The development of the practicum based environmental pollution module for guided inquiry which collaborates video to improve student learning outcomes

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Abstract. The research aims to find out the improvement of student learning outcomes by applying the development of guided inquiry-based environmental pollution practicum modules that collaborate on videos. The syntax of guided inquiry, namely: identification problems, formulating hypotheses, collecting data, interpreting data, and conclusions. All are packaged in an environment-collaborating video pollution practicum module, where the learning outcomes used are from the implementation of the guided inquiry syntax listed in the module and student cognitive problems. The type of research is modified R&D (Research & Development) Borg and Gall (2003). The research sample is in the form of initial product trial sample, limited field trial sample, and operational field trial sample. The instruments used were a questionnaire, observation, and test. Based on the results of research when conducting water, soil, and air pollution practicum's that have been carried out using the application of video collaborating modules, the results are obtained based on the syntax implementation (70.8%, 77.2%, 85.4%) and based on the results cognitive learning (79.87%, 83%, 86.40%). The results of the assessment of student learning outcomes at each meeting are increasing, so that the application of guided inquiry-based environmental pollution modules that collaborate videos can improve student learning outcomes.

1. INTRODUCTION

Human life is very dependent on the state of the surrounding environment, where we need each other in various needs. Our activities and behaviors sometimes cause various kinds of environmental problems, such as pollution and environmental damage, whether intentionally or unintentionally. In everyday life, humans are faced with a variety of behaviors that can benefit the surrounding environment and that can damage the stability of the environment. To support environmentally friendly behavior, it is necessary to be given an understanding of the importance of preserving the environment [1].

Environmental pollution can be categorized into 3, namely: 1) Soil pollution, 2) Water pollution, and 3) Air pollution. Air pollution in Indonesia is caused by the increasing volume of motorized vehicles which reaches 72, 41% [1]. Water pollution occurs due to disposal of residual detergents, textile or batik factories, whose waste is directly discharged into the water flow. While the pollution of the land due to littering by 64.85% [1].

The rapid development of science and technology in the current era of globalization has a profound impact on all aspects of life. In addition to positive impacts, many also have negative impacts. The impact is very influential in the world of education today, such as the learning process, teaching materials used, and learning strategies.

The learning module is a very complete learning unit that can stand alone and inside there is a whole series of learning activities that are organized to help student learning activities to achieve a number of objectives in learning [2]. Learning modules are learning tools or tools that contain material, learning methods or models used, evaluation methods that are designed systematically and attractively to achieve optimal learning outcomes. In the module, it has been adjusted to 1) the appropriateness of the content, which is in accordance with the needs of students, in accordance with teaching material, and the addition of insight about pollution, 2) the feasibility of the language used clearly and in accordance with Indonesian language rules, 3) the feasibility of the presentation which includes indicators that will include achieved, and 4) the appropriateness of the graph where the letter is clear, there are photos, diagrams, views and a good layout [3].

In learning biology, activities cannot be separated from the role of lecturers as motivators and students as active learning objects in all their activities, so that they need appropriate and effective learning models that use guided inquiry. Guided inquiry in its application there is still the role of the lecturer therein, namely as a motivator while students actively engage in learning activities or processes. Guided inquiry-based learning where students are trained to improve thinking skills according to their syntax which aims to make learning activities more meaningful and structured [4].

Modules will be more effective if accompanied by learning videos about environmental pollution material and become more encouraging students to be active in learning activities by applying guided inquiry models. The use of learning videos which will attract the attention of students in the absorption of learning material that will make students more enthusiastic in learning [5]. From this background, a study was conducted under the title "Development of Guided Inquiry-Based Environmental Pollution Practicum Module that Collaborates on Videos to Improve Student Learning Outcomes".

2. METHOD

Research methods in the development of learning products in the form of modules that use the method and design of research development using a modified R&D (Research and Development) design from [6], with steps, such as: 1) research and information gathering, 2) planning, 3) product development initial, 4) initial product trials, 5) product revision I, 6) limited field trials, 7) operational field trials. The procedure for developing the Guided Inquiry-based environmental pollution practicum module using the modified [6] method is presented in **Figure 1.**

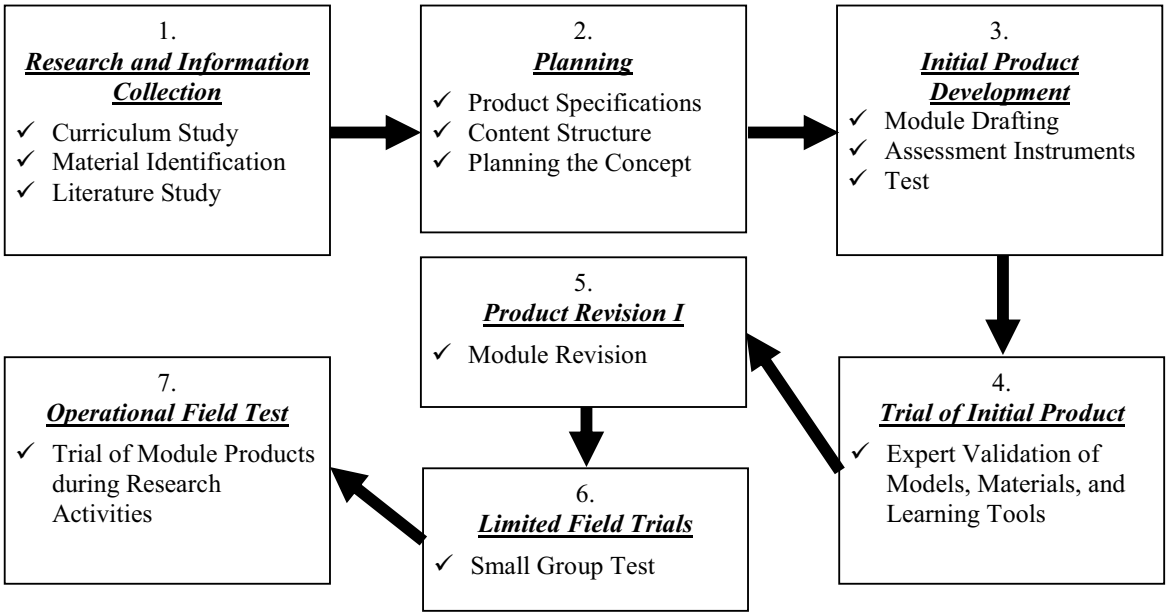

Figure 1. Product Development Procedure

Based on the explanation above, the data collection method can be explained as follows:

2.1 Research and Information Collection

a. Reviewing the curriculum to be used is an adjustment to the curriculum used at the STKIP PGRI Nganjuk.
b. Identifying the material to be used, of course, which can be collaborated with the guided inquiry model and the use of appropriate videos, and appropriately included in the planned module.
c. Literature study, where the studies used come from various sources, both books, journals, and all studies that can be accessed internet.

2.2 Planning

The planning is to prepare a draft module that is integrated with the syntax of guided inquiry, namely: a) determine the learning objectives based on indicators, b) determine the sub topics, c) determine the format and visualization of the module to be developed [7], d) determine the procedure research ranging from validation, testing, problem development.

2.3 Initial Product Floating

At this stage, a draft module is produced that is ready to be submitted for evaluation or validation. Module development is determined by the development of bases in accordance with the syntax of guided inquiry on video pollution environmental materials collaborating used for practicums.

2.4 Trial of Initial Products

The intended test is an evaluation or validation by the module design expert, the material, and the learning tools used. Where there is a scale 4 reference assessment [8] in the form of score conversion in **Table 1.**

Table 1. Converting Actual Scores to Scores of Four

Value Range	Category
3,51 - 4,00	Very good
2,51 - 3,50	Well
1,51 - 2,50	Pretty good
1,00 - 1,50	Not good

2.5 Product Revision I

Product revision I was based on validation conducted by the validators which could be used as input to improve the module content.

2.6 Limited Field Trials

The trial was conducted on STKIP PGRI Nganjuk upper semester science education students in order to get input or there are still errors in typing or sentences that are difficult to understand.

2.7 Operational Field Test

At this stage the effectiveness test is carried out on the experimental class which will be used as research. In the operational field test, it will be assessed, namely the implementation of the guided inquiry syntax already contained in the module. The values obtained were then analyzed using descriptive analysis with the value criteria according to [9], can be seen in **Table 2.**

$$\text{Value of Syntability of Syntax} = \frac{\sum \text{score acquisition}}{\sum \text{maximum score}} x100\%$$

Table 2. Implementation of the Syntax of Guided Inquiry Learning

Criteria	Conversion Value	
	Number	Calculation
Very good	4	81 - 100
Well	3	61 - 80
Enough	2	41 - 60
Less	1	20 - 40

3. RESULTS AND DISCUSSION

The development of guided inquiry-based practicum modules in collaborating videos is applied to students of the STKIP PGRI Nganjuk in science education program the fourth semester. The study was conducted three times, namely in the matter of soil pollution, water pollution, and air pollution, where the whole material is summarized into modules.

From the results of the study obtained several data that can be used as an assessment, including:

3.1 Research and Information Collection

The results of the literature study found that the use of the curriculum is in accordance with the curriculum used by STKIP PGRI Nganjuk with the use of RPS that is adapted to practicum material, namely environmental pollution. In the literature study it was also found that there was no complete practical module with the incorporation of learning models such as guided inquiry with the addition of videos.
Integrating guided inquiry models in biology practicum modules because the model used can make students build their own knowledge, so students will feel interested and motivated so that learning becomes easier [10].

3.2 Planning

At this stage the learning objectives developed are to measure student learning outcomes. Besides that the material developed is in the form of practicum modules that are systematically packaged so that students can use them independently or in groups where students are directed to conduct experiments in accordance with the syntax of guided inquiry.

The components in the module such as: a) competencies to be achieved contained in indicators, b) discourse and pictures, c) observation and identification activities through discourse and pictures, d) defining and classifying, e) identifying, formulating problems and hypotheses, f) design experiments and conduct experiments, g) measure and collect data to be entered into the observation table, h) analyze, conclude and communicate the results of experiments.

3.3 Initial Product Floating

Product development that will produce a draft module on environmental pollution starting from the cover, contents, and cover, namely:
a) The module cover, includes the title, the STKIP PGRI Nganjuk logo, and the pollution pictures
b) Preface, list of contents, introduction
c) Chapter I, Chapter II, and Chapter III.
d) Closing
e) Back cover of the module

3.4 Trial of Initial Products

Initial product trials are stages of validation by experts, starting from design experts, materials, and learning tools. The results can be seen in this table below. The results of the validation by the module design expert can be seen in **Table 3.**

Table 3. Validation Results for Module Design Experts

No.	Aspect	Average	Category
1.	Quality of content / material	3,3	Good
2.	The relevance and credibility of the source book	3	Good
3.	The suitability of the guided inquiry base	3,4	Good
4.	The quality of the presentation method	3,4	Good
5.	Presentation of learning	3	Good
6.	Use of language	3,4	Good
7.	Use of illustrations	3	Good
8.	Quality and completeness of supporting materials	3	Good

9.	Finesse	3,5	Good
10.	General appearance	3,5	Good
Average of all aspects		**3,25**	**Good**

In Table 3. Obtained the results of the assessment or validation from the module design experts obtained an average value of all aspects of 3.25 which is categorized as good but still needs to be revised or improved.

The results of the validation by material experts can be seen in **Table 4.**

Table 4. Results of Expert Material Validation

No.	Aspect	Average	Category
1.	The basic concept of the material	3,67	Very Good
2.	The concept of sub material discussion	3	Good
3.	Concept pictures	4	Very Good
4.	Presentation of images	3,67	Very Good
5.	Systematic delivery of material	3	Good
6.	Relevance to everyday life	3	Good
7.	Relevance and credibility of the source book	3,33	Good
8.	Use of language in the material	3,33	Good
Average of all aspects		**3,38**	**Good**

In Table 4. Obtained the results of the assessment or validation from the material experts obtained an average value of all aspects of 3.38 which are categorized well but still needs to be improved or the addition of some material from other sources.

The results of the validation by the module design expert can be seen in **Table 5.**

Table 5. Results of Expert Validation of Learning Devices

No.	Aspect	Average	Category
1.	Formulation of learning objectives	3	Good
2.	Selection and organization of teaching materials	3,33	Good
3.	The choice of learning resources or learning media	3	Good
4.	Learning method	3,33	Good
5.	Assessment of learning outcomes	3,67	Very Good
6.	Evaluation questions	3,67	Very Good
Average of all aspects		**3,33**	**Good**

In Table 5. Obtained the results of the assessment or validation from the experts of the device obtained a value of all aspects of 3.33 which are categorized as good but still need improvement.

3.5 Product Revision I

Based on the validation that has been done, there needs to be an improvement, that is, from the design that is less bright in the color of the cover and the addition of images that have more visible pollution. In terms of material, some references were added from other books, and learning tools were added by several essay questions to increase student thinking.

3.6 Limited Field Trials

Based on the trial results there is no need for improvement, because the module has covered all the material and there is a guided inquiry stage in it.

3.7 Operational Field Test

In the operational field test, student learning outcomes are assessed in two ways, namely from the implementation of the guided inquiry syntax in the module and the cognitive learning outcomes of students through tests, such as:

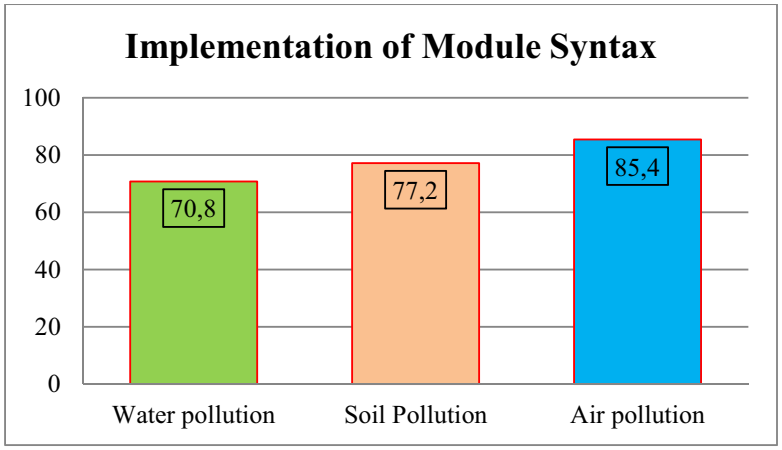

Figure 2. Results of Guided Inquiry Syntax Based on Modules

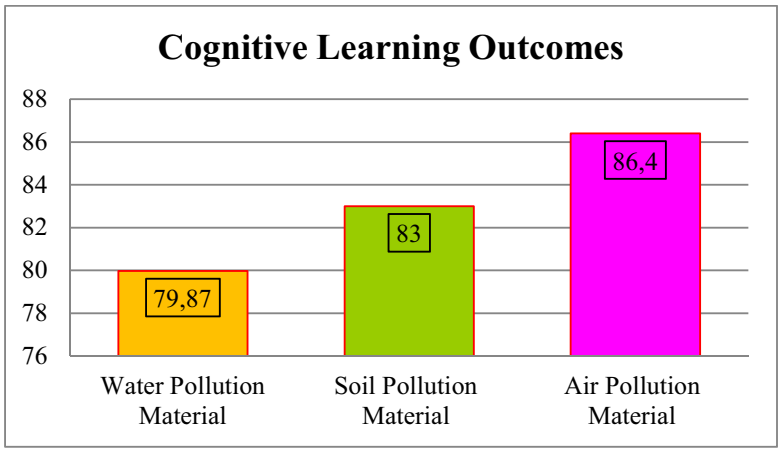

Figure 3. Cognitive Learning Outcomes

4. CONCLUSIONS

With the application of the environmental pollution practicum module that collaborates on videos can improve student learning outcomes. This can be seen from the increase in each stage of the study, where the assessment is seen from the implementation of the syntax and test questions. Where the results obtained are based on the syntax implementation (70.8%, 77.2%, and 85.4%) and based on cognitive learning outcomes (79.87%, 83%, and 86.40%).

Suggestions for researchers who want to use almost the same method are more innovative in making modules so that they are more attractive to students because each teacher has different styles and creativity, of course to require extra time and energy.

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