

Development of Digital Worksheets and Evaluation Tools Based on Higher Order Thinking in Natural Science courses for Elementary School Teacher Education Students

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Abstract. The cause of this study become to increase a worksheets and virtual assessment gear primarily based totally on better order questioning abilities in herbal technological know-how publications for Elementary School Teacher Education Students. The improvement become finished the use of ADDIE fashions by Robert Maribe Branch. In the early stages, a worksheets and virtual assessment gear primarily based totally on better order questioning abilities become produced which become designed the use of Canva software and then uploaded through the Liveworksheet page. In the subsequent degree, the goods that had been produced are evolved thru validity, practicality, and effectiveness tests. At this degree the mastering gear evolved are reflected and revised consistent with the desires of academics and students. Based on the effects of the validity, practicality and effectiveness tests, a worksheets and assessment gear primarily based totally on better order questioning abilities become produced in virtual shape which become used for college kids of Elementary School Teacher Education students.

Keywords: digital worksheets, evaluation, HOTS

1 Introduction

The Primary School Teacher Education Study Program at the Unimed Faculty of Education has two courses that specifically study the basic concepts of Natural Sciences, namely the Basic Biology Concepts Course (for first semester students) and Basic Physics and Chemistry concepts (for second semester students). In addition, there are also two other courses that discuss the Natural Sciences but on the aspect of how to design and teach natural sciences in elementary schools. To be able to teach the concept of Natural Sciences well for elementary school students, students should have at the same time two abilities in the field of natural sciences, namely the ability to master the basic concepts of natural science and the ability to teach natural science in elementary school. To be able to achieve this, study programs should have learning tools that can train abilities and measure students' mastery of the five subject areas.

Learning media is important in education because learning media can deliver messages and stimulate student interest and attention to achieve learning goals. Thus, there will be

educational interactions between students and teachers, so that there are changes in the understanding, skills or attitudes of students. (Ananda, dkk, 2019) [1]

Currently, in the primary school teacher education study program, there is not yet a special learning tool that can be used as a natural science worksheet and a natural science evaluation tool that can simultaneously be used to measure the general ability to master natural science concepts (Biology, Physics, and Chemistry) on students. The study program only has learning tools that are used in the lecture process in each subject, but those that can be used in general for students are not yet available. This is one of the basics behind the implementation of this development research.

The product so one can be evolved on this studies is a herbal technology assessment device if you want to later be utilized by the Natural Sciences Lecturer Group at the start of the direction in Basic Biology Concepts and Physics and Chemistry Basic Concepts to decide college students preliminary competencies withinside the herbal sciences field. . The consequences of this assessment could be a benchmark for academics to perform lectures. In addition, this assessment device cannot only be used to degree college students' capacity to grasp herbal technology principles, but also can be used to degree the capacity to grasp herbal technology principles for simple college teachers. Furthermore, on this study, herbal technology worksheets can also be evolved which may be utilized in trendy via way of means of college students of the school of schooling at Medan State University as a accomplice worksheet for the Basic Concepts of Biology and Basic Concepts of Physics and Chemistry. The Natural Sciences Worksheets and Evaluation Tools so one can be evolved here are the Digital Higher Order Thinking Skills (HOTS) primarily based totally Worksheets and Evaluation Tools. The motive the researchers evolved HOTS-primarily based totally Worksheets and Evaluation Tools for college students is to educate better order questioning abilities is a step to create student-targeted innovative studying. This is in keeping with the opinion of Faisal (2019) which states that college students' better-order questioning abilities are one of the barometers of the nation's highbrow degree. As agents of change, college students need to have the ability to expose their identification in highbrow, moral, and fashionable ways. Therefore, withinside the twenty first century, the studying process done at each degree of schooling should sincerely be taken into consideration so as to produce in a position graduates. [4].

The observe tested facts from 784 college students in number one faculties and found that college students' mastering fashion and net mind-set had an instantaneous effect on the college students' HOTS, however mastering motivation did now no longer have a significant effect on their HOTS. Furthermore, the influence of different key mastering elements on HOTS in the clever study room has remained unclear. Particularly, only a few research have explored the connection among the important thing elements influencing university college students' mastering and their HOTS in the clever study room environment. Understanding the elements that influence HOTS can assist educators and curriculum designers develop greater rigorous mastering possibilities and evaluation tools. (Lu, K., Yang, H.H., Shi, Y. et al., 2021) [5]

The method of the hassle on this observe is how is the feasibility of HOTS-primarily based totally virtual technology assessment worksheets and gear for college students of the Unimed schooling faculty?. The cause of this observe changed into to explain the validity of the HOTS-primarily based totally virtual technology assessment worksheets and gear for FIP Unimed students.

2 Methodology

This studies changed into carried out withinside the take a look at software on the Unimed Faculty of Education for first semester college students of the 2022/2023 Academic Year. The time of the studies changed into completed for eleven months, beginning from January to November 2022. This take a look at used studies and improvement methods. Research and Development is a studies technique used to increase a brand new product or enhance an current product, produce sure merchandise and check the effectiveness of those merchandise. In this take a look at, a HOTS-primarily based totally virtual Science Student Worksheet and Evaluation Tool will be evolved that is designed the usage of the Canva Application after which uploaded to the Live worksheet page. This Student Worksheet and Evaluation Toolkit will later be available on line via way of means of college students for use.

The improvement version used on this have a look at become advanced through Robert Maribe Branch, particularly the ADDIE version which incorporates five stages: Analysis, Design, Development, Implementation, and Evaluation.

2.1 Analysis

This evaluation level is performed to decide scholar gaining knowledge of desires and identify problems. Analysis is wanted in figuring out what type of layout may be made in growing the Digital Evaluation Worksheet and Toolkit. At this level there are 3 degrees of activity, namely, curriculum evaluation, idea evaluation, and scholar evaluation.

- Curriculum evaluation, particularly reading the learning effects of publications primarily based totally at the Indonesian country wide qualification curriculum.
- Concept evaluation is executed to discover the principle concepts that ought to be mastered via way of means of college students in fundamental faculty herbal technological know-how material.
- Student evaluation turned into carried out to decide student traits inclusive of age, motivation, distinct academic and academic backgrounds, instructional abilities, and social skills

2.2 Design

At the design stage, the design of Student Worksheets and HOTS-Based Evaluation Tools will be used for learning natural science activities and measuring mastery of natural science concepts in Elementary School Teacher Education students. At the design stage, the researcher prepares the initial design of the HOTS-based Student Worksheet and Digital Evaluation Tool using the Canva Application and will be uploaded on the Live Worksheet page. Design is divided into several stages, namely:

- Materials Collection, at the material collection stage, the materials are first collected, such as the main natural science materials, supporting pictures, work steps, and HOTS-based questions. After that, the results of the design will be made of Student Worksheets and HOTS-based digital science evaluation tools using the Canva Application.
- Product design, at the product design stage, product design is carried out in the form of Student Worksheets and HOTS-based digital natural science evaluation tools for students which are designed and adapted to learning tools in the form of Semester Learning Plans

for natural science courses at the Unimed faculty of education and the Events Unit Lectures .

2.3 Development

This stage of development is the stage of producing a product that will be developed later. The development stage is divided into several steps, namely:

- Product Development, at this stage the researcher takes steps to make Student Worksheets and HOTS-Based Digital Natural Science Evaluation Tools that are designed and will be validated by experts according to their fields of expertise.
- Revision of Products, Student Worksheets and HOTS-Based Digital Natural Science Evaluation Tools that have been validated by experts according to their field of expertise will then be revised. Revisions are made to consider things that are corrective in nature based on comments, suggestions or input, assessments, as well as conducting product trials to students.

2.4 Implementation

At this stage the Student Worksheet and HOTS-Based Digital Natural Science Evaluation Tool have been declared valid by experts. At this stage, it is a trial stage which is carried out on first semester students of the 2022/2023 Academic Year which consists of different abilities, namely high, medium, and low ability students. This stage aims to determine the practicality of Student Worksheets and HOTS-Based Digital Natural Science Evaluation Tools through the learning process and based on student responses through filling out questionnaires. At this stage, students will also fill out a test on the digital evaluation tool that has been developed, which aims to determine the effectiveness of the HOTS-Based Digital Natural Science Student Worksheet..

2.5 Evaluation

This stage is the final stage where improvements are made after receiving suggestions, comments, and input from expert validators and students. Briefly, the stages of the development procedure can be seen in the following figure:

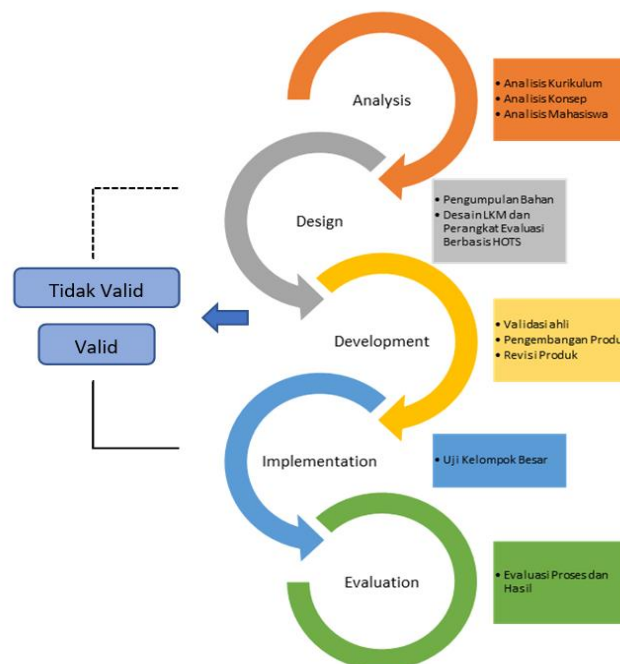


Fig. 1. ADDIE Development model

Data series strategies on this look at had been performed thru validation, remark, questionnaires and interviews. Validation is performed on aspects, specifically content material validation and assemble validation. Data had been accumulated the usage of a validation sheet. Observations had been made to take a look at the implementation of the Student Worksheet and the HOTS-Based Digital Science Evaluation Tool advanced. Data had been accumulated the usage of remark sheets. Questionnaire sheets had been used to accumulate information associated with teachers and students' responses to the advanced HOTS-based Student Worksheets and Digital Natural Sciences Evaluation Toolkit, and interviews had been used for assisting statistics in measuring the extent of practicality and effectiveness of Student Worksheets and Digital Natural Sciences Evaluation Tools. Based on HOTS advanced. The tool used is an interview guide.

The statistics evaluation approach utilized in this studies is quantitative and qualitative descriptive statistics evaluation. The expert take a look at and small institution take a look at statistics from the questionnaire have been analyzed through percent and defined qualitatively. Field take a look at / person take a look at statistics withinside the form of getting to know tactics withinside the improvement surroundings have been analyzed through qualitative statistics evaluation of float fashions through making use of the multipurpose principle. In this situation what's crucial is how an analytical approach may be used to assist trouble solving.

Analytical sports encompass: statistics discount, statistics presentation, and drawing conclusions or verification. Data discount sports encompass category and coding in line with the sort of statistics. Presentation of statistics withinside the shape of descriptions, tables, diagrams, photos or different visible forms. The statistics that has been supplied is verified, interpreted, and concluded. The goal of statistics evaluation consists of remark, description, and explanatory levels. At the remark level, the statistics were selected, categorized, and coded. At the extent of description, the statistics is supplied in sample units, occasion units, fashion units, or that means units. At the explanatory level, the evaluation is directed on the effectiveness of the trial. The data obtained from the results of the validation of the material experts and the validation of the design experts were analyzed using a Likert scale.

Table 1. Validation

No	Answer	Score
1	Strongly Agree	4
2	Agree	3
3	Don't Agree	2
4	Strongly Disagree	1

Source : Arikunto, 2014 [2]

To determine the feasibility category of LKPD based on the classification of material experts and design experts described in the form of qualitative data. According to Arikunto (2014:35) it can be seen in the following table:

Table 2. Criteria Validation

No	Percentage Range	Score interval	Classification Validity
1	81% - 100%	81 – 100	Very Worthy
2	61% - 80%	61 – 80	Worthy
3	41 % - 60%	41 – 60	Decent enough
4	21% - 40%	21 – 40	less worthy
5	0% - 20 %	0 – 20	Not feasible

Source (Arikunto, 2014)

The data obtained from the results of the validation test by two experts were analyzed using a Likert scale according to the above.

3 Result and Discussion

In this take a see at, a HOTS-primarily based completely virtual evaluation device and worksheet changed into progressed to degree authority of home grown mechanical know-how standards for essential college coach preparing college understudies at Medan State College. Theimprovement form utilized on this take a see at is the ADDIE form which joins 5 stages, particularly Investigation, Plan, Advancement, Usage, and Assessment. In this article, the results of the possibility check wrapped up on the Improvement degree are displayed, particularly after the assessment degree and item format are wrapped up, at that point the item is tried for achievability through cloth proficient approval and format proficient approval. The results of the approval of cloth masters and layoutspecialists in degree 1 may be unmistakable withinside the taking after table:

Table 3. First validation test results

No	Aspect	Maximum Score	Earning score	
			Validator 1	Validator 2
1	Contents	32	22	20
2	Language	24	18	20
3	Graphics	20	15	13
4	Presentation	24	19	20
	Amount	100	74	73
	Percentage	100%	74%	73%

Source : primary data processing, 2022

Based on the table over, it can be concluded that the HOTS-based computerized assessment worksheets and devices to degree the dominance of the concept of characteristic science for understudies of the Workforce of Instruction, Medan State College, are attainable to utilize but still require a few corrections. This may be seen within the scores gotten from the primary

approval test comes about from fabric specialists and plan specialists, specifically 74% and 73%, separately. From the scores over, it can be concluded that the HOTS-based advanced assessment worksheets and instruments to degree authority of characteristic science concepts created are doable to utilize, but there are still a few angles that require change.

After several improvements were made, a second validation test was carried out with the following results:

Tabel 4. Result of Second Validation

No	Aspect	Maximum Score	Earning score	
			Validator 1	Validator 2
1	Contents	32	24	21
2	Language	24	20	22
3	Graphics	20	16	15
4	Presentation	24	21	22
	Amount	100	81	80
	Percentage	100%	81%	80%

Source : primary data processing, 2022

Based on the data from the validation test results of the materials experts and design experts mentioned above, HOTS-based digital assessment worksheets and tools to measure proficiency in scientific concepts for students of Faculty of Education, Medan State University and can conclude. , very suitable for the scientific learning process in the course. Graduated from Medan State University, Faculty of Education, Elementary School Teacher Training Course. Student worksheets are an alternative way to activate the learning process. To improve the student's Higher Order Thinking Skills (HOTS), LKPD was developed based on her HOTS i.e. her HOTS at C4, C5 and C6 levels. Below are student worksheets and digital assessment tools on basic science concepts.

No.	Part	Research product
1.	Cover	
2.	Content List	

3. Content

Introduction Section



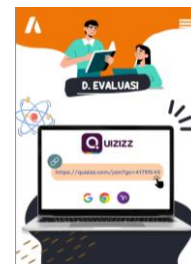
Material Section



4. Worksheet



5. Evaluation Section



4 Conclusion

Both studies show that students need to be presented with realistic situations they can understand and be able to consider perspectives other than their own. Additionally, these situations can create discourse and controversial issues for students. Incorporating these elements into online discussions is important to the ability of students to engage with course content and peers, and to construct new knowledge and meaning from the material. (Berry et al. 2022). [3]

Based on the results of the above research, HOTS-based digital assessment worksheets and HOTS-based digital assessment worksheets for teachers of primary school students, Faculty of Education, Medan State University, Science Concepts Acquisition Worksheets and Science Concepts Familiarization for HOTS-based Digital Assessment We can conclude the degree measuring tool. The measurement tool for students of Faculty of Education, Medan State University is very suitable to use with validation values of 81% and 80% respectively from materials and design experts.

References

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