at 1.38.

Table 4 Test of Differences in Mean ± SD of Children's Attitudes Within and Between Intervention and Control Groups

| Variable | Group | Mean ± SD Pre test | Mean ± SD Post test | Delta ± SD (Δ) | p-value |
|---|---|---|---|---|---|
| **Attitude** | Inttervention | 66,87 ± 3,85 | 73,48± 2,21 | 6,61 ± 4,86 | 0,000* |
| | Control | 67,64 ± 4,66 | 71,48 ± 2,17<br>p = 0,00** | 3,83 ± 5,17 | 0,002* |

Table 4. shows that the results of the paired data test of children's attitudes in the intervention group showed a p-value of 0.000 (<0.05), which means that there was a difference in children's knowledge before and after education using the Dental Care Flip model. In the control group, the p-value obtained was 0.002 (<0.05), indicating a difference in children's knowledge before and after education using a flipchart. The results of the unpaired data test show a p-value of 0.00 (<0.05), indicating that the Dental Care Flip model is more effective in improving children's knowledge compared to the flipchart. This is evidenced by the average change (Δ) in the intervention group being better than that of the flipchart used in the control group, with the intervention group at 6.61 and the control group at 3.83.

Table 5 Test of Differences in Mean ± SD of Children's Actions within and Between Intervention and Control Groups

| Variable | Group | Mean ± SD<br>Pre Test | Mean ± SD<br>Post Test | Delta ± SD (Δ) | P-Value |
|---|---|---|---|---|---|
| **Action** | Intervention | 10,61± 2,52 | 13,54 ± 1,47 | 2,93 ± 2,95 | 0,000* |
| | Control | 11,03 ±1,19 | 12,06 ± 0,67<br>p = 0,00** | 1,03 ± 1,35 | 0,001* |

*Paired test : *Wilcoxon
**Paired t-test : ** Mann Whitney

Table 5 shows that the results of the paired data test of children's attitudes in the intervention group showed a p-value of 0.000 (<0.05), which means that there was a difference in children's knowledge before and after education using the Dental Care Flip model. In the control group, the p-value obtained was 0.01 (<0.05), indicating a difference in children's knowledge before and after education using a flipchart. The results of the unpaired data test show a p-value of 0.00 (<0.05), indicating that the Dental Care Flip model is effective in improving children's knowledge compared to the flipchart. This is evidenced by the average change (Δ) in the intervention group being better than that of the flipchart used in the control group, with the intervention group at 2.93 and the control group at 1.03.

## IV. DISCUSSION

The model was tested on two groups in this study. The intervention group consisted of 31 respondents, and the control group consisted of 31 respondents. The intervention group was given treatment using the Dental Care model, while the control group used flipcharts. The model was applied to both the intervention and control groups to improve oral health maintenance in elementary school children, including knowledge, attitudes, and toothbrushing practices. The provision of materials on oral health is an activity planned through a learning process aimed at imparting knowledge, instilling attitudes, and developing skills in children, so that they can independently perform actions to maintain oral health in their daily lives.

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*A. The Effectiveness of the Dental Care Flip Model on Improving Knowledge of Dental and Oral Health Maintenance in Elementary School Children*

Statistical analysis results and paired tests showed that the average knowledge score before the intervention group treatment was 8.93, increasing to 12.80, with a p-value of 0.000 ($p<0.05$). It can be concluded that the Dental Care Flip model is effective in improving knowledge related to dental and oral health care in elementary school children.

The average change (Δ) in the intervention group was higher at 3.87 compared to the control group, which had an average change (Δ) of 1.38. The results of the unpaired test showed a p-value of 0.00 ($p<0.05$), which means that the Dental Care Flip model is more effective in increasing knowledge related to oral health care than the control group.

Knowledge is the result of human perception of an object through the five senses, which produces a specific response [18]. A person's knowledge is obtained through stimuli that can be provided through education or health education [19]. The increase in knowledge among the intervention group occurred because the Dental Care Flip education model was designed based on the needs of the target audience and presented material that was easy to understand. The content of this model includes information about foods that are good for dental health, foods that can damage teeth, the right time to brush teeth, proper brushing techniques, and the importance of visiting a dentist for check-ups.

The quizzes embedded in this educational model serve as interactive activities that encourage student engagement, thereby increasing their enthusiasm in completing each question given. This statement is in line with Nissa's (2023) findings, which show that interactive, engaging, and easy-to-understand educational media are suitable for use as learning tools. Additionally, the repeated use of media in educational activities has been proven to strengthen participants' understanding of the material presented[20].

Educational delivery that involves more than one sense has been proven to strengthen children's memory and understanding, so that the information conveyed is more profound and lasting. In line with Edgar Dale's Theory, it states that a person's level of understanding of information can increase by 70–90% if learning involves various forms of stimulation or the use of several senses simultaneously, which in turn can improve children's understanding more optimally [16].

The more knowledge a person has, the better their ability to absorb and respond to information, which leads to more positive attitudes and actions. Adequate knowledge is an important factor in promoting healthy behavior, while a lack of knowledge can trigger various dental and oral health problems [21].

Knowledge plays a key role in preventing and overcoming various problems, where one of the influencing factors is the extent to which individuals accept information. Knowledge is also an important part that can shape a person's attitudes and behavior [22]. In a study conducted by Antonio (2024), it was found that good knowledge about oral health, combined with positive habits, has a significant influence and impact on oral health and overall health, thereby improving quality of life.

The use of audio and visual media in the Dental Care Flip model integrates technology that can be accessed and used independently by children. This approach successfully attracts their attention to the information being conveyed and makes children more focused on the material. The media is designed to include elements that have been specifically tailored to the developmental characteristics of elementary school children, thereby supporting a more optimal and effective learning process.

The use of technology that is designed according to children's needs and is interactive allows children to be directly involved in the process of using it, which has been proven to increase attention and participation during the delivery of information. Children's direct involvement in the use of technology-based educational media not only strengthens their focus but also increases cognitive engagement, making the information conveyed easier to understand and remember for a longer period of time[23].

*B. Effectiveness of the Dental Care Flip Model on Improving Oral Health Maintenance Attitudes Among Elementary School Children*

Statistical analysis results and paired tests showed that the average attitude score before the intervention group treatment was 10.61, increasing to 13.54, with a p-value of 0.000 ($p<0.05$). It can be concluded that the Dental Care Flip model is effective in improving attitudes related to dental and oral health care in elementary school children.

The mean change values (Δ) in the intervention group were higher at 2.93, while in the control group, the mean change values (Δ) were 1.03. The results of the unpaired test yielded a p-value of 0.00 ($p<0.05$), indicating that the Dental Care Flip model is more effective in improving attitudes toward oral health maintenance compared to the control group using a flipchart.

A person's attitude arises from the appropriateness of their reaction to a stimulus in daily life, which reflects the compatibility between the individual's perception and the stimulus received. The increase in positive attitudes among students occurred because the knowledge they gained not only broadened their understanding but also fostered a belief in the importance of practicing healthy behaviors in their lives [24].

Behavioral transformation in children is closely related to an increase in knowledge, from ignorance to deep understanding, which forms the foundation for the formation of new attitudes. This understanding influences children's awareness in maintaining optimal dental and oral health. An educational approach that utilizes appropriate educational media to facilitate attitude change can stimulate children's cognitive and affective engagement more effectively in building sustainable healthy living habits [25]

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Providing education through the Dental Care Flip model can improve understanding of a subject so that children understand how to maintain dental health. The understanding formed from this educational process encourages children to internalize information more easily, making them more likely to adopt a positive attitude.

This is in line with the opinion that attitude is a form of individual evaluation of an object or stimulus received. After a person gains an understanding of the stimulus given, the next process is to form an assessment that reflects their attitude towards health knowledge. This shows that health attitudes are also in line with health knowledge. Attitudes towards oral health care are formed after a person learns about brushing their teeth [26].

Knowledge or cognition is a very important domain in shaping a person's overt behavior. Increased knowledge can change perceptions, habits, and form a person's beliefs, which in turn shape attitudes. Behavior based on knowledge, awareness, and positive attitudes will last longer than behavior that is not based on knowledge and awareness [27].

Attitude is an individual's tendency to respond to certain objects, situations, or individuals. These responses contain values that reflect positive or negative views toward the stimuli received. In line with the view that attitude formation is influenced by various factors, such as personal experiences, the significant role of others, cultural values, exposure to information from the media, and moral learning obtained through educational institutions, religion, and an individual's emotional state [28]

Changes in attitudes toward oral health care among elementary school children are the result of efforts to absorb and internalize information, which has a positive impact when repeated using the Dental Care Clip model. The positive values contained in the model can transform negative habits into positive ones.

*C. Effectiveness of the Dental Care Flip Model on Improving Oral Health Maintenance Attitudes Among Elementary School Children*

Statistical analysis results and paired tests showed that the average value of actions before the intervention group treatment was 10.61, increasing to 13.54, with a p-value of 0.000 ($p<0.05$). It can be concluded that the Dental Care Clip model is effective in improving actions related to tooth brushing in elementary school children.

The mean change ($\Delta$) in the intervention group was higher at 2.93, while the control group had a mean change ($\Delta$) of 1.03. The results of the unpaired t-test on the data yielded a p-value of 0.00 ($p<0.05$), indicating that the Dental Care Clip model is more effective in improving toothbrushing-related behaviors compared to the control group using a flipchart.

An action is an act or activity performed by an individual. After a person becomes aware of a stimulus or object related to health, they will then make an assessment or opinion, and the next step is to apply that knowledge and attitude in their daily life. The implementation of what has been learned and believed is called health practice, or more specifically known as overt dental health behavior [29]. This is clarified by the theory of behavioral change proposed by Notoatmodjo (2010), where action or practice is the actual response of an individual to a stimulus or object after going through the stages of knowledge, attitude, and acceptance [26].

A child's ability to brush their teeth correctly does not appear suddenly, but is the result of a learning process that involves increasing knowledge and forming attitudes [30]. Knowledge is acquired through education, whether from teachers, parents, or learning media. Education delivered using appropriate methods can help children understand the importance of maintaining oral hygiene and the correct steps for brushing their teeth [31].

As their knowledge grows, children begin to form positive attitudes toward healthy behaviors, including brushing their teeth regularly and properly. These attitudes will become the basis for children's internal motivation to brush their teeth independently in their daily lives, without always needing to be directed. Brushing teeth is a concrete manifestation or realization of the knowledge and attitudes they have acquired to maintain dental and oral health [29].

The effectiveness of the Dental Care Flip model is effective in improving tooth brushing habits. This effectiveness can be explained through the approach used, namely an interactive, visual, and engaging approach. This educational media is designed not only to convey information, but also to encourage active participation from children through a combination of audio and visual stimuli, both of which play an important role in the learning process.

The Dental Care Flip model utilizes a visual approach, such as pictures or illustrations of the correct steps for brushing teeth, attractive colors, and communicative designs that can be captured directly by the eyes, as well as explanations through audio. Children in elementary school are in a stage of cognitive development where effective learning is facilitated by media that engage more than one sense. For example, visuals that they can see and observe. By looking at images or the sequence of steps for proper tooth brushing, children find it easier to understand and remember the information [32].

In addition, the audio approach used in this model also plays an important role. Information or explanations about the steps for brushing teeth are conveyed through audio recordings on the media. Hearing is one of the most effective channels for receiving information in children, especially when combined with visual stimuli. When the ears and eyes work together to receive information, the understanding process becomes much stronger because it involves the two primary sensory systems [33].

This is supported by previous research that shows the use of learning media that combines audio and visual elements has a significant impact on improving children's toothbrushing skills. Audio media, such as narration or educational sounds, can help children understand the correct steps for brushing their teeth through repetitive and enjoyable listening.

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Meanwhile, visual media such as images, text, or illustrations of proper toothbrushing movements can provide visual stimuli that make it easier for children to imitate and practice the movements accurately [34].

The Dental Care Flip model not only functions as an educational tool, but also as a learning medium that can shape healthy habits through comprehensive visual and audio stimulation. This approach is in line with children's developmental needs and has been proven effective in encouraging real change, namely an increase in children's ability and consistency in brushing their teeth independently and correctly.

## CONCLUSION

The Dental Care Flip model is effective in improving children's knowledge, attitudes, and actions regarding oral health care compared to the control group.

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