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RESEARCH ARTICLE

Development A Virtual Flipped Classroom Learning Model with Active Learning Using Gamification

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ABSTRACT

To develop a virtual flipped classroom learning model with active learning using gamification and to evaluate the virtual flipped classroom learning model with active learning using gamification are objectives in this research. The 10 experts or teachers that have experience and skill for teaching at less 10 years are used to interview in the first phase of the research. In addition, Delphi technique is used to be the tool for up to 3 interviews. In phase 2, the researcher developed a virtual flipped classroom learning model with active learning using gamification which is a learning tool creation using the principles of games to help create learning media that are interesting and make learners enthusiastic to develop or be the winner of each lesson's game. However, this model includes both online lessons and quizzes and is used for self-learning outside of the classroom or after class time only. In the classroom, only the understanding is questioned. In phase 3, the researchers evaluated the effectiveness by testing with two groups of undergraduate students at Rajabhat Bansomdejchaopraya University, divided into 30 students per group. The first group of students used a virtual flipped classroom learning model with active learning using gamification and the second group of students learned from the instructor. The researchers gave both groups of students a pre- and post-test on four topics, 20 questions per topic. From the test results, it was found that the first group of students had higher post-test results than the second group of students in every topic. In addition, if we consider the average scores in all subjects, it was found that the first group of students scored an average of 16.93, while the second group of students scored an average of 12.6. In this regard, if comparing the percentage of average scores in all 4 subjects, it was found that the first group of students had an average score of 84.63 percent, while the second group of students had an average score of 63 percent.

INTRODUCTION

In the 21st century, learning is not limited to the transfer of knowledge from teachers to students, but also emphasizes on promoting skills necessary for living in the modern world, such as critical thinking, problem solving, teamwork, and especially creativity, which is the heart of innovation and progress.

The concept of developing a classroom to foster creativity has been gaining attention since the end of the 20th century. There has been research and development of new teaching methods that emphasize students' participation in inventing, creating, and practicing [1]. Important examples include the concept of the Creative Classroom [2], the design of a flexible learning space, or the use of the STEM/STEAM Education approach that integrates knowledge in science, technology, engineering, art, and mathematics [3-6].

In addition, studies from international organizations such as the OECD or UNESCO indicate that the physical environment, seating arrangements, learning equipment, and classroom culture all have an

impact on promoting students' creativity. Therefore, many countries have started to improve classroom design, such as using movable furniture, group space arrangements, creating zones for individual or small group work, and introducing technology to support creative learning.

In Thailand, the concept of classrooms that emphasize the development of creativity has become widespread over the past two decades, with integration into the basic education curriculum and pilot projects in many schools that emphasize learners' independent thinking and creativity, such as schools in the International Standard Schools Project or schools in the New Basic Education Project. The education in Thailnad 2022 presented the progress and development of Thai education from 2021 to 2022. It covered various topics such as national legislation, policies, strategies, and pland on education; the education system, standard, and quality assurance; educational administration, provision, and participation; important information and statistics on educational accessibility, learning outcomes, teachers, and education personnel; quality development of learning provision; educational budget allocation; and international education in Thailand and international cooperation in education.

During the Covid-19 pandemic when students have to study at home using online learning, different kinds of problems rise impacted student learning motivation. Aside from its benefits in terms of classroom use, efficiency, and flexible learning, the barriers to online learning can affect students' motivation [7]. The online learning quality during the outbreaks of Covid-19 caused the students felt less satisfied than before the Covid-19 pandemic [8]. Based on the observations, students who usually had face to face teaching and learning, lost their motivation while joining the class. The barriers that students faced in online learning include technical factors and teachers. The technical factors are in the forms of not good connectivity, limited internet quota, and other technical errors related to the devices or applications, whereas the teacher factors include lack of teachers' feedback, participation, and monitoring. The examples of students' habits in online learning; when teaching-learning process were conducted online via zoom, almost all of the students turned the camera off and even without any responses to what teacher taught.

From the study of research related to creativity, there is an interesting finding: most learners have lower abilities in the creative thinking process.. Developing technology affects educational activities as it does in many areas of human life. In many parts of the world, educators try and propose new ideas and practices in order to carry out effective teaching activities in line with changing conditions and needs. The flipped classroom model is accepted ans one of the blended learning models [9-10].

Flipped classroom is an technique based on learning the simple and theoretical parts of a subject in out-of-class time with the solve of educational technologies and performing higher-level studies in the classroom [11-12]. The flipped classroom model can be called a reversal of the traditional teaching process because while the traditional understanding is that teachers teach in the classroom and then give homeworks, the flipped classroom model follows the lectures out-of class time. It is based on doging the practices which can be home work in the classroom [13].

From the above, the learning management method that promotes and develops learners to have creative thinking requires teachers to find appropriate techniques, methods, and activities to promote and stimulate learners to have creative thinking. From the study, it was found that active learning is an interesting form of teaching activities. Because the goal of doing activities in active learning is for students to achieve the objectives of high-level thinking or creativity, promoting independent thinking processes, especially analytical thinking, problem solving, and creative thinking. Activities in which students participate in the learning process, such as stimulating students by using questions to think analytically, synthesize, or apply knowledge to solve real-world problems during lectures or assigning individual tasks, small group tasks, or tasks assigned to be done together in the whole class.

In addition to the learning management methods that promote creativity mentioned above, there are also important elements in promoting creativity, such as creating an environment, creating a conducive atmosphere, nurturing methods, and appropriate teaching techniques from home and school that are important to the success of developing students' creativity.

The learning situation in the past has been in the traditional learning format where teachers provide knowledge and experiences to students in a teacher-centered manner. The teacher is the one who transfers knowledge to students, while students must wait to receive knowledge from the teacher.

The problem found is that each learner learns at a different rate. Each learner will receive different amounts of knowledge that is transferred. Teaching that is centered around the teacher alone will not fully respond to individual differences. This causes some learners to become bored, not want to study, and develop problematic behaviors.

"The Flipped Classroom" has become an innovation and perspective from real-life experiences in the education sector. It is a method of using the classroom to create value for children by practicing the application of knowledge in various situations to create "real learning (Mastery Learning)". The flipped classroom model is different from the traditional learning model. In other words, the flipped classroom model is a teaching and learning process that changes the lecture time in the classroom to doing various activities to practice solving problems and applying them in real life. The lecture will be in the form of learning through technology media such as video, online video, Podcasting or Screen casting, etc. Students can access it when they are at home or outside of class, so homework that was previously assigned to students to practice outside of class becomes part of the classroom activity [14].

Flipped classroom learning should be a virtual flipped classroom to make the flipped classroom learning more effective and to promote a learning atmosphere that is conducive to fostering learners' creativity. The flipped classroom learning activities will use active teaching activities. One type of activity that focuses on developing creativity in learners found that the use of active activities, training problem-solving skills and creative attitudes of undergraduate students can be effective in teaching that emphasizes problem-solving and creativity when we use active activities in a virtual flipped classroom with scaffolding.

For the reasons and importance mentioned above, the researcher is interested in developing a virtual flipped classroom model with an active learning base to develop creativity and information and communication technology in undergraduate students as well as develop appropriate learning skills and enable them to be lifelong learners.

The objectives of this research are to develop a virtual flipped classroom learning model with active learning using gamification and to evaluate the virtual flipped classroom learning model with active learning using gamification. However, the researchers would like to explain the details of the research procedure as follows:

Theories and Related Researches

Flipped Classroom Approach

Flipped Classroom (FC) model is an approach based on learning the simple and theoretical parts of a subject in extracurricular time through educational technologies and performing higher-level studies during class time. With the development and spread of educational technologies, the interest in the FC model has increased [15].

With FC simplest definition flipped classroom approach is express as "what is done at school done at home, homework done at home completed in class"[16].

This approach before the course the students watch theoretical part of lesson via multiple equipment such as online videos, presentation, learning management systems and take notes, prepare questions about the parts that students do not understand [17].

FC approach is a system that provides increase interaction time between the teacher and the student, presentation of a condition in which students take their own learning responsibilities, transition of role of teacher into a guidance, blending of constructivist learning with teaching method, each student taking individual education, consistency of learning by repetations and preventing students to keep behind of class that connot come to class for any reason. FC approach is not synonym with online videos, the important point is the interactive activites done during time when teacher and students are face to face. FC is not using video instead of teacher; FC is not working unsystematically

of students. FC is not students spending all course period in front of a computer. And, FC is not a student studying alone [18].

Technology of the Flipped Classroom

In order to apply flipped classroom model it is not necessary to be a professional video producer, FC is possible to use any source that descripts the subject (pdf, recorded sounds, and websites). Tucker in 2012 [19], expressed that flipped classroom educators are not needed to prepare their own videos instead they can reach lecture videos from internet sites such as Khan Academy, Youtube or Ted, most of the educatiors and researchers prefer to prepare their own videos, Some equipments that are necessary to form and broadcast lecture videos, are showed below;

Video forming equipment: Some of them are; Screen-Cast-O-Mattic, Camtasia PC, TechSmith Relay, Office Mix, Adobe Presenter.

Video Hosting: It placed online for access of students. Some of video sites are; YouTube, Teacher Tube, Screencast.com, Acclaim, Google Drive.

Video interaction Software's: There are software's provide teachers to access some data such as student watched lecture video, how long they watched, how they answered the questions in the video. Some software's that can be given as example are; Duncannon, Puzzle, Zaption, Office Mix, Verso, TechSmith Relay, Adobe Presenter, Google Apps for Ed.

Gamification

Gamification is related, but not identical, to the concept of game-based learning. Where gamification is about the use of game design elements in a non-game context, game-based learning refers to the use of actual games to acquire skills or knowledge. In game-based learning, the skills that are put to the test in the game correspond to the learning task of Gee in 2013, as is for instance the case in a game where medical students or personnel perform surgical procedures in a simulated environment [20-21]. In a paper, we focused on the properties of gamification that can be used to stimulate learning.

For cetain cases, such as the multiple-choice quiz application used in the current study, the distinction from a gamified experience to game-based learning can be blurred [22]. Cheong and et.al. in 2013, argue that gamification "can be viewed as a continuum ranging from serious games at one end of the spectrum to normal activites to which game elements have been added at the other en of the spectrum." The gamified multiple-choice quiz application falls in the middle of this spectrum. Chou, an influential gamification expert, collected and published a list of 95 documentd gamification cases, based on the criterion that the documentation presents return on investment indicators [23].

Delphi method

Delphi method has proven a popular tool in information system reteaches [24-31]. Delphi method originated in a series of studies that the RAND Corporation conducted in the 1950s. The objective is to develop a technique to obtain the most reliable consensus of a group of experts [32].

The main characteristics of the Delphi technique are: 1. Anonymity, using a questionnaire, so that the experts do not face each other, so that they do not know who owns the opinion, so that they can consider without being influenced by their position or ability; 2. Iteration, experts in the group are informed of the topic of the study. Experts in the group form their thoughts and opinions on the topic from their personal thoughts. The researcher refines the answers and presents them to the experts in several rounds; 3. Controlled feedback, filtering and feedback of the experts' opinions by having the experts answer the questionnaire and submitting the questionnaire in the next round. The respondents will be informed of the overall opinions, criticisms, suggestions and reasons for their opinions; and 4. Presentation of the answers with statistics. Part of the feedback of the questionnaire includes quantitative opinions, which can be presented as the median, interquartile range or mean, and standard deviation [33].

METHODOLOGY

This research is to construct a virtual flipped classroom learning model with active learning using gamification model for undergraduate students. This will be done by considering the population 2 sample groups, selecting research tools, and collecting and analyzing data. In addition, this researce can divide 3 stages.

To Analyze the Information Literacy Needs of Undergraduate students

This research steps and process of the first stage are shown in Fig. 1.

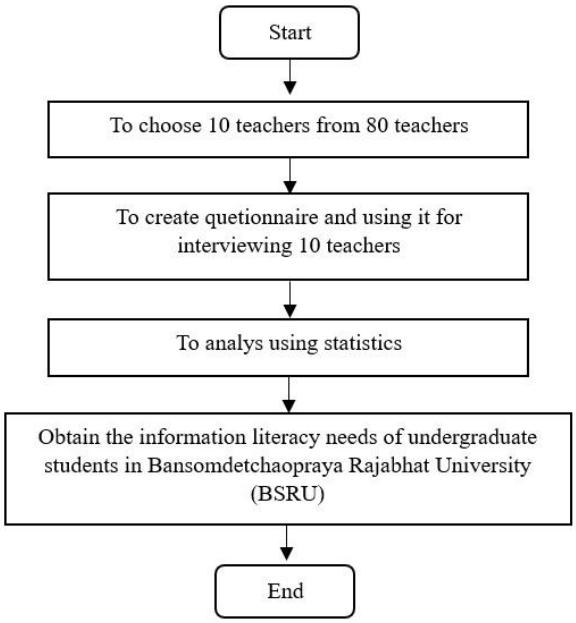

Fig. 1 The processes of analyzing the needs of undergraduate students in Bansomdetchaopraya Rajabhat University (BSRU)

From Fig. 1, the purpose of thin section is to deliver in to the needs of undergraduate students from teachers in BSRU, providing insights for the development and implementation of information a virtual flipped classroom learning model with active learning using gamification.

This section employs a stratified sampling method for sampling purposes. Stratified sampling, also known as quota sampling, was initially proposed by the American statistician Bartlett in 1937 and is a commonly used probability sampling method. The population size of this study is 80 individuals, In sampling the teachers in the sample, it is necessary to consider the coverage of basic attributes of the sample individuals, uch as the subject taught, age, teaching experience, gender, educational level, and to conduct random sampling based on these features. Then, researchers use 10 teachers for the sample of this research.

The questionnaire is used for to survey in this section. It is a widely used social research approach that involves collecting information and data from respondents through a series of written survey forms. The questionnaire consists of two parts. The first part captures teachers' basic information and the second part comprises teachers' responses to queries regarding their information literacy needs. The second part requires teachers to rate their level of agreement using a Likert five point scale, as outlined in table 1.

Table 1, Five point Liker's scale

No.	Option	Score
1	Strongly agree	5
2	Agree	4
3	Neutrality	3
4	Disagree	2
5	Strongly disagree	1

In the mean analysis of information literacy needs of undergraduate students of teachers in BSRU, the researchers established data interpretation standards based on Rensis Likert (1932). The data interpretation is as follows:

4.50 – 5.00 indicates the highest level, 3.50 – 4.49 indicates a high level, 2.50 – 3.49 indicates a moderate level, 1.50 – 2.49 indicates a low level, and 1.00 – 1.49 indicates the lowest level.

Then, the researchers survey using questionnaire. This research conducted a corresponding questionnaire study on Target 1, and the questionnaire design was mainly carried out through the following steps:

Step 1: Review the theoretical basis and policy documents related to teachers' information literacy.

Step 2: Construct a questionnaire on the information literacy needs of graudated students from teachers in BSRU.

Step 3: Researchers invited three experts to test the questionnaire's index of objective consistency (IOC). The objective consistency index (IOC) was 1.00.

Step 4: Modify the questionnaire based on expert suggestions.

Step 5: Distribute the questionnaire to 10 experts working in information technology for sampling. The reliability of the questionnaire was calculated using Cronbach's Alpha coefficient.

Then, the interviewing is made. This research will select one representative teachers from 10 teachers in BSRU. All teachers will be interviewed using interview objects. And, we will collect and analyze later.

To Design a Virtual Flipped Classroom Learning Model with Active Learning Using Gamification

To design a virtual flipped classroom learning model with active learning using gamification processes are shown in Fig. 2.

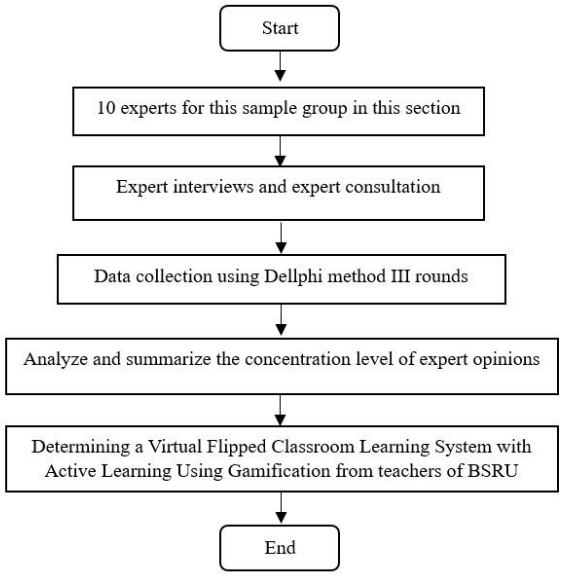

Fig. 2. The processes of development a virtual flipped classroom learning model with active learning using gamification of BSRU

From Fig. 2, the researchers use a sample size of 10 experts in the field of information technology; have more than 10 years of work experience. Most hold senior professional titles, and the majority have doctoral or master's degrees.

Then, researchers conducted a study on the constituent elements of a virtual flipped classroom learning model with active learning using gamification through an experts consultation questionnaire. The questionnaire design steps are as follows:

Step 1: Review the theoretical foundation and policy documents related to the constituent elements of teachers' information technology.

Step 2: Develop an interview outline for a virtual flipped classroom learning model with active learning using gamification.

Step 3: To invited 3 experts to examine the objective consistency index (IOC) of the interview outline.

Step 4: Modify the expert consultation questionnaire based on expert suggestions.

Step 5: Distribute the expert consultation questionnaire to a sample of 10 experts engaged in educational technology or information technology. The reliability of the questionnaire was calculated using the Cronbach's Alpha coefficient, which yielded a reliability score of 0.905.

Then, the Delphi method is a systematic expert consultation approach that employs multiple round of anonymous surveys to gather expert opinions, establish consensus, or forecast future events. This method enables experts to gradually approach consensus through a series of surveys without face-to-face interaction, thereby providing decision support on complex issues.

To develop a virtual flipped classroom learning model with active learning using gamification, the Delphi method will be employed. This research technique involves the iterative collection and synthesis of expert opinions. By utilizing the Delphi method, insights from multiple experts can be gathered and consolidated to establish a consensus, resuliting in the creation of a more comprehensive system for the information technology learning of graudated students.

Delphi round I, based on relevant studies, flipped classroom learning, and gamification frameworks. This research has developed an "Outline for expert interviews on the information technology learing with flipped classroom and gammification technique" Experts are required to discuss the content of primary and secondary indicators of teachers' information technology.

Delphi round II, expert consultation questionnaire on a virtual flipped classroom learning, and gamification frameworks for teachers. Simultaneously, an "Expert consultation questionnaire from first round has been developed. The questionnaire consists of two parts: 1. Captures basic inforamtion of the experts, and 2. Involves the interpretation of five information technology indicators base on this study, prompting experts to provide agreement ratings using the Likert five point scoring scale.

Delphi round III, this research will further integrate and revise the index system of a virtual flipped classroom learning, and gamification frameworks. In this round, the researchers will distribute the revised questionnaire of round two and ask the experts to present their agreement ratings using the Likert five point scoring method.

To evaluate a Virtual Flipped Classroom Learning Model with Active Learning Using Gamification

To evaluate a virtual flipped classroom learning model with active learning is shown in Fig. 3.

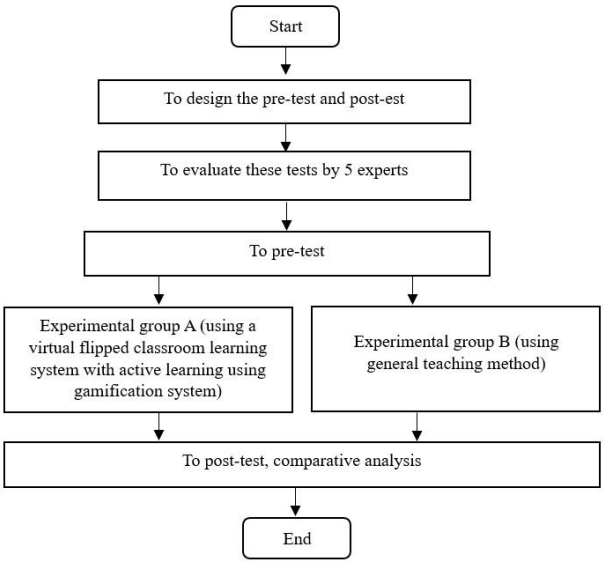

Fig. 3 To evaluate a Virtual Flipped Classroom Learning Model with Active Learning Using Gamification system From Fig. 3, there are steps of research.

Step 1: to designe the pre-test and post-test.

Step 2: to send the test for five experts to solicit their opinions.

Step 3: to collect and process expert opinions using the index of item-objective congruence (IOC) and the rating scale.

Step 4: to select undergraduate students for group A (using a Virtual Flipped Classroom Learning Model with Active Learning Using Gamification system) and group B (teach by teachers).

Step 5: after the training, a test paper is to be conducted on the group A and B.

Step 6: to use statistical methods to compare the both groups.

Research Results

There are results of development a Virtual Flipped Classroom Learning Model with Active Learning Using Gamification system.

The Results of to Analyze the Information Technology Needs of Undergraduate

The current survey results of 10 experts or teachers on Information technology issues cover a variety of areas, including digital awareness, digital knowledge and skills, digital application, digital communication, digital instructional design, digital instructional implementation, and digital leadership. Respondents viewed their digital literacy level as high, with 33.33% of respondents rated it as moderate. Digital knowledge and skills showed a fairly good foundation, with 38.10% rated it as high, but also highlighted gaps for improvement, with 19.05% rated it as low. 61.90% of respondents rated digital application as moderate, indicating general competence and a clear sense of digital responsibilities, with over 90% of respondents rated it as moderate to high. The professional development domain showed a wide range, with an even distribution across all levels: 28.57% rated it as high, 23.81% as moderate, 23.81% as low, and 23.81% as unspecified. In digital communication, more than half achieved a moderate level or higher. This indicates a high communication effectiveness (71.43%).

The results of to Design a Virtual Flipped Classroom Learning Model with Active Learning Using Gamification

The results for found 3 using Delphi technique can be shown below.

Digital perception rate found that the establish the concept of digital education for teachers and the establish a sense of overcoming difficulties are 95.24%.

The highest consensus rate of digital knowledge and skill is the conduct both online and offline at 95.24%.

The highest consensus rate of digital application are regular digital application training for undergraded students at different levels, training undergraded students to use SPSS and other software for statistical analysis, training undergraded students use a virtual flipped classroom learning model with active learning using gamification and other data analysis tool, training undergraded students to use ChatGPT and other artificial intelligence technology to carry out work and learning, and strenghen undergraded students' ability of information retrieval, evaluation and utilization, which are 90.48%.

4. The highest consensus rate of digital communication are strenghen teachers' ability to use communication tools, and learn new digital communication tools which is 90.48%.%).

The results of Evaluation a Virtual Flipped Classroom Learning Model with Active Learning Using Gamification

This research divided 2 groups. First group used 30 undergraded students and using a virtual flipped classroom learning model with active learning using gamification for learning and Second group used 30 undergraded students and learning by teachers. The results can be shown at table 2.

Table 2 The results of evaluation between a virtual flipped classroom learning model with active learning using gamification and learning by teachers

No.	Topic for testing	Avg. score of Pre-test		Avg. score of Post-test	
		Grp 1	Grp 2	Grp 1	Grp 2
1	Digital perception	8.84	8.89	16.9	12.2
2	Digital knowledge and skill	8.89	8.89	16.8	12.7
3	Digital application	8.32	8.26	17.2	12.5
4	Digital communication	8.53	8.63	16.8	13.0

From table 2, these results of the average scores of graduated students between first group (using a virtual flipped classroom learning model with active learning using gamification) and second group (using teachers). In each groups use 30 sample groups. The researchers created 20 items in each topic.

We found that the first group of graduat students had average pre-test score of 8.64 and the second group had average pre-test score of 8.67. the first group of graduat students had average post-test score of 16.90 and the second group had average post-test score of 12.60.

If comparing the percentage of post-test scores, it was found that the first group had an average score of 84.5%, and the students who studied under the teacher's teaching had an average score of 63%.

CONCLUSION

This research is to develop a virtual flipped classroom learning model with active learning using gamification model for undergraduate students. The researcher divided the research into 3 main steps: 1. exploring the factors that cause students to have problems in studying information technology. From the study, it was found that the researcher must develop learning in 4 items: 1) digital perception, 2) digital knowledge and skill, 3) digital application, and 4) digital communication. Step 2 is to create a virtual flipped classroom learning model with active learning using gamification model. Step 3 is to evaluate a virtual flipped classroom learning model with active learning using gamification model. The results of the evaluation of this model usage showed that in all four items of study, graduated students' scores increased by an average of 84.63%.

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