Integrated learning of shared model based gallery project to improve research capabilities of educational students

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Abstract:
The research aimed at developing the integrated learning model that able to improve the educational students to do research. The developed integrated learning was shared model based gallery project (ILS based GP). The development results were tested through experiment in class with 369 students samples taken by assignment random sampling, continued with prospective and retrospective tracer study with 339 participants taken by cluster purposive sampling. Experimental data were collected by test and non test, while tracer study data were collected by document analysis, questionnaire, and indepth interview, and analyzed with percentage formula. The results showed the ILS based GP was effectivein improving:(1)knowledge about research; (2) appealing toward research methodology learning; and (3) research skill of educational students.

Educational students experience difficulties in understanding the research methodology in field (FTUM, 2013; Mukhadis& Ulfatin, 2012a; UM, 2007; Ulfatin, 2006).The indicators are showed with the weak of: the educational students mastery toward content substance, methodology, and scientific writing technique, and the length of final report completion. According to Soewardi, (2000), final report is scientific work that demanded to fulfill two requirements, logically certainand empirically accurate. The embodiment of the logic of inquiryis the stage to identify problems, determine theoretical framework, hypotheses formulation as consistent hierarchical procedure. While empirical testingrequirement is representation of variable operationalization, instrumental development, data collection process, hypotheses testing, and empirical science product. The scheme to fulfill those two requirements become essential substances of research methodology learning. The relationship of research methodology with final report by Wang (2007); Reigeluth, (1983) was considered as the requirement relationship. While Cheetham andChivers (in Le Deist and Winterton, 2005); and Posner & Keele (in Westera, 2001) called it as hierarchical relationship between know-that and know-how.

From the phenomenon above, it is demanded the development of learning model that able to facilitate the meaningful learning experience of student. Meaningful learning experiences are marked with the sensitive and critical attitude in problem solving based on scientific thought in the educational field(Mukhadis and Ulfatin, 2014a).Based on the theoretical and empirical investigation results the relevant learning alternative is "Integrated Learning of Shared model based Gallery Project (ILS based GP). Theoretical investigation results as foundations such as: (1) Jonassen (1982) about Content Treatment Interactionsapproach (CTI)and Aptitude Treatment Interactionsapproach (ATI); (2) Paisak (2006); Jensen (2007); and Breadberry &Greaves (2007)about development of neuroscience, especially cognitive neuroscience; (3) Reigeluth (1983); and Reigeluth & Merill (1984)about teaching strategies; (4)Kovalik (1994) about integrated thematic interaction (ITI);and (5) Fogarty (1993)about integrated curricula. Empirical investigation by Cooper, Orrel, & Bowden (2010); Emslie (2012); Bellanca, Chapman, and Swartz (1997); Johnson and Johnson (2002); Arends (2004);Yuliati (2007); Fajar (2005);and Fogarty(1993)showed that the work integrated learningbetter than separated learningmodel in improving the academic mastery, skill, and student satisfaction. Beside that, investigation done by Mukhadis and Ulfatin (2014b)showed that the integrated learning more effective in improving the results quality and the learning interest in college.

The alternative learning meaningfulness potential at the modus of content treatment and learning modus. Modus of essential content treatment that is overlapping between concept, principle, and procedure with the shared model refer to the CTI theory (Jonassen, 1982; Fogarty,1993; Fogarty, 1997). Learning modus of gallery projectform based on the ATItheory (Jonassen,1982). ILS based GP is a thought paradigm synergy of CTI and ATI. The learning syntax (Koehler, Mishra, and Cain, 2011); Silberman(1996);Joice and Weil (1982); and Abduhzen (2013) is more students centered oriented,active, creative, challenging, enjoyable, and placing the class as learning center. Because of that, able to synergize knowledge, competence, and creativity dynamically through concept, configuration, contradiction, confusion, and ended by producing and academic project (Mukhadisand Ulfatin, 2014b).Beside that, urgency of development of ILS based GP for educational students is demand: (1)position of educational college as "educational mother" (General Directorate of Higher Education, 2011);and (2)graduates

of college should have four competencies (Peraturan Presiden RI Number8,Year 2012), those are attitude-value, work performance, knowledge mastery, and managerial capabilities.

Method

Research steps were modified from Borg and Gall (1992); Gall, Gall, & Borg (2003); Richey & Klein (2007); and completed by Mukhadis& Ulfatin (2014a)become a series of research for three years (2013—2015). The procedure included the development of model prototype, experiment, and tracer study. First year, it was done development to produce a validILS based GP prototype. Second year, it was done experiment to test the effectiveness of the model in improving knowledge and student interest toward research. The third year, it wasdone tracer study to test the model effectiveness in improving the research skill of educationalstudents.

Initial development to produce a valid ILS based GPprototype was done by documentation analysis, interview, focus group discussion, and workshop. Model effectiveness test to improve knowledge and interest toward research done through Pretest-Posttest Control Group Designto 369 students in two public and privatecollege.Data were collected by test and non test, and analyzed with t-test. Effectiveness test to improve research skill of student done by Retrospective Tracer Study Designto 339 students after learn. Data were collected through document, semi-structured questionnaires, and indepth interview, and analyzed descriptively and qualitatively.

Results and discussion

Prototype of ILS Model Based GP

ILS based GPfrom the development based on order and activities of 16 sessions presented inFigure 1.This model, developed based on theme, modus, transaction way, results, evaluation system of learning. Theme in each session from session 1 to 16 were selected and organized based on intersection of among essential slides of two overlapping subjects;with shared model (Fogarty, 1997). Interaction modus with multi strategies, either in or out of campus.The how to learn is not only classical in class with supervising lecturer, but varied with group learning, and individual learning, either in class or out of class (Joni, 1996). The use of learning resources, either by design or by utilization optimally (AECT, 1977).The expected results are hard skills, and soft skills(Agius, et. al, 1992).Evaluation system oriented to grow the learning how to learn, and learning cultureat the student through self and group evaluation.
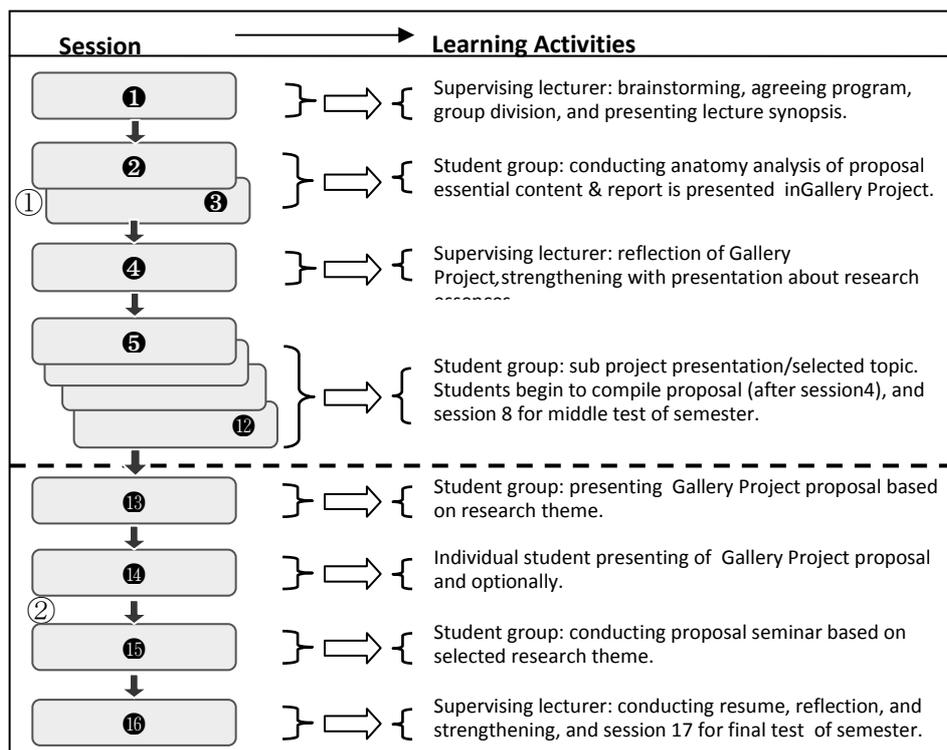
Figure 1Learning SyntaxofILSBased GP Model

Results of expert test and small group test as validation of learning model can be interpreted that the underlying principles were suitable, syntax of model in good category; social system of model was very good; rule of supervising lecturer in model was very good, model supporting system was suitable, and learning effect and model evaluation was very good. Validation results summary of ILS based GP given in Table 1.

Table 1.Results of Expert andSmall Group Validation toward LearningPrototype

Aspects	Mean of Expert Valuation	Valuation Category	Mean of Small Group Valuation	Decision
Underlying principle of the learning model	3,75	Very suitable	3,48	VTR
Syntax of learning model	3,42	Good	3,20	VTR
Social system of learning model	3,80	Very good	3,72	VTR
Role of supervising lecturer in learning	3,70	Very suitable	3,77	VTR
Supporting system of	3,40	Suitable	3,27	VTR

learning model				
Learningeffect and evaluation	3,70	Very good	3,52	VTR
Limitation of learning model	4,00	Very suitable	3,62	VTR

VTR = Valid without revision

ILSmodel based GP as representation of active and innovative principle oriented to the following. Learning as multi direction process between learner and various learning sources by placing each individual has different style, modus, and way. Class was used as learning center not as teaching center that able to facilitate the culture of learning, un-learning, and re-learning (Kasali, 2012; and Harefa, 2010). Facilitating the high level thought development with jargon "tell me, I forget; show me, I remember; and Involve me, I understood"(Kovalik, 1994).

Learning syntax was developed based on principle of "exploration, discovery, and application of concepts to the real word"by confronting connectivity of brain research, teaching strategies, and curriculum development (Kovalik, 1994). Brain research,especially the cognitive neuroscience which study about existence of structure and development of human brain (Paisak, 2006; and Jensen, 2007). Neuroscience finding in education, related with the individual uniqueness, specialty, synergetic, hemisphericand domination, imagination and fact, synchronous work, ratio symbiosis, emotion, and spiritual, and male and female brain. (Paisak, 2006; and Greaves & Bradberry, 2007).The main foundation in transaction arrangement and learning management is the learning variable theory (Reigeluth, 1983), and CTI, ATItheory from Jonassen (1982).Curriculum development, mainly that related with the planning, implementation, and evaluation and development of curriculum in learning, either in ideal, formal, instructional, operational and experiential fields. Curriculum development to make it effective, efficient and right on target by Agius, et. al, (1992) was suggested to consider aspects of thinking skills, social skills, values and attitudes among subject area.

Social system at the class background was more moderate, the students interact with various learning sources. The system is embodied in the student freedom suitable with the agreement in forming group, selecting modus, and the how to learn, selecting topic, finding and study of references, discussing the study results, and organizing in the form of group work result project, preparing material for gallery project, and role division in presenting gallery project, and visiting gallery project of other group. The social system facilitates interaction among students, inter group or among groups, student with supervising lecturer, student with practitioner and other expert in field, so able to improve the enthusiasm in expression and creation of students (Abduhzen, 2013; Adimihardja, 2000; and Soewardi, (2000).

Supervising lecturer function was more as facilitator and resource person in facilitating the determination of investigation content, group formation, direction and goals, and learning transaction logically, objectively, egalitarian, challenging and enjoyable. The role was expected able to support the creation of interaction for various learning sources optimally suitable with modus and the dialogical and meaningful how to learn(Harefa, 2010; Pranoto, 2013).Able to facilitate learning person andfast-learner in context of multi space and time (Cahyo, 2013) for students.

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Learning effect was more direct to the effective, interesting, challenging, enjoyable, and meaningful. The indicators   such as, the students: (1) formed group suitable with interest,(2) divided task, either in big or small project deliberatively,(3)   identified, determined, found the needed information wuitable with the group task, (4) determined information sources and the scheme to find and collect the needed information suitable with the task and group agreement, and (5) packaged and presented information in gallery projectand class discussion, and ended with activities of reflection or strengthening, either from students or the supervising lecturer.

Knowledge of Educational Students toward Research
Significance test of knowledge improvement difference of the educational students about research between experimental and control group based on score mean of combined test results (objective, subjective, and proposal task) with t-test. It was used because the data fulfill the normality, and homogeneity requirements. Summary of combined test score of t-test shown in Table 2.

Table 2Summary of Combined t-test of Objective, Subjective, and Proposal TaskScores

	Class	n	df	t_{cal}	Sig.	Interpretation
Sample	Experiment	173	337	4,582	0,000*	There was differences
	Control	166				

) Significance<0.05

Based on Table 2 the t-calculation = 4,582, with significance = 0,000 **<0.05,** can be interpreted, that there was significant difference between test score (combination of objective, subjective, and proposal task) between experimental and control group. It mean, ILS based GP was more effective to improve the knowledge of students about research.

The results can be explained based on the framework about learning model characteristic and study field characteristic. First, ILS based GPwas developed based synergy of CTI and ATItheory from Jonassen (1982). CTItheory to organize the overlapping essential content, while the ATIto accommodate the modus difference and the how to learn (Bloom in Keefe, 1987; and Sugden, 1989). With the content treatment interaction and accommodate the individual differences, the learning model has potentials (1) to be holistic, learnerandprocess oriented, meaningful experience, authentic, active, and product and process evaluation (Fogarty,1993; Kumar,et al., 2008); (2) to improve the understanding of student about learning at the meaningful level (Joni, 1996; Silberman, 1996); (3) to facilitate the development of mindset how to the solve the problemnot mindset how create the new problem(Nuh, 2014) as the main character of college graduates(Wijaya, 2004 in Mukhadis, 2012b; Kasali, 2012). Theoretical and empirical support of the learning model was affirmed by Cooper, Orrel, and Bowden (2010); Van-Rooijen (2012); Arends (2004); Fajar (2005); Bellanca, Chapman, and Swartz (1997); Johnson and Johnson (2002); Mukhadis, (2013)that the combination of integratedand project model that were followed with appropriate assessment alternative able to improve the learning meaningfulness (Phillips, 1991; Cronbach, 1984; and Nunnally, 1978).

Second, characteristic of research methodology and final project which were experimented aimed at facilitating the development of scientific thought competences of the students (FT UM, 2013). The scheme of scientific thought is representationofdeductive and

inductive thought which are synergized systematically. Deductive thought is rational theoretic that is logical. While inductive thought is based on empirical phenomenon under observation and can be measured. Representation of scientific thought product in the form of finding, proving, and development (Sugiyono, 2013; Ulfatin, 2013).The knowledge group is according to Hanafin (2014)and (Soewardi in Mukhadis, 2015), knowledge that is required to fulfill the requirement of logically certain and empirically accurate. The logically certainis requirement that is relates with certainty of logic, that is mathematic. While the empirically accurate is requirement that relates with the accuracy in conducting observation, and measurement precisely.Second, the required characteristic essentially bridging the synergy between conceptual and empirical world(Balian in Salladien, 1997).

Appealing of Educational Student toward Learning

Significance test of the appealing improvement difference of educational students toward the learning between experimental and control group based on the mean of questionnaire score with t-test. The t-test results of the questionnaire given in Table 3.

Table 3.Summary of t-test of StudentsAppealing Score

Class		n	df	T_{cal}	Sig.	Interpretation
Sample	Experiment	173	337	5,015	0,000*	There was difference
	Control	166				

) Significance<0.05

Based on Table 3, the value of t-calculation = 5,015, with significance = 0,000 *<0.05,* can beinterpreted there was significant difference between the score of students interest between experimental group with control group. It means, the ILS based GP was more effective to improve the student interest toward the learning.

The results could be explained from the underlying principles and the learningsyntax. First, the underlying principle for active and innovative learning(Keller-Schneider, 2014) which was built based on theoretical assumptions that: (1) learning is multi direction interaction processes between the learner and the learning sources (by design or by utilization) to build a new mean; (2) different individual need different learning activities and style and modus (individual differences);(3) synergize appropriately between modus and the how to learn able to grow the initiative and learning action, and (4) the role of learning management is more as conductor who orchestrate the learning activities. The multi directions interaction between learner and the learning sources (by design or by utilization) as embodiment of facilitation in building new meaning as the representation of learning experience. The learning source of by design, that is the existence intentionally designed to reach the learning goals. While the learning source of by utilization, the existence is not designed to reach the learning goals, but able to improve the effectiveness and interest of the learning (Reigeluth, 1983).

Learning syntax that accommodate the style and different way in learning. The main foundation for group formation in learning is adjusted with the interest, either toward task, investigation topic, or individual motivation of the students (Kasali, 2012; Keefe, 1987). The syntax accommodate the individual difference diversity, either cognitive, affective, or psychomotor aspects, that relevant with the investigated field. The discretion in the learning activities has potentials to bring nearer to the type and style of learning from each individual into a suitable group with selected modus and learning way (Keefe, 1987,

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Joni, 1996; Wang, 2007; and Silberman, 1996). The condition become the stimulant to reach goals in facilitating student to interact with various direction, especially with good relevant learning sources, either by design or by utilization.

Beside that, the discretion in selecting discussion topic, research topic, and the research approach, and discretion in discussion, with peers (small group or class discussion), discussion and consultation with the supervising lecturer and other resource person that make the learning become meaningful (Emslie, 2012; Freudenberg, et al. 2012; Van-Rooijen, 2012).The meaningful learningevent is marked with the presence of topic mastery, able to interpret the experience from investigation topic to steps of problem solving through research activities; able to reach internalization of the investigated field in the attitude-value, either in thought or action, and able to represent the research methodology learning in proposal writing performance as final report in finishing the study.

Skills of Educational Students in Research
Significance test of the difference of research skill improvement for students between experimental and control group based on tracer study results with percentage. The measuring rod of the research skill improvement based on (1) final score of research methodology for the students, (2) proposal percentage which is continued become final report, and (3) the score of the final report for the student (those who finished the final report). Summary of analysis results for research skill improvement of the students in Table 4.

Research skill improvement of the students with indicator of research methodology score:(1) score presentation of (A & A-)and (B+&B) experimental group were better than control group (58,62% &39,66%)and (47,92% and 36,74%).The otherwise, the percentage of students who get lower than B (<B) the experimental group were lower than control group (1,72% and 16,27%). The results showed that ILS based GP able to (1) improve the learning content understanding meaningfully,(2) facilitate the interpretation of meaningful understanding to the procedure of identification, finding, packaging, and reporting information, and (3) internalize the positive value in developing learning initiative by placing class as the learning center than teaching center.

Table 4.Summary of Research Skill Improvement Results of the Students

Group	Research Methodology Score			Amount of Continued Proposal			Final Report Score		
	A & A- (%)	B+&B (%)	<B (%)	∑ (%)	TR (%)	R (%)	A & A- (%)	B+&B (%)	<B (%)
Exp	58,62	39,66	1,72	72,42	12,07	60,35	41,38	12,57	-
Cont.	47,92	36,74	16,27	69,39	8,20	61,19	30,61	18,37	-

The strength of ILS based GP can be explained as follow. First, according to Silberman, (1996) and Joni (1996), that packaging strategy of learning experience was more oriented to the meaningfulness of the relation of conceptual, procedural, theoretical elements, either intra or inter study field, has potentials to improve the meaningfulness of learning. Second, principles of organaizing to the overlapp essential content with CTI, and selection of modus and the how to learn with ATI (Jonassen, 1982), has potentials to improve the

learning meaningfulness (Bloom in Keefe, 1987and Sugden, 1989). Third, relevance of learning model development foundation by synergizing the integrated and project method at the college background from Arends (2004) and Fajar (2005); Bellanca, Chapman, and Swartz (1997); and Johnson and Johnson (2002)able to improve the meaningfulness of learning. The further implication of ILS based GP in college able to facilitate the logical capability development and placing class as the learning center. (Kasali, 2012; Pranoto, 2013; and Abduhzen, 2013).

The research skill improvement for the student with indicator of proposal percentage that was continued to be final report (1) proposal percentage from the research methodology subject which was continued to be final report at the experimental and control group (72,42%, and 69,39%). The results can be explained from the characteristic of research proposal as the form of scientific writing. Proposal as the representation of scientific work, according to Adimihardja(2000) is knowledge group that is true in reality. The knowledge group is empirical that required to fulfill two main characters, logically certainand empirically accurate (Soewardi, 2000). Demand to fulfill thelogically certain is requirement in the logical alignment. While the fulfillment of the empirically accurate is the accurate requirement in defining, tool preparation, and doing measured and precise observation. With other world, success in mastering the goals of research methodology learning (in score) able to facilitate the embodiment of meaningful learning, correlates with the success to reach the final project learning.

The research skill improvement for the students with indicator of final project score percentage(those who finished the final project).The results showed the final project score obtained by experimental group compared with the control group: score A and A 30,61%); score B and B (12,57% and 18,37%); and score B (0,00% and 0,00%). The results could be explained, either at the experimental or control group there were no students who get score lower than B (B). But if seen from the student percentage who got A or A , the experimental group higher (41,38%), than control group (30,61%).Also the otherwise, from the percentage of score B and B, experimental group lower (12,57%), than control group(18,37%), although substantively, no significant differences.

The percentage superiority of score A and A▬, at the experimental group showed that ILS based GP with all of its characteristic able to facilitate the formation of framework about the logic of inquiry, and empirical testing. It was suitable with opinion of Fogarty(1993 and 1997);Weasmer & Woods (1998) that the characteristic of ILS based GP was holistic,orient to learner, process, meaningful learning experiences, authentic, active,and process and product evaluation that able to facilitate the formation of framework about research as effort for scientific problem solving. Beside that,Cheetham and Chivers (in Le Deist and Winterton, 2005); and Posner & Keele (in Westera, 2001) stated that the meaningful understanding from theory or concept relate with know-that as representation of cognitivecompetencewilldetermine the skill level in know-how as representation of functional competences. With other words, ILS based GP able to develop the thought abilities at the high thinking to find, collect, package, useand develop information, either from dimensions of hard skill or soft skill (Harefa, 2010; Wijaya, 2004in Mukhadis, 2012b; Kasali, 2012).High level thinking, in developing hard skills and soft skillsinformation can be facilitated with learning strategy that orient to the inquiry based learning(Hanafin,2014); Bhargava & Pathy,2011; and Wang, 2007) through   active asking, problem solving, critical thinking, and synthetic thinking.

CONCLUSION

Based on the results interpretation and discussion, it can be concluded first, component validation of ILSbased GP prototype which consist of the underlying principles were very appropriate, social model system was very good, the supervising lecturer role in very good category, model supporting system in category of appropriate, and lecture effect and evaluation were very good. Second, ILS based GP was very effective to improve the knowledge of students about research. Third, the ILS based GP was effective to improve the interest of the students toward learning. Fourth, ILS based GPwas effective to improve the research skill for the students. Fifth, in general, the ILS based GP was effective to improve the research capabilities (knowledge, attitude, and skill) of the educational students.

SUGGESTION

First, the decision makers in college, educational institution, and educational workers, the findings can be used as reflection and self evaluation in effort to develop innovative learning. Especially in placing class as learning center, especially in developing the research capabilities of the educational students.

Second, the lecturer especially the lecturers of research methodology, the ILSbased GP can be adopted and developed further in improving the service qualities and learning results continuously. Especially, in developing the logic of inquiry and the empirical testingin scientific problem solving, especially at the students.

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