Learner Characteristics as Consequences of Active Learning

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Abstract. This paper aims to explore the consequences of active learning implementation toward students’ characteristics. Literature reviewing, and synthesizing intend to delineate the framework of active learning driven classroom where teachers lessen their own profile from lecturers into facilitators. By deploying active learning, students’ multiple skills are activated and practiced. These skills, gradually, become students’ characteristics. Reviewing and synthesizing from the existing literature and research reports indicate students’ characteristics as possible outcomes of active learning in 12 traits: 1) students have a great opportunity to first-hand experience; 2) students create learning process and construct knowledge by themselves; 3) students learn and reflect from their experiences; 4) students develop higher order thinking; 5) students develop their learning skills; 6) students play important roles in learning which are also varied and diverse; 7) students highly participate in learning process; 8) students reach academic achievements with meaningful learning; 9) students build rapport with teachers and their peers; 10) students integrate information with their prior knowledge; 11) students develop positive attitudes and self-esteem; 12) students are enthusiastic, active, happy and joyful.

1. Introduction
Educational development in Thailand mainly focuses on knowledge, morality, learning process, and integration suited to the students. According to Section 22 of the National Education Act B.E.2542, education arrangement shall be consistent with the principles that all students are capable of learning and self-development. Accordingly, students are highly prioritized. In other words, teaching and learning arrangement is based upon the student-centered approach in accordance with active learning. It is, in fact, the learning system which enables students to engage themselves in the learning process, develop their learning to suit their potential, interest, and aptitude. They are also encouraged to actively think and do on their own in order to construct the knowledge through the learning exchanges for their meaningful learning.

2. Definition of active learning
“Active learning” is regarded as one type of teaching and learning arrangements which has been studied by several researchers. It is hand-on learning and experiential learning which is interchangeably used with different names in Thai language such as active learning practical learning holistic learning learning by doing active teaching and learning enthusiastic learning and experiential learning. The word “active learning” is used in this research.

3. Meaning
Active learning refers to real practice and active participation of students while listening to the formal presentation in class. The learning arrangement undertaken by students and based on what they have done is regarded as the learning activity under two assumptions: 1) learning as a natural attempt of human, and 2) distinctive ways of learning among individuals. Typically, students are conversed from receivers into co-creators.
Active learning is therefore the learning activity allowing students with an opportunity to learn in a meaningful, valuable, and joyful way in response to their interest. In this manner, students are challenged and encouraged to find the answers through various activities e.g. group working, talking, reading, writing, discussing, questioning, reflecting, and finding answers. These enable students to construct knowledge and comprehension along with enthusiasm for learning, problem-solving skills, data analysis and synthesis systematically.

4. Importance of active learning
The Office of Basic Education Commission (OBEC), Ministry of Education, has developed the educational system in line with Thailand 4.0 framework to forward the country with security, wealth, and sustainability as a developed country under the philosophy of sufficiency economy. Indeed, Thai people of Thailand 4.0 must possess the capability of higher knowledge and skills under the 20-year national strategies so that they can apply the knowledge for innovations, potential developments, and environmental friendliness. In addition, the 12th National Economic and Social Development Plan mentions about the promotion and development of human potential with high quality education based on the international standards and constant self-learning approaches in line with the National Education Plan B.E.2560-2579. As planned, all students shall be developed with the characteristics and learning skills of the 21st century in regard to changes of economy, society, culture, and environment along with rapid changes of advanced science and technology as well as international testing e.g. PISA, which reflects that Thailand is encountering with the educational problems and educational inequality. The educational challenge in the 21st century for students to get prepared for living in the 21st century is essential for current social changes which put an effect on the social living. Teachers must therefore be alert on learning arrangements to get students prepared with skills required for such living. That is, learning skill has influenced the learning arrangement to enable students with knowledge, abilities, and essential skills due to reformation of learning arrangements and other preparations [46]. Active learning is a new concept for traditional education reformation with its focus on the direct transfer of knowledge from teachers to students through varied teaching techniques for designing the learning arrangements and activities. Meanwhile, it can promote class participation among students and improve relations between students and students or between students and teachers. It is therefore another kind of learning arrangement that enhances students’ characteristics to keep up with the current trends [45].

5. Definition of students’ characteristics of active learning
Students’ characteristics of active learning refer to the quality of students brought by the arrangement of active learning through 1) students’ characteristics of intellectual ability or intelligence as the ability for solving problems in diverse environments or producing varied works depending on the cultural contexts (Gardner) through eight types of intellectual abilities [30] 2) students’ characteristics of physical ability [68]; students’ characteristics of attitudes [3] 4) students’ characteristics of society or learning reactions between students and students in three traits [26] through an observation, evaluation, and interrogation.

6. Students’ characteristics of active learning
Students’ characteristics of active learning synthesized from academic journals can be divided into 12 traits below.

6.1. Students learn through first-hand experiences.
The learning process mainly stresses on students [9] whereby students are deemed to play key roles in their learning [55]. In this regard, students are required to control themselves in doing various activities that will allow them to think and make decisions about speaking, listening, reading, writing and reflecting [36]. Besides, students can learn by doing [56, 60] various activities [2] or other actions on their own through an adoption of the framework relating to what they have done
It is regarded as higher order thinking, analytical thinking, synthesizing, and evaluation [69]. Students must have more chances to learn by doing other than passive listening to teachers or only reading [18,37,45,63]. Students implement learning-by-doing and construct the knowledge from what is undertaken during lectures [5], mainly prioritizing skill and ability developments in response to their existing knowledge) through an availability of various learning media for an exchange of opinions or experiences [2]. These enable students to learn through first-hand experiences from real practice or activities where perception is drawn through five senses [44], leading to the constructive knowledge from activities during lectures through speaking, listening, reading, writing, and reflecting [48]. Learning-by-doing will build understanding and develop several skills [50] e.g. experiment, survey, practice for intellectual development, problem-solving, analysis or decision making [18] such as application, presentation, and implementation [52]. In addition, students will have an opportunity to make an observation, establish some talks relating to the subject matters with their peers, and communicate for self-reflection [22]. Teachers are to facilitate and encourage students through learning-by-doing [56]. Students may apply the skills of speaking, listening, reading, and reflective writing along with the knowledge obtained from doing other learning activities [9] so that they can successfully implement learning-by-doing [32,56]. Students are able to discover the mathematical concepts from learning-by-doing or observations and scientific experiments for the summaries and rules from those experiments [20]. Their learning also corresponds to their own interest, knowledge presentation, and practice [52]. Students are therefore able to think and do in a meaningful way to apply the knowledge for their daily life [13].

6.2. Students create the learning process and construct knowledge by themselves.

Active learning is the situation-based process that enables reading, speaking, listening, and deep thinking among students. By this process, students manage their self-learning [32,34,56]. Indeed, students are able to learn by themselves [17,22,43] to obtain the direct experience in response to their real problem-solving [35] and create the learning process suited to the natural way of brain functionality [13,70]. Students can also construct knowledge [5,32,35,45,52,56,64,72] and manage their self-learning process [32,34,45,56]. It is required that students themselves search for knowledge, attitudes, values, and experiences [5,22,45]. Accordingly, knowledge is obtained from the experience, knowledge construction, and reviews [32,34,56]. Students are then able to find out the knowledge and apply various skills for their comprehension to create meaningful learning [29,32,34,49,62,67,72]. Students learn by doing and construct knowledge from what is practiced during lectures [5] while determining the concept, plan, acceptance, evaluation, and presentation [35]. In addition, students have an opportunity to learn by themselves to obtain the first-hand experiences to address the problems in authentic situations. They also do and think about what they are doing for construction of new knowledge [6] while choosing and generating their knowledge through numerous activities [65] other than passive listening to teachers [54]. Students must search for the contents to generate the knowledge by talking, writing, reading, and asking questions or the learning process that encourages students’ movement [13]. Students are viewed to possess the thinking concepts and working systems, have self-discipline, and search for new ideas by themselves through knowledge exchanges [55].

In this process, they are able to apply their knowledge [55] whereas teachers are advisors and facilitators for their learning [5,22,32,45,72]. It is therefore to reduce the process of content transfer from teachers to students solely whereas it is another way to develop higher order thinking which promotes learning-by-doing rather than passive listening to the lectures and provide feedbacks to students [72].
6.3. Students learn from their experience.
In the arrangement of practical learning, students will have first-hand experience by doing, searching for the data, thinking, and summarizing the results using the media that enable the perception of five senses [8]. In fact, this knowledge is based upon the experience and generated by students [13]. In addition, students will learn experience-based sciences and solve the problems arising from skeptical situations [22, 41] Practical learning enhances self-learning among students to learn by doing [66] and promotes the experience through practices and observations along with talks to themselves and others [22]. In fact, they have more enthusiasm for learning and more activities by exchanging experiences through speaking, writing, and discussion [12, 72]. This helps generate experience-based learning [61], promotes exchanges of learning experiences [52], connect their existing experiences to new ones or explain new problems for further knowledge construction or conclusions [52]. Such encouragement for knowledge and experience exchanges enables students to learn by doing, make an observation, and talk to themselves or others through diverse activities e.g. listening, speaking, reading, writing, and reflecting or responding [16]. These can be done through passing on their thinking and obtained knowledge to their group as the data for solving the problems and improving the learning process of the whole group members [54]. Students will build their understanding and seek the meaning of contents by connecting them with their already existing experiences [65], memorizing the contents and principles through their understanding gained from such experiences. Students can eventually search for knowledge, attitudes, values, and experiences on their own [22].

6.4. Students develop their higher order thinking.
Active learning is the development of thinking ability, problem-solving skill, and knowledge application [32] [34]. Students are then required to read, write, discuss or solve the problems, and implement actions, particularly for the work requiring higher order thinking of analysis, synthesis, and evaluation through an evaluation of higher order thinking, analyzing, and critical thinking [5]. It is believed to develop students with higher order thinking, analysis, synthesis, and evaluation [6,13,22,37,45,73] as well as application [5,7,12,22,45,56,63]. It is also to constitute the skills of analytical thinking, problem-solving, and higher-order thinking. Activities focusing on higher order thinking [56] in which students are required to think and do on their own are essentially arranged [69]. These activities have an influence on the development of thinking skills into higher levels [5,32,45,60,72]. Students are also evaluated for higher order thinking, analysis, and critical thinking [5]. The development of intellectual abilities such as thinking, problem-solving, and knowledge application [17] [56] can promote higher order thinking whereby students must read, write, question, and discuss the subject matters collaboratively in their groups and put it into practice [58]. Hence, it can reduce the process of content transfer to students solely while developing higher order thinking and focusing on practical learning rather than passive listening to the lectures along with the provision of feedbacks to students [72].

6.5. Students develop their learning skills.
Active learning is the learning process aimed to lessen the knowledge transfer from teachers to students and constitute learning skills among students [5,22]. It is also the process which rests on the student-centered approach by allowing students to apply their skills of speaking, listening, reading, thinking, and writing, including expressing their opinions while performing activities [28]. In fact, it is to develop the skills and concepts of students other than those of teachers regarded as the knowledge providers [6]. Learning is a natural attempt of human beings whereas students can develop their skills for knowledge searches independently [13] and learn by themselves to promote the constant out-of-
class learning [13,22,45]. Students are then able to express themselves through speaking, listening, reading, writing, and reflecting [41]. Learning activities therefore rest on higher order thinking [56]. Activities regarding the development of student skills and concepts [5] typically improve learning skills [5,22,32,45,72] and thinking skills as well as writing skills [13]. Students have an opportunity to develop themselves and their academic performance [15,31], improve skills of knowledge seeking by themselves [12] and promote collaborative learning habits among students by expressing their opinions through listening, speaking, reading, writing, and reflecting [51]. The students’ roles are truly conversed from students into co-creators to establish the communicative skills [5]. Indeed, students take roles in their learning through a number of diverse learning activities to help them constructively develop their knowledge and essential skills [39]. Students can implement learning-by-doing and generate knowledge from what is performed during the lectures, with an emphasis on the ability and skill development that matches their existing knowledge. For practical learning, students are able to build their understanding from what they are doing and promote other skills [50]. Meanwhile, students receive the data to form their own concepts or new skills from such learning [41] to help them analyze and solve the problems, synthesize the data systematically [65,75]. Besides, students can develop their thinking ability, problem-solving skill, and knowledge application [17] while transferring the knowledge to their peers or expressing opinions and doing presentations properly. They also determine the concept, plan, acceptance, evaluation, and collaborative presentation. Students therefore must seek the meanings and understanding by themselves or with their peers e.g. finding out the answers, discussion, collaborative presentation, and summary of important concepts [18,73].

6.6 Students play the key roles in learning and adopt diverse learning approaches. Learning is a natural attempt of humans whereas individuals have their own distinctive ways of learning [23]. Active learning is regarded as the learning process with its main focus on students [9]. Teachers are therefore viewed as educational facilitators [5,32,45,72] to help students in their learning [13] together with their responsibility for such learning. Regarding a conversion from the lectures provided by teachers into the roles regulated by students [47], students are changed from receivers into co-creators [23,63]. In other words, it is a shift from listeners to participants in learning activities set out by teachers such as reading, writing, corresponding, and problem analyzing [73]. Students are believably benefited from diverse teaching methods whereby teachers are encouraged to adopt different strategies for comprehension of each individual [57]. Learning how to learn is expected among students [65] and they can learn from valid sources through distinctive approaches. Students play the main roles in their learning more actively [39]. In this manner, students must regulate their self-learning at a high level and are independent for their own learning [69]. While performing those activities, they will have an opportunity to think and make decisions about speaking, listening, reading, writing, and reflecting [36,39], corresponding and problem analyzing [37] and forming social relationships [39]. Students additionally engage in learning [32,34] and determining the learning goals as they are encouraged to forward the problems for further analysis [47], pay attention to group discussions, and apply the knowledge for real life [57]. Hence, most students are more satisfied with active learning than passive learning [55,58].

6.7. Students actively participate in the learning process. Active learning allows students’ participation in the learning process at most [7,12,17,32,45,56,61,63]. Students have more participation in learning or doing activities so that meaningful learning is truly established [65]. Students take more roles in their learning rather than gain knowledge or new concepts as passive students [22]. In doing so, students have more engagement in learning [12,61]
in addition to just only listening to teachers [5,6,22,23,45,56]. They are conversed from passive students into active ones who engage in learning activities planned by teachers [12]. In fact, there is a shift from receivers into co-creators [5,12,23,63]. It is believed to promote collaborative learning behaviours since students are able to share their opinions and adopt the skills of listening, speaking, reading, writing, and reflecting [51]. Moreover, this typical learning is to promote reactions and collaborations rather than competitions [12,45,56,70]. Students must seek the answers and understanding by themselves or with their peers e.g. finding the answers, discussion, presentation, and summary of important concepts [12,73]. Students generate the knowledge and systemize the learning process on their own from collaborative learning [56] whereas they learn together and put the knowledge into practice [61]. Students participate in the teaching and learning activities at the highest level while they take roles of speaking, questioning, discussing, and declaring [54]. Students play the main roles in their learning and a variety of learning activities are arranged for self-development among students to promote more creativity for knowledge and skill enhancements [39]. Students engage themselves in the learning process [5,32,34,45,61,72] which are varied and diverse [32,34]. They are then encouraged to participate in learning activities [12,55], for example, reading, discussing, and writing [6] and have reactions with learning activities [61]. They may work in groups and collaborate with other students while jointly planning the curriculum for active learning. Students have roles in learning activities and knowledge seeking [4]. They also share their opinions based upon the analysis, synthesis, and application of supportive principles and theories [74].

6.8. Students attain the academic achievements and meaningful learning.

Active learning enables students to have academic achievements [12,72] and understanding of the main concepts they have learned precisely and correctly which is permanent and well-connected knowledge [45,57]. Students are required to search for the meanings and build comprehension by themselves or with peers [12,73]. Students are then able to express through speaking, listening, reading, writing, and reflecting [41]. Students take part in learning activities [16] and solve or adjust their misconceptions immediately from communications made between peers and teachers [57]. It is viewed as learning by understanding with long-lasting memories and problem-solving skills along with positive attitudes toward the study and motivation [42]. Students have an opportunity to develop themselves and improve their academic performance [15,31]. Students share their participation as a part of learning activities for them to associate their existing knowledge with something new while studying [16]. This process emphasizes students to construct the knowledge and comprehension of contents and principles through experience-based understanding. Students eventually establish more understanding and longer memories [7]. Besides, students can seek the knowledge and apply various skills for their understanding to generate meaningful learning [29,32,34,49,62,67,72]. Meanwhile, students share their roles in learning or doing activities to promote meaningful learning [65]. With cooperation among students, they will have more enthusiasm in doing activities whether it is an exchange of experiences through speaking, writing, or discussion with peers [72].

6.9. Students build rapport between teachers and students.

Active learning is a shift from passive students into co-creators in learning activities planned by teachers [12]. At the same time, it promotes good relations between teachers and classmates [72]. This also makes the lessons more interesting [32,34]. Students build good relations between teachers and classmates [48] and gain the communicative skills [7,72]. As students benefit from reactions in class, they can develop their social experience to work with other people [7,32,34,57]. Students have an opportunity to question, respond, criticize, and appreciate the working system with
different methods and perspectives of individuals or groups [57]. Students talk with classmates to build cooperation and rely on each other [61]. Students learn to have joint responsibilities, work discipline, and different duties [17,32,34,45,56]. At the same time, students can learn together [17,22,43]. Typically, students observe and do by themselves and they must communicate with each other about the subject matters and reflect their own thinking [22]. Students share roles in expressing opinions to promote the analysis, synthesis, and application of supportive principles and theories [74] as well as exchanges of learning experiences [35].

6.10. Students integrate the information with their prior knowledge.

Active learning is an activity that allows students to integrate the information and principles to generate the main concepts [32,34,56,]. Students with enthusiasm and skills are able to select, analyze, and synthesize the information systematically [65,75]. Students can integrate the information and technology into analysis, synthesis, and evaluation [17,56] whereas students and teachers receive the feedbacks from reflection quickly [5,45,60]. Students talk about what they have learnt, work on writing related to their prior experience, and apply the knowledge for daily life [42]. Students can integrate the subject matter and relate it to other different subjects. Students’ engagement is considered a part of learning activities where they can associate their new and existing knowledge through learning by doing during the lectures [16]. They can also search the meanings of contents and relate them to their prior experience [65] and integrate the new knowledge with their own [5].

6.11. Students develop positive attitudes and self-esteem.

Active learning helps students to learn from what they have practiced through interesting and challenging activities in order to bring them pride and enjoyment [7]. It also develops students in terms of feeling, self-confidence, interest, and self-esteem [22]. Furthermore, students are encouraged to search for the knowledge, attitudes, values and experiences by themselves [22,45]. Active learning is then regarded as valuable and joyful learning in such a way that students can learn what truly interests and challenges them [75]. Meanwhile, it can promote positive attitudes toward the study due to their realization of learning by doing [57]. This process stresses on the importance of surveying attitudes and social values among students [5,22,45]. Active learning develops students in respect of feeling, self-confidence, interest, and self-esteem [22] already existing in students [5,45,60]. Students have enthusiasm for learning e.g. getting actively involved in activities [12,13] while developing positive attitudes toward the study and raise learning motivation [7,32,34,42,72] among students [5].

6.12. Students are enthusiastic, active, happy, and joyful.

Active learning helps students to be cognitively active to achieve more efficient learning [12,55]. They will have more interest and pay more attention to the study in a joyful way [42]. Therefore, active learning is valuable, exciting, and challenging for students [13,75] so that they are proud and joyful [7]. This stimulates their curiosity [66]. Students have more enthusiasm in doing activities whether it is an exchange of experiences through speaking, writing, and peer discussion [12,72]. Students will read, speak, listen, think, and write enthusiastically [13] for their study and problem-solving [75]. Students further develop social intelligence, learn by themselves, work together with other people, and establish good relationships [57]. They also possess skills of selecting, analyzing, synthesizing the information systematically [65]. Students learn meaningfully through their collaboration and they have more enthusiasm in doing activities which are varied and diverse in the form of an exchange of experiences through speaking, writing, and peer discussion [72].
7. Application of learning activities for good learner characteristics

Active learning can be used for the learning arrangement in numerous ways e.g. 1) constituting learning among students both in class and out of class, 2) being generated by an individual or group, and 3) managing the learning process with or without technology. Upon an application of active learning, teachers will consider the followings: 1) adopting the proportion suited to the allowable time to help students develop their deep understanding and skills, 2) spending some time providing additional time and advice, 3) applying for and demonstrating what is learnt, and 4) receiving the feedbacks at once from peers and/or teachers [21].

8. Roles of teachers in active learning for good learner characteristics

Considering the roles of teachers for active learning [33,56], teachers take the following roles in active learning.

- Adopting the student-centered approach for learning whereas activities must reflect the need for student development and application for real life.
- Creating collaborative learning and responses contributing to good relations with teachers and classmates.
- Arranging the active learning activities to promote students’ participation and learning achievements.
- Establishing collaborative learning for cooperation among students.
- Introducing learning activities which are challenging and allow students to learn through diverse teaching methods.
- Planning the time for learning clearly in terms of contents and activities.
- Teachers are open-minded and accept students’ ability of expression and thoughts.

Cornell University has applied the teaching techniques based on active learning for effective practice.

1. Giving an assignment for preparation before the study.
   1.1 Assigning students to read the contents or subject matters related to their study in advance.
   1.2 Assigning students to study the video and give them the questions so that they can find the answers by themselves.
   1.3 Encouraging students to provide answers to the subject matters of the next lesson.

2. Adopting the teaching techniques contributing to active learning in class.
   2.1 Choosing the techniques which are simple and do not require much time for starting the lesson e.g. “one minute paper” and “think-pair-share”.
   2.2 Analyzing the learning targets and a few teaching techniques.

3. Main principles of learning arrangement based on active learning.
   3.1 Choosing the activities suitable for the contents and what students should practice.
   3.2 Emphasizing the importance of reactions among students.
   3.3 Describing the activities and their expected benefits.
   3.4 Allowing students to bear the responsibility and determining the amount of time and budget.
   3.5 Summarizing the main points and exchanging them before starting the new contents.
4. Applying the technology for effective learning arrangements to promote the activities based on active learning.

9. Conclusions and suggestions
Active learning is another learning process that prioritizes practical learning or learning by doing whereas the knowledge is truly obtained from the experience. In this process, students are required to take actions rather than passively listen to teachers. Hence, activities for students to learn through reading, writing, responding, and problem analyzing must be introduced. Meanwhile, students are encouraged to apply higher order thinking such as analysis, synthesis, and evaluation. Active learning is therefore the process contributing to meaningful learning through collaborations among students. In this manner, teachers must limit their roles in teaching and providing knowledge to students directly, but add the process and activities that engage students in doing more activities. These gradually develop learner characteristics. According to the literature review and knowledge synthesis, learner characteristics generated by active learning are described in 12 traits: 1) students have a great opportunity to first-hand experience; 2) students create learning process and construct knowledge by themselves; 3) students learn and reflect from their experiences; 4) students develop higher order thinking; 5) students develop their learning skills; 6) students play important roles in learning which are also varied and diverse; 7) students highly participate in learning process; 8) students reach academic achievements with meaningful learning; 9) students build rapport with teachers and their peers; 10) students integrate information with their prior knowledge; 11) students develop positive attitudes and self-esteem; 12) students are enthusiastic, active, happy and joyful. For suggestions, learner characteristics from active learning should be acknowledged as they bring positive results to students and can be further applied as the guidelines for designing learning activities in class to benefit Thai children with effective learning in the 21st century. These characteristics also influence the design of learning programs to students in terms of the process and target to promote the full potential development and preparation for the challenging and complicated world at present and in the future.

References
[1] Anunthavorasakul A 2016 Assessment Result of PISA 2015 with The disparity of quality education in Thailand
[2] Attaporn J and Koraneekit P 2014 Development of an Active Online Instructional Model to enhance Learning Behaviors of Undergraduate Chulalongkorn University
[3] Belkin, Gary S and Skydell R H 1979 Foundation of Psychology (Boston : Hougton Mifflin Co.)
[4] Banjongjit S 2008 Active Learning *Journal of Naval Academy* 8 34–42
[5] Bonwell C C Active Learning: Creating Excitement in the Classroom. [Online]. Retrieved October 17, 2017 from https://www.ydae.purdue.edu/let/HBCU/documents/Active_Learning_Creating_Excitement_in_the_Classroom.pdf
[6] Bonwell C C and Eison J A 1991 Active Learning: Creating Excitement in the Classroom. ASHE-ERIC Higher Education Report, Washington DC: School of Education and Human Development (George Washington University)
[7] Boonprakob M 2001 Research Report No. 80 (Research and Development)
[8] Boonyakanit W 1989 The Result of Implementing Learning Experience Practice and General relation on Young Children’s Graduate School (elementary education) (Bangkok: College Srinakharinwirot University. Photocopy)
[9] Brandes D and Ginnis P 1996 A guide to Student Centred Learning (Oxford : Blackwell)
[10] Center for Teaching Excellence, University of Kansas 2000 Teaching Strategies:Active Learning. Retrieved November 27, 2006, from http://www.ku. edu/~etc/resources/teachingtips/active.htm
[11] Chickering A and Gamson Z 1987 Save principles for good practice *AAHE Bulletin*, 39 pp 3–7
[12] Chaikijpinyo S 2005 How to Teaching Active learning Journal of Innovative Teaching, 2 pp 12–15
[13] Chamnankit B 2006 Why do you need a knowledge management to learn in higher education knowledge management journal Nakhon Sawan Rajabhat University 1 pp 1–7
[14] Cornel University Center for Teaching Excellence 2015 Why incorporate active learning Techniques and How can you incorporate active learning into various classroom settings. Retrieved October 17, 2017 from http://www.cte.cornell.edu/teachingideas/engaging-students/active-learning.html
[15] Colleen J 1996 Designing Web-Based Instruction: Research and Rationale [Online] Retrieved October 17, 2017 from http://www.cc.utexas.edu/~jonesc/research/empaper.html
[16] Dasa J 2009 15 techniques in Active learning IPST Magazine 36 pp 72–76
[17] Driscoll M 2002 Web-Based Training: Creating e-Learning Experiences. 2nd ed. (San Francisco: Jossey-Bass Pfeiffer)
[18] Detsri P 2002 Active learning Journal of Science Education Mathematics and Technology 30 pp 53–55
[19] Development Science Instruction techniques based on Science Education Quality (Bangkok: Srinakharinwirot University)
[20] Doctorow M, Wittrock M C and Marks C 1978 Generative processes in reading comprehension Journal of Educational Psychology 70 pp 109–118
[21] Eison Jim 2010 Using Active Learning Instructional Strategies to Create Excitement and Enhance Learning. University of South Florida. Retrieved October 17, 2017 from http://www.coe.cornell.edu/documents/presentations/EisenHandout.pdf.
[22] Fink L D 2003 Creating Significant Learning Experiences: An Integrated Approach to Designing College Courses (Jossey Bass Higher)
[23] Felder R M and Brent R 1996 Navigating the Bumpy Road to Student-Centered Instruction Journal of College Teaching 44 43–47
[24] Good CV 1973 Dictionary of Education Prepared Under the Auspices of PhiDelta Kappa (3rd ed.). New York: McGraw-Hill. Meachle (1998) Active Learning. Retrieved October 17, 2017 from http://hydro4si.fau.edu/~rjordan/active_learning.html.
[25] Hendrikson L 1984 Active Learning. Retrieved October 17, 2017 from http://www.ed.gov/database/ERIC_Digests/ed253468.html.
[26] John Von D W, John Von R T and Holubee E J 1994 The Nuts and Bolts of Cooperative Learning (Minnesota: Interaction Book Company)
[27] Kasembundit university n.d. Active Learning. Retrieved October 25, 2560, From http://www.archlebu.ac.th/home/research/pdf/academic/academic001pdf
[28] Kamtde W 2006 Effects of using Leslie dee Fink's model of active learning in biology instruction on paragraph writing ability and learning achievement of upper secondary school students. Thesis (Science Education) (Bangkok: Graduate Studies, Chulalongkorn University. Take document)
[29] Khammani T 2005 Research-based learning (Bangkok: Chulalongkorn University Printing House)
[30] Khammani T 2012 Science of Teaching: Knowledge to the effective learning process (Bangkok: Chulalongkorn University Printing House)
[31] Khan B H 1997 Web-Based instruction. Englewood Cliffs (New Jersey: Educational Technologies)
[32] Ketpichainarong W 2014 Introduction Active Learning Sharing Active Learning Experiences. Nakhon Pathom: Institute for Innovative learning, Mahidol University. Retrieved October 25, 2560, From http://qa.bu.ac.th/cop/index.php/ component/phocadownload/category/-km-copteaching?download=18:active-learning
[33] Kaewchajjaroenkit N 2007 The Role of Teachers in the event and how to follow the guidelines of the Active Learning Retrieved October 25, 2560, from http://www.itie.org
[34] Kaewsanit M 2015 Active learning through a student-centered approach in the communication arts department Kasem Bundit Journal 16 pp 113–124
[35] Kruesaeng P 2013 Proactive Technical Education Learning from Shelton College international, Singapore Journal of Humanities and Social Sciences (Nakhon Sawan Rajabhat University)
[36] Kiteak P 2007 The Effect of Using Active learning toward Achievement and Attitude in Chemistry of 12nd Grade Students Pathumthani Province. Master's Thesis (Chandrakasem Rajabhat University)
[37] Kothakhyun P 2011 What is Active Learning? Retrieved October 25,2560, from http://prapasara.blogspot.com/2011/09/active-learning.html
[38] Laohapiboon P 2542 Teaching Science (3rd ed.) (Bangkok: Thai Watana Panich Printing)
[39] Manopichetwattana S 2004 The Development of a Science Instruction Model Integrated Management to engage learner participation in active learning about the Anatomy. Ph.D. thesis, Srinakharinwirot University
[40] Meyers Chet and Jones Thomas B 1993 Promoting Active Learning: Strategies for the Collage Classroom (San Francisco: Jossey-Bass)
[41] Meyers C and Jones T B 1993 Promoting Active Learning: Strategies for the Collage Classroom (Oxford: Elmsford)
[42] McKeachie Wilbert J, Paul R Pintrich, Yi-Guang Lin, and David A F Smith 1986 Teaching and Learning in the College Classroom: A Review of the Research Literature Ann Arbor: Regents of The Univ of Michigan ED 314 999 124 pp MF-01, PC-05
[43] Na Songkhla J 1999 WWW-Based Instruction Journal of Education Studies 27 pp 18–28
[44] Nateetanon S 2007 The Effect of Active Learning Environment on Creative Thinking of Preschool Children. Master thesis, M.Ed (Early childhood Education) (Bangkok: Graduate School, Srinakharinwirot University Take document)
[45] Pakdeejit Y 2014 Academic Dissemination Documentation: Day promotes academic quality of teaching (Faculty of Education, Nakhon Sawan Rajabhat University)
[46] Panich V 2012 21st century Skills: Rethinking How Students Learn (3rd ed.) (Bangkok: Sodsri-Saridwongso Foundation)
[47] Praprutkit N 2003 Childhood behavior in childhood behavior and teaching Materials (Bangkok: SukhothaiThammathirat Open University)
[48] Pattrakorn S 2009 The Effects of Organizing Active Learning on Problem Solving and Mathematical Communication Abilities of Mathayomsuksa III Students in Probability (Master thesis, M.Ed. (Secondary Education), Srinakharinwirot University)
[49] Pittayanuwat S and Boonterm T 2002 Research methodology : a tool or a way of [40] thinking Journal of Research Methodology 15
[50] Phudetch A 1998 Practical learning (Active Learning) Journal of Private Education, 72 pp 57–58
[51] Prince Michael 2004 Does Active Learning Work? A Review of the Research Journal of Engineering Education 93 pp 223–231
[52] Paonil P 2003 Training materials: Participatory Learning. Bongkok: Chandrakasem Rajabhat University (Photocopy)
[53] Ramkhamhaeng University 2014 History of the University Retrieved October 25,2560, From http://www.ru.ac.th/th/index.php/site/page?view=history
[54] Rungklab A 2000 Why is that Active Learning? Journal of Naval Sciences 83
[55] Roongrangsee C 2006 Active learning management plan in Course 1000101 Human Behavior and Self Development Unit 2 “Self Development” (Nakhon Sawan: Faculty of Education, Nakhon Sawan Rajabhat University)
[56] Ruangsuwan C (n.d.) Active Learning Retrieved October 25,2560, from http://www.drchaiyot.Com
[57] Salemi M K 2001 An illustrated Case for Active Learning. University of North Carolina Retrieved October 17, 2017 from http://www.unc.edu/~salemi/Active_Learning/Illustrated_Case.pdf
[58] Sweller J 2006 The worked example effect and human cognition: Learning and Instruction (New Jersey: Educational Technologies)
[59] Saweckngam W 2012 Pipeline Instructional Teaching: How to teach effectively in the context of education that focuses on results Journal of Education, 40 pp 255–272
[60] Shenker J I, Goss S A and Bernstein B S 1996 Instructor's Resource Manual for Psychology: Implementing Active Learning in the Classroom Retrieved October 17, 2017 from http://s.psyh/uiduc.edu/jskenker/active.html
[61] Silberman M 1996 Active Learning. Boston : Allyn & Bacon. Strategies: Active Learning Retrieved October 17, 2017 from http://www.ku.edu/~etc/resources/teachingtips/active.html
[62] Sinlarat P 2002 Research-Based Learning (Bongkok: Chulalongkorn University Printing House)
[63] Sirijanchuen M 2011 The teaching a large group in Gsoc 2101 the development community. Approach to learning by Active learning and using e - leaning to develop a model of teaching in higher education, learning and academic achievement of students: Chiang Mai Rajabhat University
[64] Songkram N 2012 The Development of Blended Learning Model with Active Learning for Knowledge Construction and Creative Problem Solving Ability for Undergraduate Students (Research Grants Chulalongkorn University)
[65] Suwannatthachote P 2008 Active Learning. Retrieved October 17, 2017 from http://www.academic.chula.ac.th/elearning/content/active%20learning_Praweenya.pdf
[66] Tantiphlachiva K 2000 Psycho-Intellectual Model: The line is used to create lesson plans Of Pre-School Children (BangKok: Edison press product.co.,ltd)
[67] Thipakorn B 2007 The Development of tecturer's Potential in higher education institutions. Paitoon Sinlarat (Editor) Professional teacher: Concepts tools and development (Bangkok: Chulalongkorn University Printing House)
[68] Theradakorn S 1999 Educational Psychology Bangkok: Department of Psychology and Guidance (Faculty of Education Phranakhon Teacher's College)
[69] Thepworachai A 2000 Active Learning (1st ed.) (Bangkok: Academic Welfare Scholarship)
[70] Thomas J 1972 The variation of memory with time for information appearing during a lecture Studies in Adult Education 4 pp 57–62
[71] Toonthong S 2002 A Development of an Authentic Assessment Model. Dissertation Ed.D.(Testing and Measurement) (Bangkok: Graduate School. Srinakharinwirot University)
[72] Wattana B 2003 Active Learning Academic Journal 6 30–34
[73] Walailak University 2012 Active Learning (Copied from Walailak University)
[74] Ward R 1998 Active, Collaborative and case-based learning with Computer based case Scenarios C 30 pp 103–110
[75] Wuttiwan W 2010 The effect of teaching science by using the active learning method to enhance science achievement and problem solving ability for Students in Matthayomsuksa (Master Thesis, Burapa university)