RESEARCH-BASED EXPERIENTIAL LEARNING AT HIGHER EDUCATION

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***Abstract*—Student learning can be through learning strategy while doing. Lecturers with students involved in research activities in the field of land classification and in the laboratory (experiential learning). This learning strategy is meant for mastering concepts and practicing scientific thinking. The object of research is soil in the village of Sumberbrantas, the area on the slopes of Mount Arjuno as a vast expanse of farmland. Sumberbrantas villagers are almost all farmers and are centers of vegetable producers. Based on the soil taxonomy in Sumberbrantas Village including the order Andisol. Specifically, we need to know the level of great group and sub group to be able to give information according to the land use. Experiential learning is designed to engage students in full-time research in the field and laboratory tests. The results that students have the capabilities of knowledge and scientific work skills.**

Keywords— experiential learning, research, scientific work skills

I. INTRODUCTION

Geography learning sees space as a whole character built by synergy between spatial components. Character of a space can be studied distribution, interrelation, corology, and its description through field work [1]. Space that is always dynamic, as the spatial component works and synergizes [2], so soil is dynamic. The soil as an individual has characteristics that can occur due to the synergy of its forming factor. Looking at the soil profile and analyzing it can reveal the physical, chemical, and biological properties of its epipedon and sub surface horizon [3]; [4];[5]. The researcher's land-giving through direct experience, learning by doing [6] and challenges [7] to students in real, factual, and natural conditions are hard to forget [8]. Students practice doing scientific activities, have the attitude of scientists, and able to think scientific through experiential learning. Experiential learning is a learning experience that is often different from literature or classroom learning [9].

Experiential learning is designed in the form of soil classification research. Students learn firsthand how to distinguish the properties of the soil from each other, and classify the soil into specific classes based on the similarity of nature possessed. Soil grouping based on soil properties and characteristics [10];[11]; [12]; [13] that can be observed in the field and in the laboratory [14] on the keys to soil taxonomy 2014 [15].

Experiential learning is implemented in Sumberbrantas village, especially on Andisol soil as student research field. Students can gain new experience in conducting soil research, so they can master the concept and implementation. Other research results can provide the classification of soils at the great groups and sub groups in the order of Andisol. The great group and sub group information on Andisol can be beneficial for farmers to adjust their land use.

Learning outside the classroom can be a feature of geography learning, because it covers the aspect of space in which interrelationships occur between spatial components, as well as between humans and their physical environment. The phenomenon that occurs in that space can not only be preached to the students, but the students must see for themselves. Experiential learning encompasses activities outside the classroom by involving students in research to learn and do or learning by doing [16]; [17]; [18]. Learning by doing as a way of learning from experiences that lead students to their activities (direct experience). In students there is mental contact with phenomenon through introspection [6]. Each experience affects the next experience, experience can awaken the curiosity, and strengthen the initiative [19].

Experiential learning or learning by doing [20]; [21]; [22] is a learning outside the classroom through a series of experience processes in the field, interacting with the people, places, situations and environments [23]. Students can conduct research activities to master the concept and its implementation in live case [24]. The key element of experiential learning is the analysis of learning experiences through reflection, evaluation, and reconstruction [25] with high level of active involvement [24]. Learning outcomes occur because of the synergy of transactions between students and their environment [26]. Experiential learning proposed by Kolb (1984) as a process of creative knowledge through the transformation of experience.

Students who conduct research activities directly on the object of learning has built the ability of cooperation, independence, confidence, and responsibility. Students do in-depth study and encourage reflection to develop new skills, new behaviors, or new thinking [20]. Students construct knowledge, skills, and values from experience (The Association of Experiential Education, in [27]. Students perform creations through the transformation of experience [17]; [28], discovery, information application, and reflection, knowledge-building, skills development, and value clarification (Association for Experimental Education, 2007 in [29].

II. METHOD

The research was designed using experiential learning model based on research. Research as an activity and as a student experience. Students conduct research activities through 4 elements Kolb [30]; [31]; [32], namely: Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation. Each clarity can be seen in Table 1 and experiential learning cycle in Figure 1.

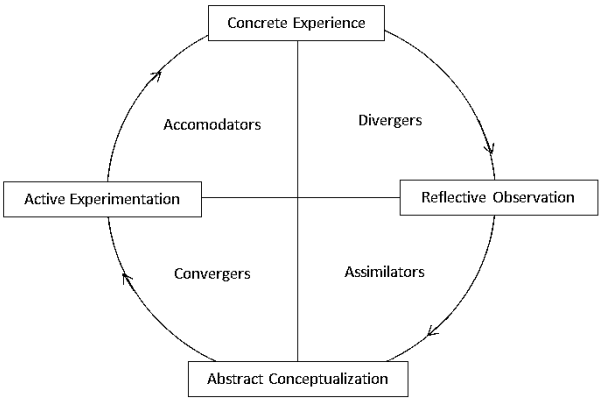

Fig. 1. Experiential Learning Cycle Kolb [33];[30]; [34]

TABLE I. EXPERIENTIAL LEARNING ELEMENTS AND STUDENT ACTIVITIES

Elements	Description of Student Activities	Purposes
Concrete Experience	Students fully engage in new experiences, adapt to the environment, tools, and research materials, create a soil profile, soil sampling, and process documentation	Students apply theories to solve problems, make decisions, classify, and conclude.
Reflection Observation	Students perform data analysis, inference, synthesis, and reflect the activities that have been done	Open, critical, and creative thinking.
Abstract Conceptualization	Students discuss the results of research, build the concept of knowledge, and integrate his observations into theory	The acquisition of knowledge, scientific thinking.
Active Experimentation	Students apply theories to solve problems, make decisions, classify, and conclude	Knowledge application

Experiential learning is based on soil classification research on students who already have capital knowledge of the theory about soil geography (soil classification) which is then implemented in research activities. Research activities are not followed by all students but only interested students and will conduct similar research. Students are given an observation sheet of soil classification according to keys to taxonomy 2014 [15] and an explanation of how to use it. Determination of location based on land map in Batu area, Malang Regency that is in Sumberbrantas Village having Andisol Order. Observations were made at each point that varied but had similar vegetative land cover. At each point a soil profile is formed with a depth of 150 cm and a surface area of 1 x 1 m2. Observations were made on soil profiles (diagnostic horizon, color, texture, pH, lime content), and soil samples for analysis in the laboratory (physical, chemical, and biological properties). Students record all results and analysis through discussions and joint reports.

Research data, field observation data and laboratory analysis results. The data were collected and then classified based on their similarity. Determination of the similarity of properties that can be classified based on guidelines of keys to soil taxonomy 2014. Order is determined based on morphology and soil genesis which is a supporting factor. The subordo is determined by humidity, climatic and vegetation, while the great group is distinguished by the epipedon and subsurface horizons. Data of students' knowledge and skills through research on all research activities. Research activities include: preparation of tools and materials, determination of sample points on the map, sample point execution, soil profile preparation, profile morphological observation, soil sampling, process documentation, data analysis, result discussion, yield reporting, and problem solving. Student's skill (knowledge and skill) data is done through process observation and product.

III. FINDING AND DISCUSSION

Research activities, students make observations and measurements on each pedon or soil profile that has been determined. Observations and measurements using observation guidelines and the use of field analysis tools and materials. Student activities include: tool and materials preparation, sample point determination, sample point extraction, soil profile preparation, soil sampling, and process documentation. This activity provides an opportunity for students to master the concept and skill of observation and measurement. The results of observation and measurement as research-based experiential learning can be seen in Table 2.

TABLE II. OBSERVATION AND MEASUREMENT RESULTS ON EACH PEDON

No.	Observation Activity	Pedon 1	Pedon 2	Pedon 3
1.	Slope	0-5%	8-15%	5-8%
2.	Physiografi	Plain	Wavy	Choppy
3.	Drainage	Good	Good	Good
4.	Vegetation	Mustard	Potato	Potato
5.	Erosion	High	High	High
6.	Effective depth	100-150 cm	50-100 cm	100-150 cm
	Observation Date	30-08-2017	30-08-2017	30-08-2017

Soil classification activities, data analysis, discussion of results, reporting of results. Students are involved in the discussion of soil classification after known field and laboratory data. The discussion process provides students with opportunities to explore knowledge and experience. The results of the discussion are set forth in the discussion of the research findings. This activity activates inferen ability, synthesis, argumentation, put forward ideas, and scientific thinking ability. The findings of the research are the epipedon is Umbric, the subsurface horizon is Kandic, due to the presence of iluviation, high clay percentage and low CEC <16 cmol / kg, and decreased organic content regularly

with increasing depth. The results of soil classification as experiential learning can be seen in Table 3.

TABLE III. SOIL CLASSIFICATION IN SUMBERBRANTAS BATU, EAST JAVA, INDONESIA

Pedon	Ordo	Sub Ordo	Great Grup	Sub Grup
1	Andisol	Udans	Hapludands	Typic Hapludands
2	Andisol	Udans	Hapludands	Typic Hapludands
3	Andisol	Udans	Hapludands	Typic Hapludands

The ability (knowledge and skills) of students by group in conducting research activities can be seen in Table 4.

TABLE IV. SOIL CLASSIFICATION IN SUMBERBRANTAS BATU, EAST JAVA, INDONESIA

No.	Students	Activities	Score, %
1	Group 1	preparation of tools and materials,	91
2	Group 2	determination of sample points on the map, sample point execution, soil	92
3	Group 3	profile profiling, profile morphological observation, soil	95
4	Group 4	sampling, process documentation, data analysis, discussion, and research report	97
5	Group 5		94

Experiential learning provides real experience to students, so students can explore their knowledge and learning experiences and generate new knowledge. Students can link between academic knowledge with practical skills, deepening practical application of knowledge to real-world conditions, and is the best practical way [35];[36]; [37]; [38]; [39]; [40]; [18]; [41]; [42]. Experiential learning occurs in students who interact with the environment, including humans, animals and the situation. Students are involved psychologically, sociologically, and academically, so that reasoning and critical thinking can be built through evaluation, reflection, and analysis [43].

Elements Concrete experience provides research activities that demand accuracy and accountability for the accuracy of research data. Concrete experience is also called participation phase [44]. Reflection Observation provides a high level of confidence because the results of the observations are reviewed on the way and the acquisition, if anything is wrongly repeated. Abstract Conceptualization students have built the theory through observation and reflection that has been synchronized with existing theory. Active Experimentation students have a number of knowledge and research procedures that can be used to solve problems, make decisions, and classify in other research.

The experiential learning result shows students (90%) ability (knowledge and skill). This is due to the students' activities constantly engaging the mind, and the motivation that results in long-term retention [17]. Students experience improved tooling skills, decision-making speed, precision of action, and accuracy of results. Experiential learning has built life-effectiveness skills [45] which are shown in terms of time management, social skills, motivation, intellectual flexibility, leadership, emotional control, initiative, and confidence.

IV. CONCLUSION

Application of experiential learning through research can provide high cognitive knowledge, skill, and scientific thinking skills or enhance the capabilities of the theory and practice. Students can explore their knowledge and learning experiences, generate new knowledge, link between academic knowledge with practical skills, accountability for the accuracy of research data, and synchronized with existing theory. Students had built theory based on research.

Department of Geography Education Faculty of Social Sciences, Universitas Negeri Malang need to make research-based experiential learning as a learning strategy that can be applied by geography lecturer widely. Lecturers are encouraged to conduct research-based experiential learning on other subjects by involving students. Student involvement in research is very helpful for students to complete their own research, so as to speed up the graduation

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