Ideas for Creation: A Comparison of the Learning Results of Three-Dimensional Images between Active Learning and Child-Centered Education of Product Design Students

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Abstract—This research conducted a comparison of the learning results for the creation of three-dimensional images between active learning and child-centered education. The population and group sampling comprised 90 freshmen students in the Design Education program of King Mongkut's Institute of Technology Ladkrabang during the Academic Year 2019-2020. Similarly, the population was classified from the selection of systematic random sampling with 45 people for active learning and 45 people for child-centered education. In addition, the research tool used in this research was knowledge and skills test for the students, which was an appropriate test with the simplicity and ability to categorize, accordingly (P = .64; r = .62). The results showed that the students who were studying active learning had higher scores than those studying child-centered education, which had a statistical significance of .05. This case brought the positive features of each of the two methods to be integrated as mixed learning that would also be suitable for the study program of the students. As a result, it was found that the pretest and t post-test had a correlation (Sig. = 0.000) in a positive direction (r = 0.492), as well as displayed the post-test scores at a higher level than the pretest scores, thus having a statistical significance level of .05.

Keywords—Idea, three-dimensional images, active learning, child-centered education, product design

1 Introduction

The learning process in the twenty-first century is significantly being integrated with the teaching pattern through a variety of tools and teaching media [1]. As a consequence, this has become relevant for the transferring characteristic of knowledge to stimulate students to be interested in learning through intelligence [2]. Therefore, designed learning is essential for developing the learning patterns that could conform to the ever-changing world in the twenty-first century without creating only the students' own knowledge.

However, from the knowledge of modern product design students, this should promote the students to have their own thoughts and imagination through active learning in terms of enhancing their intelligence with real action processes [3]. Thus, this would direct the knowledge into the learners with effectiveness by using active learning and child-centered education. In contrast, these methods have clearly gained their own specificness with regard to the learning processes, strengths, and weaknesses in varying levels [4]. As such, each learning process was compared to the copoints on the same core, which are also called the aiming goal to assist the learners to gain knowledge from the action or real performance with effectiveness. As a result, this has become the learning characteristic for the promotion of having the analytical skills and imagination for learners.

Furthermore, the learning processes from active learning and child-centered education could be applied with the designed learning. In this case, this would not only depend on textbooks, but also involve the intellectual knowledge from students' own analysis causing their cognitive knowledge processes to gain the highest level of effectiveness [5]. Similarly, this would also assist the students to utilize the knowledge from active learning to be applied with the creative designing of three-dimensional images as widespread products, including promoting the creative ideas for learners at a broader level [6].

2 Materials and Methods

2.1 Objective

To conduct a comparison of the learning results in designing three-dimensional images from product design students by using both active learning and child-centered education.

2.2 Scope

1. The population comprised 90 freshmen students in the Design Education program of the Department of Architectural Education and Design, Faculty of Industrial Education and Technology, King Mongkut's Institute of Technology Ladkrabang during the Academic Year 2019-2020.
2. The above-mentioned group sampling was classified into two groups consisting of 45 people each. The selection method used the group sampling of systematic random sampling.

The research tool was the test of the principle of three-dimensional imaging that had five subjects. The two groups used the learning procedure methods of active learning and child-centered education.

Table 1. Quality assessment test to measure the learning results by creating three-dimensional images

| Test Subject	P	r	Quality Assessment Test from Value P and Value r	Test Attribution
1 Imagination	.54	.90	Good	Suitable difficulty and easy classification.
2 Beauty	.70	.45	Good	Suitable difficulty and easy classification.
3 Eyesight view	.73	.42	Good	Suitable difficulty and easy classification.
4 illusion	.51	.94	Good	Suitable difficulty and easy classification.
5 Theory Principle	.74	.47	Good	Suitable difficulty and easy classification.
Total	.64	.62	Good	Rather suitable difficulty and rather easy classification.

From the test, it was found that the value of Discrimination: P was able to be categorized easily as being an appropriate test as well as the part of the Difficulty: r in the test was also easy for making the scores to receive a good classification (P = .64; r = .62).

Data analysis: This demonstrated the mean, standard deviation (S.D.), and independent t-test for making the comparison about the learning results between the two group samplings.

Research design: This research focused on the study of the results under the title of the principle of three-dimensional imaging (3D) for the two groups with the differences in the teaching methods between active learning and child-centered education, and this was able to make a comparison between the two teaching methods for searching their suitability by creating knowledge of the above-mentioned principle for the freshmen students in the Design Education program.

2.3   Research framework

Table 2. Working framework
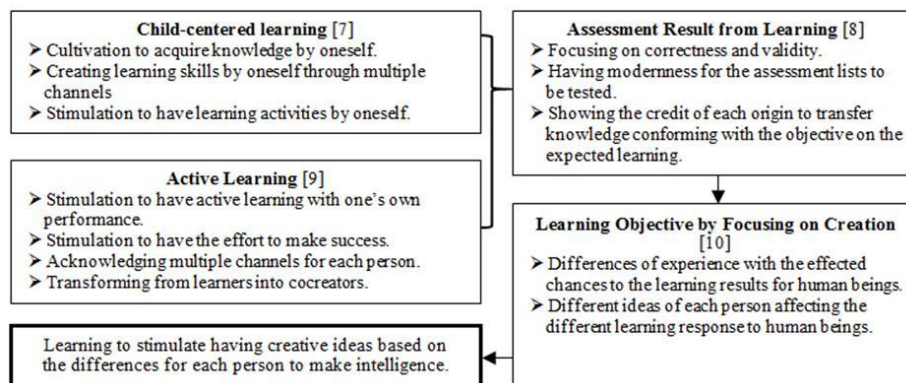
3 Results

The active learning step of the student groups was based on the tools; such as, text-books, exercises in and outside the classroom, including the promotion of creative thinking activities, knowledge test after learning in the classroom, and other related aspects (Tables 3 and 4).

Table 3. Activities in the classroom according to the concepts of the active learning procedure.

Activities in the Classroom	Needed Goal	Promoting Activities	
		Intelligence	*Skill*
1. Learning the contents of the lessons and knowledge creation of the theories.	➢ Relevant knowledge of the theory with the three-dimensional images from stimulated learning between instructors and learners to respond by asking and answering questions [11].	✓	
	➢ Broad knowledge with a variety of integrated knowledge to develop multiple knowledge [12-13].	✓	
2. Practicing work from presenting their own ideas.	➢ Students joined groups and presented their opinions by brainstorming to solve the problematic questions and answering with creative ideas [14-15].	✓	✓
	➢ Criticizing the ideas from friends' groups to present creative ideas through the beauty and new aspects of three-dimensional images [16-17].	✓	✓
3. Practicing designing and creating three-dimensional images with the principles and concepts.	➢ Writing about the images to present thoughts and joining to express opinions about other students' work [18].		✓
	➢ Practicing the writing skills about the three-dimensional images as the concept to gain drafting writing skills and writing about images for communicating to other people [19].		✓

	➢ Learning with intellectual integration into in-depth skills through active learning from memorizing with effectiveness.	✓	✓
4. Practicing to produce models from the concepts through active learning.	➢ Learning by manufacturing a model with a three-dimensional attribute to be ready for working.		✓
	➢ Designing the communicative concept through the presentation of the methods of the product model from the intellectual process with special intelligence [18].	✓	
	➢ Connection of intelligence from the expression of active learning [20].	✓	✓
5. Bringing creative work to be applied with the requirements of the communities and local areas.	➢ Result of the presentation from the thoughts of active learning by the required learners reflecting about applying their thoughts with an improved design.	✓	
	➢ Eagerness from the feeling of learning to improve the thinking, designing, and agreement methods as significant and high flexible skills of the twenty-first century [21-22].	✓	✓

From the learning atmosphere of active learning in the classroom, it was found that the students had high concentration in the contents of the lesson of the creation of three-dimensional images from the instructors. Thus, this resulted in the students fully understanding the relevant principles of the theory with the objectives of the units' lesson. Similarly, as a consequence of the active learning skill, the students were able to make the performance have a positive result from the teaching to gain a positive level. In contrast, from the creative concepts from the students' work, this showed the performance at a lesser level with the learning and performance in terms of the instructor's presentation in the classroom. Therefore, this appeared as a framework with a high level of effective creativity, except for affecting thinking outside the box to begin the new creative idea differently from the teaching at a lesser level. In this case,

it was congruent to the structure of the active learning teaching patterns that demonstrated the negative effects of the creative skills as the requirements of intellectual independence from the learners with significant roles.

Table 4. Activities in the classroom as a learning procedure framework
of child-centered learning.

Activity in the Classrooms	Required Goal	Promoting Activities	
		Intelligence	Skill
1. Instructors guided the problems for stimulation.	➤Stimulation for seeing the importance of the three-dimensional images and theory principle based on questioning with the requirements for additional learning stimulation [23].	✔	
	➤ The students draw the intellectual drafts about problems with the creation of three-dimensional images in design [24].	✔	✔
2. Presenting the gathered results from mapping.	➤The students presented the gathered results with their classmates to understand and learn new things about different issues.	✔	
	➤Criticizing classmates' ideas widely and concluding the issues suitably with flexible thinking skills in creative ideas with beauty and view creation issues as the main part [25].	✔	✔
3. Designing activities with three-dimensional images as principles and concepts [26].	➤Creating three-dimensional images activities based on classmates' participation to exchange the creative skills together [27].	✔	✔
	➤Learning designing skills and practicing writing skills of the three-dimensional images gained from classmates by exchanging ideas and skills [19].		✔
	➤Learning with intellectual integration into the learning skills to gain effective memories.	✔	
4. Practicing the creation of the model as a concrete design [28].	➤Gathering for the modeling of students' productions to fulfill the thoughts among classmates.		✔
	➤Representing ideas by beginning to take action in factories for stimulation to transfer thoughts and craft skills [29].	✔	

	➤ Intellectual skills with action learning skill's connection based on creative ideas as the production modeling framework of the concepts of the three-dimensional images.	✔	
5. Applying the model work with the response of the community's requirements [30].	➤Creating attributes to reflect back to customers and the community's people in schools to the satisfaction for gaining intellectual skills by listening and understanding people's thoughts [31].	✔	✔
	➤Stimulating to gain the effect of learning from applying the products as the result of the creation of the three-dimensional images with concrete attributes to be significant intellectual skills in the twenty-first century [21-22].	✔	

From the learning atmosphere of the learning procedures of child-centered learning, it was found that the students had the activeness to join in expressing the involved knowledge of the concepts as thought mapping in different levels. Thus, this resulted in different learning requirements for the creation of the three-dimensional images to exchange the knowledge of the students in the classroom. With this case, this involved a creative idea at a high level, except for gaining the perfection of the three-dimensional masterpieces at a lesser level due to the excessive method of the students. Then, there were some creative methods of the students that were not successful in the production step that was congruent to the learning concept with the aim of the result at a high level for creative ideas. As a result, this had a lesser opportunity to be accomplished with the increasing of the creative ideas [32].

Moreover, the test procedure was involved with the knowledge creation method from the creative idea of using three-dimensional images for the students. In this case, this showed the relevance of the ideas relating to the intellectual skills and action learning skills with a different result [33-34]. Similarly, according to the creative thought levels from the intellectual skills, this presented the different levels of the expression of the students' behavior in the classroom and the effects of the successful trend as the unit learning goals (Table 5).

Table 5. Comparison of the result of students' satisfaction after the learning test in the classroom with active learning and child-centered learning (n=45).

Specific Assessment List	Active Learning		Child-centered Learning		Comparison	
	Mean	*S.D.*	*Mean*	*S.D.*	*t*	*Sig.*
1. Learning conditions in the class-room; tidiness; classroom control; concentration.	4.69	0.47	4.24	0.65	3.740*	0.000
2. Increasing of intellectual skills or availability of effective knowledge.	4.27	0.65	4.04	0.67	1.589	0.058
3. Modeling of active learning skills and writing of the creative three-dimensional images.	4.13	0.66	4.18	0.65	-0.322	0.374
4. Feeling confident in gaining intel-lectual knowledge with action learn-ing skills in the classroom.	4.20	0.66	3.56	0.72	4.409*	0.000
5. Feeling fun in learning.	3.87	0.69	4.56	0.50	-5.393	0.000
6. Having independent feelings with independent learning.	4.36	0.57	4.31	0.60	0.361	0.359
Total	**4.31**	**0.66**	**4.16**	**0.69**	**2.831***	**0.002**

* This was different with a statistical significance level of .05.

a) From the learning conditions in the classroom and the feeling of confidence in the classroom, it was found that active learning in the classroom had the mean of satisfaction for the students at a higher level than that of child-centered learning with a statistical significance level of .05.

b) From the increasing of intellectual skills and independent learning, it was found that active learning in the classroom had the mean of satisfaction for the students at a higher level than that of child-centered learning with a statistical significance level of .05.

c) From the increasing of the performance skills, it was found that child-centered learning in the classroom had the mean of satisfaction for the students at a higher level than that of active learning with a statistical significance level of .05.

d) From the amusement for learning, it was found that child-centered learning in the classroom had the mean of satisfaction for the students at a higher level than that of active learning with a statistical significance level of .05.

Hence, from the comparison of the students' satisfaction to the two learning proce-dures, it could be concluded that active learning in the classroom had the mean of students' satisfaction at a higher level than child-centered learning with a statistical significance level of .05.

Table 6. Test result of the students' intellectual skills and active learning skills (n=45).

Specific Assessment List (Assessment Scores with Each of 50)	Active Learning		Child-centered Learning		Comparison	
	Mean	*S.D.*	*Mean*	*S.D.*	*t*	*Sig.*
1. Imagination with intellectual promotion.	38.91	3.66	41.72	3.28	-3.835*	0.000
2. Beauty from practicing skills.	42.21	3.31	33.63	6.58	7.817*	0.000
3. Suitable eye views.	41.98	4.54	31.65	5.69	9.518*	0.000
4. Suitable illusion.	35.37	6.88	32.76	7.61	1.707*	0.046
5. Theory principle about knowledge.	42.47	3.49	30.12	6.27	11.543*	0.000
Total	**40.49**	**5.21**	**33.59**	**7.05**	**12.923***	**0.000**

* This was different with a statistical significance level of .05.

From the testing scores to promote the intellectual skills of the creation of three-dimensional images, it was found that the students undertaking child-centered learning had test scores at a higher level than the students undertaking active learning with a statistical significance level of .05.

From the testing scores of the beauty from practicing skills, the suitable eye view, the suitable illusion, and the theory principle about knowledge of the four fields, it was found that the students undertaking active learning had higher scores than the students undertaking child-centered learning with a statistical significance level of .05.

In conclusion, according to the overall test results of the creation of three-dimensional images, it was found that the students undertaking active learning had a mean score of 40.49, and the students undertaking child-centered learning had a mean score of 33.59. Thus, this presented that the results of learning with active learning had a higher level than learning with child-centered learning with a statistical significance level of .05.

3.2 The concluding step of the direction of the suitable learning pattern with the learning unit of the creation of the three-dimensional images of the students was based on the test of these teaching methods that contributed to the result for the learning pattern's creation with the integration of positive features. Then, it was introduced into the learning pattern with the student groups (Table 7).

Table 7. Integration with the learning procedure's planning in the classroom as a new pattern of the creation of three-dimensional images.

Component in the Learning Unit of the Creation of the Three-dimensional Images	Skill	Active Learning	Child-centered Learning	New Learning Pattern Integration (Integration for the positive points of active learning and child-centered learning with a suitable learning pattern as per the students' requirements in the classroom.)
1. Imagination: Intellectual independent promotion into broad creation.	Thought		●	➢ Applied during the learning with the requirements by allowing independence with the expressed stimulation for designing the creation without closing ideas.
2. Beauty: Practicing writing communication skills with three-dimensional images.	Craft	●		➢ Applied during the craft learning by emphasizing practicing and action learning by letting students do exercises with planning and taking action with the objectives.
3. Suitable eye view.	Thought	●		➢ Applied during the learning as relevant ideas and theories about the suitability between the eye view and beauty. ➢ Applied with an explanation about the learning to guide the action learning to gain a positive result.
4. Suitable illusion images.	Craft	●		➢ Applied during action learning from the students to gain a positive result. ➢ Determined to examine if the students applied active learning with the design.
5. Knowledge principle and theory.	Thought	●		➢ Applied for the learning of the relevant theories about the creation of the three-dimensional images emphasizing knowledge and memory learning. ➢ Determined the main contents by the instructors and presented to the learners for other knowledge issues.
6. Learning atmosphere in the classroom with the goal to develop concentration in the classroom.	Thought	●		➢ Applied for the classroom management patterns by the instructors to develop the core knowledge and give an opportunity for the learners to express ideas with the objectives of the learning content.
7. Intellectual field to be available with high effective knowledge.	Thought	●		➢ Stimulated to gain the intellectual skills as memory patterns from the origins and ideas of the thinkers and the international creators assessed by the test in the classrooms.
8. Active learning skills from the models and writing of the creative three-dimensional images.	Craft		●	➢ Stimulated learning based on child-centered learning with different requirement skills in each field planned with the creative concepts for each learner.
9. Have a feeling of confidence with the knowledge in the classroom.	Thought	●		➢ Stimulated seeing the importance of knowledge as being a positive result after learning in and outside the classrooms by aiming at generating a feeling of confidence.
10. Have a feeling of amusement with learning.	Thought		●	➢ Created positive attitudes in the classroom by stimulating views of creative concepts with effectiveness; creative concepts were created on the basis of happiness.
11. Have a feeling of independence and independent learning.	Thought	●		➢ Stimulated having continuous questions from the learning in the classrooms by leveling up the intellectual skills; independence was created from the questioning as the new main points.

The learning of active learning was integrated with the new learning issues as follows: 1) Beauty by focusing on practicing communication skills with images, 2) suitable eye view, 3) suitable illusion images, 4) knowledge principles and theories, 5) learning atmosphere in the classroom, 6) intellectual field to be available for high effective knowledge, 7) feeling of confidence on the knowledge in the classroom, and 8) feeling of independence and independent learning and other fields. With this case, according to all the above positive fields, this presented that the learning of active learning responded to the creation of the three-dimensional images for the students by being promoted with the active learning skills as high effectiveness.

In this case, the learning of child-centered learning was integrated with the new learning patterns as follows: 1) Imagination, 2) active learning skills of the creative models, 3) feeling of fun with learning and other fields. Then, according to the above positive fields, this presented that the learning of child-centered learning enabled a response with the creation of the three-dimensional images for the students by being promoted with the creative idea processes with high effectiveness.

Therefore, this enabled the integration of the learning patterns with the positive points of active learning and child-centered learning by applying them with the experiment groups, including modeling with the new developed learning conditions to examine the suitability of the new integrated learning patterns (Table 8).

Table 8. Learning assessment result and active learning with the new developed integration (n=45).

Specific Assessment List (Assessment Scores for Each of 50)	Pretest		Post-test		Comparison of Pretest and Post-test		Paired Samples	
	Mean	*S.D.*	*Mean*	*S.D.*	*t*	*Sig.*	*Correlation*	*Sig.*
1. Imagination and creative ideas.	27.56	5.827	38.17	6.820	15.878*	0.000	0.760	0.000
2. Beauty and stimulation of interests.	29.02	5.545	36.89	6.444	9.928*	0.000	0.615	0.000
3. Suitable eye view.	23.96	7.202	28.33	8.943	6.228*	0.000	0.852	0.000
4. Suitable illusion images.	25.92	6.181	36.10	5.841	11.204*	0.000	0.486	0.001
5. Principles and theories of the contents	20.96	3.347	40.44	3.788	25.046*	0.000	-0.066	0.666
Totals	**25.48**	**6.371**	**35.99**	**7.709**	**21.916***	**0.000**	**0.492**	**0.000**

* This was different with a statistical significance level of .05.

From the imagination and the creative ideas, it was found that the pretest and the post-test were correlated with each other (Sig. = 0.000), as the positive values had the same direction of correlation (r = 0.760), and the post-test scores had a higher level than the pretest with a statistical significance level of .05.

From the beauty and the stimulation of interests, it was found that the pretest and the post-test were correlated with each other (Sig. = 0.000), as the positive values had the same direction of correlation (r = 0.760), and the post-test scores had a higher level than the pretest with a statistical significance level of .05.

From the suitable eye view, it was found that the pretest and the post-test were correlated with each other (Sig. = 0.000), as the positive values had the same direction of correlation (r =0.760), and the post-test scores had a higher level than the pretest with a statistical significance level of .05.

From the suitable illusion images, it was found that the pretest and the post-test were correlated with each other (Sig. = 0.000) as the positive values had the same direction of correlation (r = 0.760), and the post-test scores had a higher level than the pretest with a statistical significance level of .05.

From the principles and theory contents, it was found that the pretest and the post-test were not correlated with each other (Sig. = 0.000), as the negative values had the opposite direction of correlation (r = 0.760), and the post-test scores had a higher level than the pretest with a statistical significance level of .05.

The concluding assessment result of the creation of the three-dimensional images was involved with the integration of learning between active learning and child-centered learning for the student groups. Additionally, it was found that all five components of learning in the classrooms of the pretest and the post-test were correlated (Sig. = 0.000), as the positive value in the same direction of correlation (r = 0.492). In this case, the score test for the post-test was at a higher level than the pretest and had a statistical significance level of .05.

4   Discussion and Conclusion

From the positive features for active learning with the creation of three-dimensional images of the designed product work by the student groups, this could be presented as eight components: 1) Beauty emphasizing the practicing of the images communication skills, 2) suitable eye view, 3) creation of suitable illusion images, 4) knowledge principle and theory, 5) learning atmosphere in the classroom, 6) intellectual field to be available for high effective knowledge, 7) feeling confident with the knowledge in the classroom, and 8) feeling of independent learning that was congruent with the learning pattern of active learning. Thus, according to the high effectiveness from the active learning practice, this had the trend to promote empirical learning that was congruent with the learners' behavior by being expressed with the increasing intelligence during the participation of the learning activities in the classroom [35-36].

From the positive features for child-centered learning with the creation of the three-dimensional images of the designed product work of the student groups, these features consisted of three components: 1) Imagination, 2) active learning skills of creative modeling, and 3) feeling of amusement with learning that was congruent with the learning pattern of child-centered learning. This applied documents and a variety of textbooks to promote learning that resulted in the development of high intelligence

for the learners. In this case, this was able to develop the independence skills and learning acceptance by oneself in the relevant ways [37-38].

The integration of the two learning patterns was able to be fulfilled as suitable learning with the three-dimensional image goals in designing the product work [39]. Thus, according to the results, this showed that the pretest and post-test scores for the student groups had correlation in positive ways that were in the same direction of correlation, including the post-test score result that gained a higher level than the pretest score with a statistical significance level of .05. Additionally, this was in accordance with the requirement of the concepts with the examination of the two-sides intellectual skills based on knowledge participation and assistance skills between the learners and the instructors. With this case, this demonstrated a positive trend to gain a better result of teaching successively, including the learning process with integration in multiple learning units contributing to better performance [40]. In contrast, provided that there was assistance from the classmates, this would make the learning stimulation gain the development of the social dimension and relationships until becoming a creative learning strength [41].

By directly applying one learning type with the same learning pattern, this contributed to eliminating some parts of the intellectual skills and craft skills. Furthermore, this directly affected the learning effectiveness of the three-dimensional images for the students, including the learners who were not prepared in the long term for practicing designing work after graduation [42-43]. Therefore, provided that the instructors applied an integration of the learning patterns of active learning and child-centered learning, this would fully generate the perfection to level up the knowledge and craft skills for the learners, including create interest with high effectiveness. Finally, according to the results for the student groups, this confirmed that the ideas had an increasing trend of generating better scores with the students after applying these two learning patterns simultaneously; the better result from the learners showed the additional skills [44]; such as, good thinking skill and flexible thinking skill after graduation from the classrooms [45-46].

5 Acknowledgement

6 References

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