

Models of Hyflex Learning a Having Activities Base Via Constructionism for Enhancing as Critical Thinking of Undergraduate Students'

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ABSTRACT

An effective learning management by building a learning society for students as become to the creator of knowledge by yourself and continue learning anywhere, any time. Specific purpose for developing the models of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students', andtest the consist of measurement model with confirmatory factor model with the empirical data of the models of hyflex learning. A mixed method research of qualitative and quantitative to study with 15 key informants and 1,170 samples. Collections to came from documentary study, interview, questionnaire to data. Factors model of hyflex learning including teacher, students, hyflex learning, learning management method, learning media, evaluation process, learning strategy, assessment. Factors model there was a statistically significant to harmonization with the empirical data at .01 level.

Keywords

Factors model of hyflex learning, activities base, constructionism, critical thinking

INTRODUCTION

Education is the main mechanism for the development and promotion to the cultivation of ideas, knowledge in the youth of citizens, which an education is therefore a key parameter of long-term the competitiveness. Educational design is essential to it's development in all areas related of humans and society. Thailand National Education Plan (2017-2036 A.D.) with vision and goals in providing education for the stability of society and the nation, manpower development, research and innovation, competing, developing the potential of people of all ages, creating a learning society, creating opportunities for equality in education for enhancing the quality of life, and developing the efficiency of educational administration. (Office of the Education Council, 2017) Thailand, 4.0 era is determined to transform the economy into an innovation-driven economy of value-based economy and to create a new economy. (Maesincee, S, 2017) It is the creation of a moral and learning society in the policy vision of development, and is an important mission in organizing the direction of the development of education management 4.0 that meets to dynamism of the 21st century of mechanisms that lead to the development of the sustainability. The critical contexts in educational design today are to the dynamics of changing the world from the transition from the 20th century to the 21st century. Panich, V (2011) to said that the global tide of change has had a social, economic, environmental, and political impact, and a clear flow of change has been brought up as a transitional factor, such as the Arab Spring revolution through the use of technology as social media, the economic rise of Asia, people in the modern world amid such changing dynamics must be ready to face the change. Education, 4.0 is an era of education management, it must have to own innovation. Therefore, the educational arrangement is consistent with the 21st century and changing student behavior, through the application of technology that is the learning motive of the focus on students to create innovation for increase a learning capacity and competencies into stable, prosperous and sustainable.

Background Study

Learning management under the 21st century era of rapid and widespread change and flow has created a sustainable balance of educational development to a learning society in line with education in 4.0 era of an integrity into the capital that will be able to continue development such as human capital, intellectual capital, financial capital, instrumental capital, social capital, natural resource and environmental capital has to become a major the problems in the area of learning management of good planning as finding of teaching and learning processes, techniques and methods to develop for students to be used to a keeping the pace with changes in the 21st century as the Mechanisms to drive education management to be ready on developing new future skills of learning that create the 21st century skill concept and the cooperative organization network of educational management development. (Jedaman, P, and Others, 2020) Wongsapan, M (2013) to added that the management of learning to the learners in the current problem was monopolized by teachers. Causing the students to not practice thinking skills and unable to expand knowledge,

which skills are necessary in the 21st century, modern teachers need to organize teaching and learning to be in line with the changing times in order to educate the learner, they are durable and can be effectively applied to different contexts. By fostering critical thinking that is based on the principle of careful evaluation of claims and evidence for leading as truly feasible conclusion. As well as taking into account all relevant elements and applying a logical process in a logical and logical order. (Good, 1973) The thinking process at a high level requires the ability to think carefully, use reason to solve problems. By considering different situations or information in a managing and designing of learning management to the learners to be the effective. Hyflex learning is a learning design that incorporates online face-to-face learning elements and a teaching method that can be flexibly to adapted an according to the structure of learning to allow the students of participate into activities, that are provided by the instructor. And select the available equipment or resources of bidirectional and semi-directional communication, the frequency of access of the learners for individual learning, and the students can choose the time to study. Self-guided, dynamic, collaborative approach to teaching and learning, students and teachers interact with each other anywhere and at any time. (Beatty, 2006) In line with thaprasan, K (2015) there are 3 types of flexible blended learning methods: individual teaching in which the learners interact in the classroom, online communication by the learners into the learning method. Virtualization that can be accessed anywhere and at any time, bidirectional online and offline communication where learners can participate in self-paced learning based on a well-designed learning model. Teaching with learning elements. Therefore, Hyflex learning model is based on the needs and learning processes with a learner-centered focus in order to enable the learners to truly learn of the cultivation of critical thinking in relation to knowledge. The learning management process must encourage learners to develop naturally and to their full potential, learners must learn and self-determining knowledge, being flexible and adapting properly to the situation, there are the ways of thinking creativity, critical thinking in solving learning and making decisions, there are ways of working in the ability to work with others, there are tools for a working with information technology, management to a highly integrated, interdisciplinary teaching that to the developed of student-centered and most important. Objectives in this study aimed for developing the models of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students', and test the consistent of measurement model of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students' with confirmatory factor model with the empirical data of the models of hyflex learning.

RESEARCH FRAMEWORKS

Research frameworks from conceptual analysis of hyflex learning into the learners a having as higher ability of thinking, analyze, summarize, reason and problems solving to after their studies. Sirisawat, C (2013) has used to the process of linking ideas, initiatives of the learners, exchange of opinions, analysis. Their own learning process, learning new experiences, and assessing learning from activities in which the learners face problem situations, collaborate to think and act. Beatty (2006) it's an instructional design that includes online face-to-face learning elements, and teaching methods that can be flexibly adjusted according to the learning structure of the learner according to the group or class to provide engage online, where learners can do activities according to the format provided by the instructor, select available learning materials and resources, able to communicate with each other in both bidirectional and semi-directional, students to access frequency is kept, because homework in the classroom is necessary for the learners can take to the course both online and joint the online class of commenting further on their learning. Learners can learn using technology both online and by joining an online class of expressing additional opinions on their learning. By posting text, audio, video, learners can choose a menu for homework they need to do as reading, practice exercises, and research from various learning resources. Sometimes a class is required to share ideas from a group meeting in order to communicate with each other in a virtual classroom, and there is research from various learning sources as an appropriate for self-directed learning of interacting and participating in learning activities with the others outside of the classroom or in the virtual classroom. However, learning is multi-choice in the digital age, where learners are expected to meet new dimensions of learning with multimedia technologies that can be chosen or adapted to their learning styles and needs of more students. (Ratanaphon, P, 2008) A "Key" features in event design of hyflex learning based on the necessary elements to create a variety of activity methods to provide learners with learning options, the content and learning activities must meet the learner's interest, focus on developing the learning experience, and a variety of learning resources are supported by problem-based there are three main components such as fact search by the teacher is the leader to present an unsolved problem situation by assigning learners to understand and identify problem areas, concept searching after as understanding of the problem, students have to brainstorm ideas together to exchange ideas with one another within the group. To find possible solutions, teachers are responsible for asking questions and encouraging the learners to think and analyze in depth, and finding the solutions by the learners jointly summarize and compile the facts of their findings to explain and

solve the problems identified in the learning process in 6 steps: 1) define a problem, 2) identify, 3) brainstorm solutions, 4) make and test the best solution, 5) evaluate results, and 6) share results into activities base via constructionism as the creation of self-knowledge, and the creation of knowledge by the learner will have to create something. Constructionism Theory of the learning for doing and making as a learning is best done when learners to involved of learning that is meaningful to himself. When the learner is able to create new knowledge, it will help the learner to create things that are more complex from a changing the learning methods and exchanging knowledge with others that will increase knowledge, this is the process to will be a continuous, harmonized and harmonized cycle of self-directed learning. (Patapee, S, 2009) Project-based learning consists of 6 steps: 1) providing basic knowledge, 2) stimulating interest, 3) grouping, 4) seeking knowledge, 5) summarizing what was learned, 6) presenting the works. Based on project-based learning, teachers can provide a suitable learning environment for learners by using technology to help define problem situations, search for additional resources, and build a support base. There are instructors to guide students and cooperate into the problems solving. (Phoen, W, PornchitPratumsuwan, P, and Hutaman, S, 2014) It is learning to support of the learners in thinking, analyze and create as the knowledge by themselves. Developing the models of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students', and test the consistent of measurement model of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students' with confirmatory factor model with the empirical data of the models of hyflexlearning in component that is the study variable, it can be summarized as shown in figure 1.

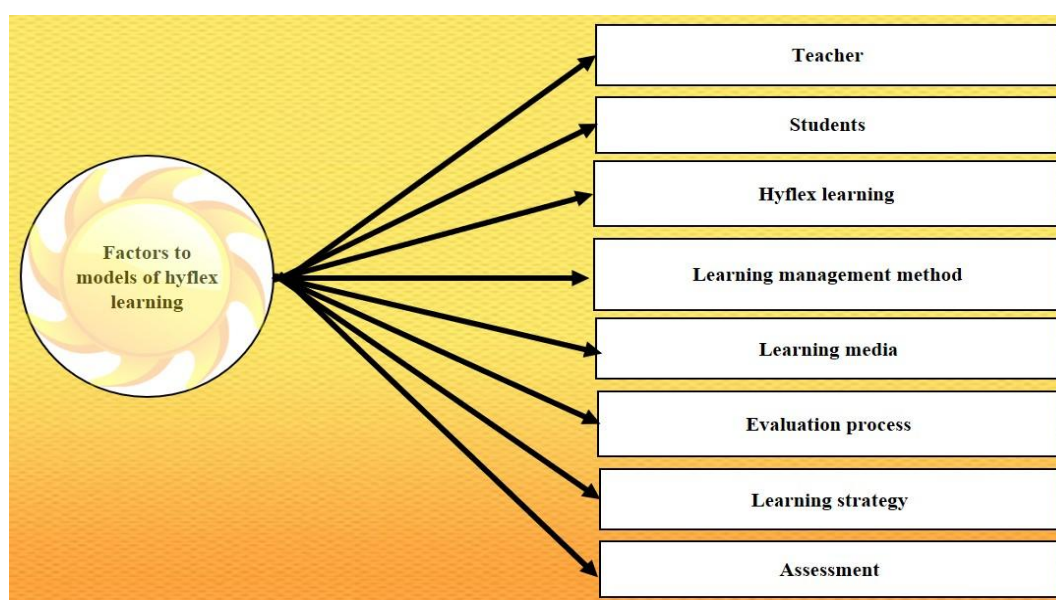


Figure 1.Research frameworks.

THE METHODOLOGY

This a mixed method research of qualitative research for developing the models of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students', and quantitative research to test the consistent of measurement model of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students' with confirmatory factor model with the empirical data of the models of hyflex learning.

Participants

The participants of the teachers and undergraduate students of Faculty of Science and Technology, Faculty of Education from Rajabhat University, divided into 5 groups: Rattanakosin group is SuanSunandhaRajabhat University, The central group is Village ChomBuengRajabhat University, the northern group is Chiang Mai Rajabhat University, the southern group is SongkhlaRajabhat University, Northeastern region is NakhonRatchasimaRajabhat University, Thailand. key informant of 15 teachers into in-depth interviews by interview questionnaire, they all were by purposive sampling. And 1,170 samples of the teachers and undergraduate students into survey by questionnaire, they all were by cluster sampling.

Research Instruments

The instruments of an interview questionnaire on structure is open-ended interview with a consistent to Item of Objective Congruence (IOC) by 5 experts to assessment, and semi structure questionnaire of 5- rating scales with a consistent to Item of Objective Congruence (IOC) by 5 experts to assessment, and to confidence value of the whole questionnaire was 0.85, from try- out of 50 persons, which was different from the samples a using that the research into the quality inspection of the instruments.

Collection Methods

A developing the models of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students', and test the consistent of measurement model of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students' with confirmatory factor model with the empirical data of the models of hyflex learning into 3 stages of data collection were followed:

•**Analysis stage**:-Studying documentary, concepts, theories and relevant research work as fundamental information to provide a framework for constructing and developing a conceptual framework in factors to the models of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students', and use the results to factors frameworks in accordance with the conceptual by analyzing from the study of factors and principles of development. Conducted to in-depth individual interviews with 15 teachers of key informant to gathered of information.

•**Synthesis stage**:-Studying an additional materials and related research to obtain a wide range of information to synthesize and summarize key components and indicators into the models of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students', that the qualitative data.

•**Assessment stage**:-Taking the questionnaire of factors to the models of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students' to survey with 1170 samples of teachers and undergraduate students to test the consistent of measurement model of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students' with confirmatory factor model with the empirical data of the models of hyflex learning, that the quantitative data.

Inquiry Methods

Inquiry methods as factors to models of hyflex learning a having activities base via constructionism for enhancing as critical thinking into factors and indicators as the qualitative data was analyzed by using three main stages, i.e., data reduction as a coding to classify the variables to be able to enumerate as the frequency, data organization as classifying variables and grouping them into conceptual of factors or dimensions, then grouping them into concepts, this method is called to variable analysis model to the concepts, data interpretation as identification of directions and trends of relationships between concepts by explaining and interpreting the rational relationship to conclusion. Into test the consistent of measurement model of hyflex learning a having activities base via constructionism for enhancing as critical thinking with confirmatory factor model with the empirical data of the models as quantitative data was analyzed by descriptive statistical analysis including mean, standard deviation. Also, the Confirmatory Factor Analysis (CFA) was conducted to analyze the factors associated with the models by using computer, and the researcher adjusted the model according to the statistical criteria.

Table 1. The conformity index and comparative index of the model.

Index	Criteria	Analyzed models
Chi-square value(X^2)	Not statistically significant	603.18
X^2/df	Not more than of 2.00	1.34
RMSEA	Not more than of 0.05	0.02
GFI	From 0.95 at above	0.95
AGFI	From 0.90 at above	0.92

* Enhanced analysis of multivariate statistics for research by Kaiyawan, Y, 2016.

RESULTS AND DISCUSSIONS

a) Factors and indicators to models of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students' to shown as figure 2.

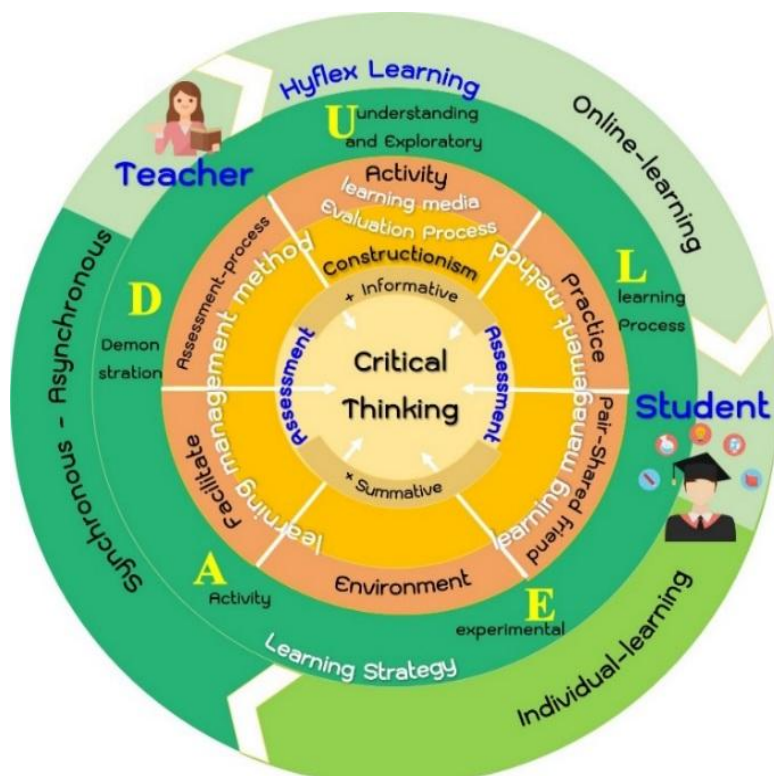


Figure 2. Factors and indicators to models of hyflex learning.

On figure 1 the factors and indicators to models of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students' of 8th factors to indicators were followed;

- *Teacher factor*: have to 4 indicators were to, (1) supervision and implementation of learning management activities in the classroom of face-to-face learning and classroom outside of online learning, (2) clarification for understanding of the overall activities, guiding and advising students in the management of learning, including making lesson plans, (3) define to the contents and provide as learning resources that are consistent with the subject matter and prepare to technology materials used for learning, (4) transferring the knowledge in learning management activities and assessment of learning outcomes a during and after learning.
- *Student factor*: have to 6 indicators were to, (1) perform to assigned a learning activities, (2) learning and studying the lessons for themselves from the learning materials to provided by teacher, (3) listen to lectures and contents introductions from teacher to use while a performing of learning activities in the classroom of face-to-face learning and classroom outside of online learning, (4) group learning and participation in presenting the topic on the problem that needs to be learned, (5) grouping and planning of meetings to form a collective agreement, (6) help each other to discuss and present by the group's results and draw conclusions.
- *Hyflex learning factor*: have to 5 indicators were to, (1) Use of technology as an office automation that is used by teachers to pass on activities base, (2) Synchronous (Bidirectional) and asynchronous (Semi-directional) learning through online learning, and personal learning, (3) activities base learning processes, (4) constructionism of self-guided learning into knowledge experiences to create of new knowledge, (5) enhancing as critical thinking of learning management in the learning contents
- *Learning management method factor*: have to 6 indicators were to, (1) inside classroom with face-to-face learning between teachers and learners in normal classrooms, (2) using activities as a base to link content that learners learn independently from outside of class, (3) problem situation to creation is a base that uses interactive tools to stimulate the interest of learners as conducive of learning together as groups/ teams, (4) outside classroom using technology website www.it.nrru.ac.th/benjapuk/hyflex, (5) organizing a learning environment for promoting as critical thinking, (6) supporting learning, researching additional information to the creation of the assigned portfolio, and being able to ask the teacher while learning on their own to anywhere and at any time.
- *Learning media factor*: have to 3 indicators were to, (1) learning management system were the resource provides of contents for teaching and learning management, assignments and follow-up of the weekly as learning management, (2) synchronous and asynchronous communication were communication resources, supporting learner-student

interaction and learner-teacher interaction, e.g., chat rooms, and asynchronous communication, e.g., web boards, (3) online learning resource by providing additional resources and links to the website in www.it.nrru.ac.th/benjapuk/hyflex of the related.

• *Evaluation process factor*: have to 5 indicators were to, (1) pre- test, (2) post- test, (3) group work evaluation, (4) critical thinking assessment, (5) observation of learning behavior to bring results to improve of the learning management to be more effective.

• *Learning strategy factor*: have to 4 indicators were to, (1) understanding and exploratory were online teaching and learning procedures, able to study and learn by oneself into anywhere and at any time, consistent with the behavioral objective learning in the course content and subject of learning, (2) learning process were the procedure for organizing a learning environment in a suitable learning environment for the learner, facilitating the provision of advice, consultation and communication in various ways, the online learning learner needs are analyzed for the effectiveness and efficiency of the online learning format, (3) learning experimental to the learners can build knowledge and understanding of things in environment and self-sustaining life by presenting to create experiences using computers is a tool that can be used in learning management, (4) activities as using methods of technology transfer through organizing activities for students is a learning tool that can adapt learners and teachers to understand and learn more effectively, the lack of distinction between learning of inside - outside classroom as contributes to the fun, exciting and unobtrusive of learning that encourages the learners to learn and understand in encouraging learners to change their concepts, gain more skills and knowledge by using related technologies and tools online and offline a using the learners as a base to generate ideas of active thinking and active learn by self.

• *Assessment factor*: have to 2 indicators were to, (1) formative of during a learning, (2) summative of after learning.

b) Test the consistent of measurement model of hyflex learning a having activities base via constructionism for enhancing as critical thinking with confirmatory factor model with the empirical data of the models of hyflex learning were to consistent with the empirical data as the statistical values of the harmonization of the model found that the value of $X^2 = 603.18$, $p\text{-value} = 0.68$, $df = 449$, $X^2/df = 1.34$, $RMSEA = 0.02$, $GFI = 0.95$, $AGFI = 0.92$. Also, factors and indicators to models of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students' of 8th factors including , 1) teacher, 2) students, 3) hyflex learning, 4) learning management method, 5) learning media, 6) evaluation process, 7) learning strategy, 8) assessment to a statistically significant at level of .01. The results are shown in figure 3.

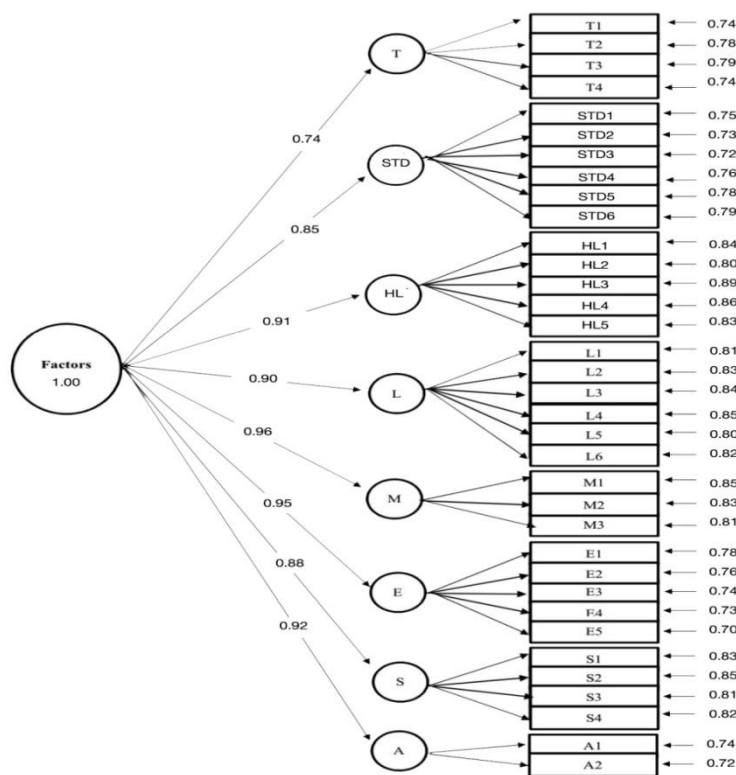


Figure 3. Research hypothesis model is consistent with the empirical data of hyflex learning

On figure 3 the model of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students' into developed is consistent with the empirical data. In addition, the weight on factor loading of all observable variables was significantly different from zero, the results of the analysis showed that the observable variable was the variable that was able to measure the individual components well. When considering the weight of all 8 factors in descending order (1-4), it was found that learning media(M) to highest weight value is 0.96, followed by *evaluation process* (E) to weight value is 0.95, assessment (A) to weight value is 0.92, hyflex learning(HL) to weight value is 0.91, respectively. Also, the details are shown in table 2, effecting confirmatory factor analysis of the first and second order, figure 3, the research hypothesis model corresponding to the empirical data.

Table 2. Effecting confirmatory factor analysis of the first and second orders.

Confirmatory Factor Analysis of First Order		b	S.E.	t	R²	F.S.	e
Teacher (T)							
T1	Supervision and implementation of learning management activities in the classroom of face-to-face learning and classroom outside of online learning.	0.76	(---)	(---)	0.19	0.01	0.81
T2	Clarification for understanding of the overall activities, guiding and advising students in the management of learning, including making lesson plans	0.78	0.03	14.79**	0.23	-0.05	0.77
T3	Define to the contents and provide as learning resources that are consistent with the subject matter and prepare to technology materials used for learning	0.79	0.04	12.31**	0.27	0.12	0.72
T4	Transferring the knowledge in learning management activities and assessment of learning outcomes a during and after learning	0.74	0.05	9.14**	0.25	0.05	0.75
Student (STD)							
STD1	Perform to assigned a learning activities.	0.75	(---)	(---)	0.58	0.10	0.42
STD2	Learning and studying the lessons for themselves from the learning materials to provided by teacher	0.73	0.03	23.21**	0.06	0.20	0.40

Table 2. (Followed)

Confirmatory Factor Analysis of First Order		b	S.E.	t	R²	F.S.	e
STD3	Listen to lectures and contents introductions from teacher to use while a performing of learning activities in the classroom of face-to-face learning and classroom outside of online learning	0.72	0.04	20.30**	0.62	0.09	0.38
STD4	Group learning and participation in presenting the topic on the problem that needs to be learned	0.76	0.03	18.50**	0.61	0.18	0.39
STD5	Grouping and planning of meetings to form a collective agreement	0.78	0.04	19.21**	0.61	0.18	0.39
STD6	Help each other to discuss and present by the group's results and draw conclusions.	0.79	0.04	17.51**	0.61	0.18	0.39
Hyflex Learning(HL)							
HL1	Use of technology as an office automation that is used by teachers to pass on activities base.	0.84	(---)	(---)	0.27	0.15	0.73
HL2	Synchronous(Bidirectional) and asynchronous (Semi-directional) learning through online learning, personal learning.	0.80	0.04	11.90**	0.56	0.34	0.43
HL3	Activities base learning processes.	0.89	0.07	10.96**	0.33	0.18	0.35
HL4	Constructionism of self-guided learning into knowledge experiences to create of new knowledge.	0.86	0.05	12.96**	0.32	0.18	0.35

HL5	Enhancing as critical thinking of learning management in the learning contents.	0.83	0.05	10.66**	0.23	0.13	0.75
Learning Management Method(L)							
L1	Inside classroom with face-to-face learning between teachers and learners in normal classrooms.	0.81	(---)	(---)	0.49	0.20	0.51
L2	Using activities as a base to link content that learners learn independently from outside of class.	0.83	0.05	11.39**	0.27	0.13	0.72
L3	Problem situation to creation is a base that uses interactive tools to stimulate the interest of learners as conducive of learning together as groups/ teams.	0.84	0.04	16.50**	0.53	0.18	0.47
L4	Outside classroom using technology website www.it.nrru.ac.th/benjapuk/hyflex	0.85	0.05	14.29**	0.53	0.20	0.56
L5	Organizing a learning environment for promoting as critical thinking.	0.80	0.03	13.17**	0.50	0.19	0.53
L6	Supporting learning, researching additional information to the creation of the assigned portfolio, and being able to ask the teacher while learning on their own to anywhere and at any time.	0.82	0.03	13.16**	0.49	0.13	0.52
Learning Media(M)							
M1	Learning management system were the resource provides of contents for teaching and learning management, assignments and follow-up of the weekly as learning management.	0.85	(---)	(---)	0.35	0.08	0.64
M2	Synchronous and asynchronous communication were communication resources, supporting learner-student interaction and learner-teacher interaction, e.g., chat rooms, and asynchronous communication, e.g., web boards.	0.83	0.04	13.12**	0.32	0.04	0.67
M3	Online learning resourceby providing additional resources and links to the website in www.it.nrru.ac.th/benjapuk/hyflex of the related.	0.81	0.05	14.22**	0.47	0.14	0.59
Evaluation Process (E)							
E1	Pre- test.	0.78	(---)	(---)	0.46	0.14	0.54
E2	Post- test.	0.76	0.05	14.86**	0.47	0.12	0.56
E3	Group work evaluation.	0.74	0.05	19.18**	0.42	0.10	0.53
E4	Critical thinking assessment.	0.73	0.05	15.12**	0.41	0.11	0.52
E5	Observation of learning behavior to bring results to improve of the learning management to be more effective.	0.70	0.04	15.12**	0.41	0.10	0.53

Table 2. (Followed)

Confirmatory Factor Analysis of First Order		b	S.E.	t	R²	F.S.	e
Learning Strategy(S)							
S1	Understanding and exploratory were online teaching and learning procedures, able to study and learn by oneself into anywhere and at any time, consistent with the behavioral objective learning in the course content and subject of learning.	0.83	(---)	(---)	0.30	0.11	0.69
S2	Learning process werethe procedure for organizing a	0.85	0.06	13.23**	0.70	0.39	0.30

	learning environment in a suitable learning environment for the learner, facilitating the provision of advice, consultation and communication in various ways, the online learning learner needs are analyzed for the effectiveness and efficiency of the online learning format.						
S3	Learning experimental to the learners can build knowledge and understanding of things in environment and self-sustaining life by presenting to create experiences using computers is a tool that can be used in learning management.	0.81	0.05	14.22**	0.60	0.27	0.30
S4	Activities as using methods of technology transfer through organizing activities for students is a learning tool that can adapt learners and teachers to understand and learn more effectively, the lack of distinction between learning of inside - outside classroom as contributes to the fun, exciting and unobtrusive of learning that encourages the learners to learn and understand in encouraging learners to change their concepts, gain more skills and knowledge by using related technologies and tools online and offline a using the learners as a base to generate ideas of active thinking and active learn by self.	0.82	0.05	14.22**	0.60	0.27	0.30

Assessment (A)

A1	Formative of during a learning.	0.74	(---)	(---)	0.55	0.13	0.44
A2	Summative of after learning.	0.72	0.03	23.34**	0.61	0.32	0.18

$X^2 = 603.18$, $p\text{-value} = 0.68$, $df = 449$, $X^2/df = 1.34$, $RMSEA = 0.02$, $GFI = 0.95$, $AGFI = 0.92$

** $p < .01$.

Factors model of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students' including teacher, students, hyflex learning, learning management method, learning media, evaluation process, learning strategy, assessment. And consistent with the empirical data was a statistically significant at level of .01. Also, hyflex learning to use of technology as an office automation that is used by teachers to pass on activities base, synchronous (Bidirectional) and asynchronous (Semi-directional) learning through online learning, and personal learning, activities base learning processes, constructionism of self-guided learning into knowledge experiences to create of new knowledge, enhancing as critical thinking of learning management in the learning contents of inside classroom with face-to-face learning between teachers and learners in normal classrooms, using activities as a base to link content that learners learn independently from outside of class, problem situation to creation is a base that uses interactive tools to stimulate the interest of learners as conducive of learning together as groups/ teams, outside classroom using technology website www.it.nrru.ac.th/benjapuk/hyflex, organizing a learning environment for promoting as critical thinking, supporting learning, researching additional information to the creation of the assigned portfolio, and being able to ask the teacher while learning on their own to anywhere and at any time. Learning management system were the resource provides of contents for teaching and learning management, assignments and follow-up of the weekly as learning management, synchronous and asynchronous communication were communication resources, supporting learner-student interaction and learner-teacher interaction, e.g., chat rooms, and asynchronous communication, e.g., web boards, online learning resource by providing additional resources and links to the website and to evaluation process such as pre- test, post- test, group work evaluation, critical thinking assessment, observation of learning behavior to bring results to improve of the learning management to be more effective to accordant with Beatty (2006) it's an instructional design that includes online face-to-face learning elements, and teaching methods that can be flexibly adjusted according to the learning structure of the learner to according to the group or class to provide engage online, where learners can do activities according to the format provided by the instructor, select available learning materials and resources, able to communicate with each other in both bidirectional and semi-directional, students to access frequency is kept, because homework in the classroom is necessary for the learners can take to the course both online and joint the online class of commenting further on their learning. Learners can learn using technology both online and by joining an online

class of expressing additional opinions on their learning. And the project-based learning consists of providing basic knowledge, stimulating interest, grouping, seeking knowledge, summarizing what was learned, and presenting the works. Phoen, W, PornchitPratumsuwan, P, and Hutaman, S, (2014) on project-based learning, teachers can provide a suitable learning environment for learners by using technology to help define problem situations, search for additional resources, and build a support base. There are instructors to guide students and cooperate into the problems solving. It is learning to support of the learners in thinking, analyze and create as the knowledge by themselves. Brett Milano (2017) says that adaptive learning relies on computers to tailor the learning experience to individual learners' abilities, and that the function of learning is online through the use of technology. Digital learning allows learners to be effective in their learning and achieve their goals. Dreyfus, S. E. (2014) based on learning and created a model for an educational practice that could enable learners to build knowledge, and to incorporate technology into it. It is used to foster a truly innovative society, as well as learning through doing things in the environment, it has designed to create space and facilitate to foster creativity and be a good role model. McMillan, J. H (2015) However, the learning strategy is learning process were the procedure for organizing a learning environment in a suitable learning environment for the learner, facilitating the provision of advice, consultation and communication in various ways, the online learning learner needs are analyzed for the effectiveness and efficiency of the online learning format, learning experimental to the learners can build knowledge and understanding of things in environment and self-sustaining life by presenting to create experiences using computers is a tool that can be used in learning management, activities as using methods of technology transfer through organizing activities for students is a learning tool. Office of the Chief Scientist (2016) on teaching and learning according to the theory of learning to create intelligence by using virtual technology, found that the teaching and learning management can improve the learning achievement and metacognitive thoughts the students study happily. (Ministry of Education, 2019) And feel satisfied with the teaching and learning activities. The lack of distinction between learning of inside - outside classroom as contributes to the fun, exciting and unobtrusive of learning that encourages the learners to learn and understand in encouraging learners to change their concepts, gain more skills and knowledge by using related technologies and tools online and offline a using the learners as a base to generate ideas of active thinking and active learn by self.

SUMMARY

Models of hyflex learning a having activities base via constructionism for enhancing as critical thinking of undergraduate students' of 8th factors were to, (1) teacher to supervision and implementation of learning management activities in the classroom of face-to-face learning and classroom outside of online learning, clarification for understanding of the overall activities, guiding and advising students in the management of learning, define to the contents and provide as learning resources that are consistent with the subject matter and prepare to technology materials used for learning, transferring the knowledge in learning management activities and assessment of learning outcomes a during and after learning, (2) student to perform to assigned a learning activities, learning and studying the lessons for themselves from the learning materials to provided by teacher, listen to lectures and contents introductions from teacher to use while a performing of learning activities in the classroom of face-to-face learning and classroom outside of online learning, grouping and planning of meetings to form a collective agreement, (3) hyflex learning to use of technology as an office automation that is used by teachers to pass on activities base, synchronous and asynchronous learning through online learning, and personal learning, activities base learning processes, constructionism of self-guided learning into knowledge experiences to create of new knowledge, (4) learning management method into inside classroom with face-to-face learning between teachers and learners in normal classrooms, using activities as a base to link content that learners learn independently from outside of class, problem situation to creation is a base that uses interactive tools to stimulate the interest of learners as conducive of learning together as groups/ teams, outside classroom using technology website, organizing a learning environment for promoting as critical thinking, and being able to ask the teacher while learning on their own to anywhere and at any time, (5) learning media as learning management system were the resource provides of contents for teaching and learning management, synchronous and asynchronous communication were communication resources, supporting learner-student interaction and learner-teacher interaction, e.g., chat rooms, and asynchronous communication, e.g., web boards, online learning resource by providing additional resources and links to the website, (6) evaluation process into pre- test, post- test, group work evaluation, critical thinking assessment, observation of learning behavior to bring results to improve of the learning management, (7) learning strategy such as understanding and exploratory were online teaching and learning procedures, able to study and learn by oneself into anywhere and at any time, consistent with the behavioral objective learning in the course content and subject of learning, learning process were the procedure for organizing a learning environment, activities as using methods of technology transfer through

organizing activities for students is a learning tool that can adapt learners and teachers to understand and learn more effectively, the lack of distinction between learning of inside - outside classroom, (8) assessment into formative of during a learning and summative of after learning. Factors model there was a statistically significant to harmonization with the empirical data at .01 level. A creating innovation, applying technology to improve as quality of learning management to effectively.

IMPLEMENTATION

A key feature in the design of hyflex learning activities is to create a variety of activity methods, and provide learners with learner-centered learning options and responsive content and activities. Learners' interest is focused on developing learning experiences, supporting diverse and quality learning resources.

REFERENCES

- [1] Abaid Ur Rehman, Tariq Mehmood Bhuttah, Xuqun You. (2020). Linking Burnout to Psychological Well-being: The Mediating Role of Social Support and Learning Motivation Psychology Research and Behavior Management, pp. **545-554**.
- [2] Beatty, B. (2006). Designing hyFlex world - hybrid, flexible courses for all students. from http://olc.onlinelearningconsortium.org/effective_practices/using-hyflex-course-design-process
- [3] Dreyfus, S. E. (2014). The five- Stage Model of Adult Skill Acquisition. Bulletin of Science, Technology & Society, 24(3), p. 177-181.
- [4] Good, Carter V. (1973). Dictionary of Education. New York: McGraw-Hill Book.
- [5] Jedaman, P, and Others. (2020). Educational Management 4.0 : The Result Based Management Process To Driven A Uplifting Sustainable Education In The 21st Century. Journal of Psychology and education. 57(9), pp. 1226-1237.
- [6] Kaiyawan, Y. (2016). Analysis of multivariate statistics for research. (2nd edition). Bangkok, Thailand: Publishing Chulalongkorn University.
- [13] Publishing Chulalongkorn University.
- [26] Masintree, S. (2017). Strategy and Reform to Thailand 4.0. Bangkok, Thailand: Ministry of Education. The office.
- [27] McMillan, J. H. (2015). Classroom assessment: principle and practice for effective standards based instruction (5th ed.): Boston: Pearson.
- [28] Ministry of Education. (2019). Promotion of learning society and youth development. Bangkok, Thailand: QLF.
- [29] National Research Council. (2011). America's climate choices. Washington, DC: The National Academies Press.
- [30] Office of the Education Council. (2017). The national education Plan (2017-2036 A.D.) in action. Publishing in 1st. Bangkok, The sweet pepper graphic co., Ltd.
- [31] Office of the Education Council, Ministry of Education. (2017). Policy and strategy development of education Quality. Bangkok, Thailand: Ministry of Education. The office.
- [32] Office of the Chief Scientist. (2016). Science, technology, engineering and mathematics in the national interest: A strategic approach. Australian Government, Canberra.
- [33] Phoen, W, Pornchit Pratumsuwan, P, and Hutaman, S. (2014). Project-Based Learning. Mechanical Engineering in industrial education. King mongkut's university of technology north Bangkok.
- [34] Ponpatapee, S. (2009). Presenting guided for developing human to characteristics the philosophy of sufficiency economy. Thesis of Chulalongkorn university, Bangkok.
- [35] Ratanaphon, P. (2008). A knowledgebase design of specific English for flight attendants at Thai Airways International Public Company Limited: Using Flexible Learning Approach. Doctor of Philosophy (Curriculum and Instruction), Department of Education. Kasetsart University.
- [36] Sirisawat, C. (2013). The science instruction consistency on constructionism theory for science project creating. Journal of Education. Burapha University, 24(1), pp.1-15.
- [37] Wongsapan, M. (2013). The promotion to learning of student with analytical thinking process. Journal of education Thaksin university. 13(2), pp.125-139.