Nature-based learning management; How is it planned?

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Abstract. This study aims to describe management in the planning activities section, nature-based learning in the Linow Lake for students of the Physics Department, Faculty of Mathematics and Natural Sciences, Manado State University. This research used qualitative methods. The results obtained in management for nature-based planning activities that describe the results of the analysis of the analysis of Curriculum, student needs, observation of natural objects (the Linow Lake), formulating objectives for field activities, designing field activities according to activities at level 1 to activity level 4, compiling formats observation and assessment rubrics. The results of these planning activities are then ready to be implemented in the next management stage that follows management functions (Planning, Organizing, Implementing and Evaluating).

1. Introduction
Management has an important role in organizations and individuals with the aim of achieving a common goal [1]. Learning success can be realized through proper management work processes. One of the efforts to improve the quality of learning is by making improvements in the teaching and learning process itself. The development of the teaching and learning process cannot be separated from the learning management setting. Musadad [2] argues that learning management consists of the steps of planning learning, organizing learning, implementing learning and evaluation. Learning management functions include planning, organizing, implementing and evaluating [3]. This article is discussed specifically for the planning part. Planning will produce policies, plans, procedures, budgets and activity schedules [4].

Trumper [5] suggests the importance of field activities in nature-based learning for students to do observation, experiment and testing activities. Nature-Based Learning is learning that has the principle of learning about nature, learning using nature, and also learning with nature [6]. Activities or practical implementation in the field can provide understanding to students to be able to assess and analyze the results of objects in nature. Nature-based learning exposes students to real natural phenomena. Observations and measurements in the field do not only show the relationship between physical variables but also the influence of environmental conditions that cannot be controlled as in practicum in the classroom (laboratory).

The results of the authors’ observations on the implementation of learning management and lectures in the Department of Physics show that the lecturers have not optimally implemented the proper management stages in learning, both learning that takes place in the classroom and outside the classroom, lectures are very much dominated by the unilateral transformation of knowledge, by lecturers
to students so that students become passive and less creative participants in lectures. The function of lecturers as academic guides is not optimal either to control student academic activities or to motivate students to develop competencies. Students are positioned as listeners of lecturers' lectures, without being given the opportunity to participate democratically in the lecture process. The learning outcomes of most students are low and the study period exceeds four years. Students are weak in mastering the relationship between physics concepts and context. One of the reasons for this is related to the lack of field activities designed as part of the lecture program.

2. Methods
This research is a qualitative method. Sources of data in this study are informants (Head of Department / Study Program, Lecturers, and Students), events, natural objects, and documents. The technique of collecting data through (1) unstructured interviews, namely free interviews where the researcher does not use structured interview guidelines, scrolling questions naturally according to the data needs of the researcher, (2) Participatory observation, namely the researcher is involved with the activities of the person or object being observed. Observations on the implementation of nature-based learning and observations of field study objects, and (3) Documents, namely the Vision, Mission, Curriculum documents, event notes, and photos of research activities. Data analysis techniques using flow models (collection, reduction, display, verification).

3. Results
The planning stages in this study are as follows:

3.1. Analysis of curriculum
- The curriculum used by the Physics Education Study Program has not described the integration between classroom learning and learning outside the classroom (field activities)
- The curriculum is still predominantly oriented towards theoretical learning
- The importance of field activities in the course.

The results of this analysis are then discussed with the head of the department / study program so that the department leader can take a policy that in the curriculum there must be lectures that are carried out outside the classroom.

3.2. Analysis of student needs
- The need for knowledge through a learning process that is not boring
- The need for self-actualization in order to be able to develop themselves
- The need to understand the relationship between natural phenomena and physics concepts through authentic learning
- The need for appreciation that cultivates self-confidence
- The need for social and democratic behavior
- Students in the geothermal concentration physics study program really need basic knowledge and experience from the start about geothermal phenomena

3.3. Analysis of study objects (The Linow Lake)
- West part of the lake: there is a hot water manifestation
- Northern part of the lake: there are manifestations of hot water and steamy soil
- East part of the lake: there are manifestations of hot water and steamy soil
- Northern part of the lake: there are manifestations of steaming ground, limestone land, and hot mud pools
- Southern part of the lake: there are manifestations of steaming ground, shrubs and small trees
• Southern Lake Land: land overgrown with tree species with a microclimate that is influenced by thermal manifestations from the lake and surrounding land [11]

3.4. Formulation of field activity purposes

- Forming comprehensive student competencies in knowledge, attitudes and skills.
- Generate data to describe in general natural phenomena, and related scientific concepts.
- Generate data on changes in physical variables, interactions between physical variables, special conditions that become limiting factors for change (spatial, temporal, combined) of physical variables.
- Increase student-lecturer productivity in assignments and research.

3.5. Preparation of activity plans

This field activity is designed in accordance with the zoning that has been determined so that field activities can be effective and efficient [7].

The design of field activities is shown in Table 1.

| Num | Zone                      | Manifestations and location boundaries | Design of potential field activities                                                                 |
|-----|---------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------|
| 1   | A. West part of the Lake  | Hot air manifestations, with a fairly high temperature, varying between 30 °C - 50 °C, with an area: a radius of about 20 m | • Observation of hydrothermal phenomena and energy transfer between hydrothermal manifestation centers and the environment/pengamatan/penguatan variasi spasial (horizontal dan vertical) hidrotermal dan kondisi ekologis  
• energy potential and loss research, energy continuity research, environmental energy transfer and thermal energy utilization opportunities  
• research on the chemical properties of water, biota life  
• Observation / measurement of hydrater mall influence from the center of manifestation and water supply (discharge and continuity), as well as spatial and temporal variations in water temperature  
• observation of the chemical properties of water, biota life  
• Direct measurement of spatial variations in hydrothermal and ecological conditions  
• research on the chemical properties of water, biota life  
| 2   | B. North part of the Lake | Hot pool with low temperature, 22 °C - 28 °C, fluctuates due to sun exposure, there are aquatic biota and become a habitat for poultry | • Observation of water conditions and the presence of biota and poultry  
• Observation / measurement of hydrater mall influence from the center of manifestation and water supply (discharge and continuity), as well as spatial and temporal variations in water temperature  
• research on the chemical properties of water, biota life  
• Direct measurement of spatial variations in hydrothermal and ecological conditions  
• research on the chemical properties of water, biota life  
| 3   | C. East part of the Lake  | Hot water manifestations, small scale, on the shores of a shallow lake, with varying temperatures between 30°C - 50°C, and steamy land with an area: radius of about 1 m | • Observation of hydrothermal phenomena and energy transfer between hydrothermal manifestation center and the environment  
• Direct measurement of spatial variations in hydrothermal and ecological conditions  
• research on the chemical properties of water, biota life  
• observations of steaming ground phenomena, hot mud pools, land surface appearance, the process of transferring energy from the center of manifestation to the environment  
• measurement of soil temperature variations according to depth for modeling the steaming ground manifestation profile and heat loss estimation  
| 4   | D. North part of the Lake  | The steaming ground manifestation with a manifestation center radius of 5 m, is limestone land without land cover, hot mud ponds with a temperature > 100°C | • measurement and modeling of air temperature and humidity above the steaming ground to describe the energy transfer, the distance of the influence of manifestations in the vertical direction above the center of manifestation  

Table 1. Cont.

| Zone | Fact | Phenomena | Characteristic |
|------|------|-----------|----------------|
| 5    | E. South part of the Lake | The steaming ground manifestation with high spatial variations in soil temperature is characterized by thickets and small trees | • observation of the steaming ground phenomenon, land surface appearance, the process of transferring energy from the center of manifestation to the environment  
• measurement of soil temperature variations according to depth for modeling the steaming ground manifestation profile and heat loss estimation  
• measurement and modeling of air temperature and humidity above the steaming ground to describe the energy transfer, the distance of the influence of manifestations in the vertical direction above the center of manifestation  
• measurement / analysis of rock and soil chemical composition, soil and air temperature in relation to the growth of vegetation types. |
| 6    | F. Land to the South of the Lake | The land is covered with tree types with a micro climate that is influenced by thermal manifestations from the lake and the surrounding land | • Observations about the distribution of trees and variations in land surface appearance  
• measurement of microclimate spatial and temporal variations (temperature and humidity variables) to analyze: manifestation effects, microclimate variations due to solar radiation,  
• measurement of soil temperature in vertical direction, analysis of rock and soil chemical composition compared to tree growth |

3.6. Design of observation format and field activity assessment rubric

3.6.1. Format observation 1 activity level 1. Observation format 1 in activity level 1 is to determine student interest in objects and natural phenomena they see.

3.6.2. Format observation 2 activity level 1

Table 2. Format observation 2 for activity level 1.

| Zone | Fact | Phenomena | Characteristic |
|------|------|-----------|----------------|

3.6.3. Format observation 3 activity level 2

Table 3. Format observation 3 for activity level 2.

| Fact | Phenomena | Variable | Spatial Variations V(s) | Temporal Variation V(t) | Factors affecting | Relations between variables | Concept | Percentage of score per group |
|------|-----------|---------|------------------------|-------------------------|-------------------|---------------------------|---------|-----------------------------|

3.6.4. Format observation 4 activity level 3

Table 4. Format of activities to measure the physics quantities of geothermal manifestations.

| Location | The coordinates of the center of manifestation | The variable being measured | Measuring position | Measurement time | |
|----------|-----------------------------------------------|------------------------------|--------------------|------------------|
3.6.5. **Questionnaire format/observation of democratic interactions.** This format aims to see the democratic interaction of students which is the formation of democratic attitudes at each level of activity Dare to express opinions, Respect other people's opinions, Encourage friends to actively participate, Appreciate friend’s criticism of the explanation I have given, Discipline and responsibility towards collective agreement and Give appreciation for the opinion of friends.

4. **Discussion**

Nature-based Learning Management in this research is in order to optimize field activities for students of the Department of Physics at the Faculty of Mathematics and Natural Sciences UNIMA, both in the Education Study Program and Physics Study Program because from the monitoring of the researcher as a Physics lecturer, field activities for Physics Department students are rarely carried out even if it is only a kind of tourism activity without preparation or without implement management functions. Optimization of field activities in this study focuses on one of the management functions, namely learning planning.

Planning that includes; 1). Analysis of the vision, mission of FMIPA shows that nature-based learning management supports the implementation of the vision, mission of FMIPA, especially the strengthening of each study program in the Department of Physics, Faculty of Mathematics and Natural Sciences UNIMA; 2). Curriculum analysis shows the need for integrated field activities in lectures in the Department of Physics in order to form comprehensive student competencies in knowledge, attitudes and skills; 3). Analysis of student needs which shows that students need nature-based learning organized in a management frame; 4). Analysis of the object of study in Lake Linow which is a good and interesting learning area with the results of 6 zoning which are used as study locations for students; 5). The formulation of the purposes of field activities through discussions between the research team and department leaders, which are then formulated to see their achievements; 6). The preparation of field activity designs is related to the form of activities for each zone that ignores the 5-E learning cycle with tiered activities according to the development of students' thinking maturity; 7). Designing the observation format and assessment rubric per activity level from activity level 1 to activity level 4. Planning in nature-based learning management can all be carried out well and receive good support from all management components related to this planning activity. This planning is also a thought material which becomes the basis for carrying out field activities with different objects of study and learning models.

Utilization of the Linow Lake area for field activities for students of the Physics Department of the Faculty of Mathematics and Natural Sciences UNIMA from the results of the research can provide reinforcement of the materials obtained in theoretical and practical lectures in the laboratory room. Field activities present real phenomena that are sometimes difficult to control, such as in a laboratory room. Through field activities students can find a causal relationship between factors that influence or control physical phenomena. The knowledge that students have on analyzing the effect of the relationship between phenomena that occur and the abilities that students have, to be able to describe the relationship of context directly with the concepts that students have, they will be able to master the concept of physics as a whole. For Physics Study Program students, field activities to observe Geothermal phenomena that are given at the beginning of the semester will motivate and clarify study orientation, provide experiences and impressions that can encourage lecture activity and productivity.

Some experts, Higgins [8] and Slingsby [9] argue that learning activities in the field are fun and motivate students, increase learning activities and improve scientific communication. Field activities can be very varied, due to variations in phenomena, environmental conditions, as well as the needs and strategies of students. The design of materials and activities is needed to provide direction, among others: synchronizing lecture materials with field activities, efficiency and productivity of field activities, security and safety during field activities, orientation of activities to support advanced learning activities.

Utilization of the Linow Lake - Tomohon area in field activities as a natural laboratory for the Physics Study Program to implement management models, materials, methods and formalized activities as field
activities. The field activity management plan provides direction for activities to optimally support lectures and build student competence. For Physics Education Study Program students, the implementation of field activity management in the Linow Lake area has provided experience in developing learning to utilize the surrounding environment so that students have comprehensive knowledge as prospective teachers.

The Linow Lake area has the potential as an area to understand various physics phenomena. Faculty leaders and department / study program leaders gave positive responses to the implementation of this Field Activity and recommended the use of a nature-based learning management model with tiered and coherent field activities in learning / field activities in the Physics Department. For Physics Education Study Program students, the implementation of field activity management in the Lake Linow area provides experience in developing learning to utilize the surrounding environment so that students have comprehensive knowledge as prospective teachers.

This research also contributes to the vision and mission of the faculty, namely:

- Development of a research-based lecture system in the field
- Improved academic climate such as democratic interaction in groups, discussion initiatives, openness in communication between students and lecturers.
- The relevance of the competence of graduates in the material and development of learning resources

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5. Conclusion
Nature-based learning planning in Linow Lake for students of the Department of Physics, Faculty of Mathematics and Natural Sciences UNIMA includes analysis of the vision, mission, curriculum, student needs, formulation of activity objectives, analysis of study objects, designing field activities that adopt the 5-E learning cycle, designing observation formats and compiled assessment rubrics as an integral part of the professional work process in management which serves as a guide in the implementation of nature-based learning. The identification results of the geothermal manifestations of the Linow Lake geothermal area in the analysis of the object of study in Linow Lake resulted in six zones that can be used as the location of field activities for Physics Department students.

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References
[1] Handoko T 2003 Manajemen edisi 2 (Yogyakarta: BPFE)
[2] Musadad 2016 Model Manajemen Pembelajaran Sejarah terintegrasi Pendidikan Multikultural Untuk Membangun Wawasan Kebangsaan Paramitha Historical Studies Journal 25(2) 247 - 260
[3] Sewang A and Halik A 2019 Manajemen Pembelajaran Berbasis Masalah di Perguruan Tinggi Islam
[4] Sugiyono 2014 Metode Penelitian Manajemen (Bandung: Pt. Alfabet)
[5] Trumper R 2003 The Physics Laboratory-A Historical Overview and Future Perspectives Science and Education 12 645 - 670
[6] Wulansari B Y 2017 Model Pembelajaran Berbasis Alam Sebagai Alternatif Pengembangan Karakter Peduli Lingkungan Jurnal dimensi pendidikan dan pembelajaran
[7] Silangen P M 2016 Utilization Management Linow Lake as Natural Laboratory in Department of Physics in Isqae 2016 International Seminar on Quality & Affordable 477

[8] Higgins P 2012 Outdoor education in Scotland Journal of Adventure Education and Outdoor Learning 2(2) 149 - 168

[9] Slingsby P 2006 The Future of school science lies outdoors Journal of Biological Education 40(2) 51 - 52