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Development Of Integrated Instrument Components Learning Media (KIT) Tamoka Pain Of Chemical Bonding Through Guided Inquiry Learning Model For X Class IPA Students Of SMAN 7 Samarinda

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Abstract:
Background: *According to media expert validators, the average percentage score of aspects of content/material, linguistic, presentation, technical quality and effects on learning strategies is 93.50% while student responses to the use of this media are 91.54%.*
Materials and Methods: *The purpose of this study was to determine the level of feasibility and student response to the media component of the integrated chemical bonding instrument.*
Result: *The research method used is research and development (R&D) which adopts the Molenda & Reiser development model. The subject of this research is the media component of an integrated chemical bond instrument that was tested on students of SMA Negeri 7 Samarinda through a guided inquiry learning model. Small class trials and large class trials were conducted on product users. The instruments used in this study were questionnaires, observations, documentation and evaluation sheets. Based on the results of the study, it can be concluded that the chemical bond integrated instrument component media is suitable for use in schools. It can be used in class to teach chemical bonding.*

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I. Introduction

The development of reading interest and scientific skills, especially our students, is very concerning. It is because the methods and textbooks given to students are generally less interesting and unpleasant. Less attractive textbooks cause a lack of interest in learning and reading in students, this will certainly affect students' cognitive abilities, due to a lack of knowledge and insight regarding the subject matter delivered by the teacher Nurhaidah and Musa (2016). In this case, a media that can be used to make students interested in reading and studying the chemistry material has been described by the teacher is needed. According to Ahmadi (2017), the results of his research show that textbooks commonly used in schools are less effective and must be made creatively to attract the attention of students or readers, based on his research results, creative books are very effective in improving learning outcomes where a percentage of learning outcomes is obtained using creative books that is equal to 94.7%. The development of pictorial or creative books is one of the media that is believed to be effective in increasing students' reading interest (Tarigan, 2018). In addition to creating books, teachers can also carry out variations in learning, such as learning with games, the internet, or learning videos that can be integrated with the teaching materials or learning media used. In determining the variation of learning, the teacher must also pay attention to trends or things that are liked and often used by students, one of which in this case is the internet. The development of the globalization era, followed by the development of Information Technology (IT) which is running very rapidly, requires policies of all parties to respond to it, especially in the field of education, the presence of IT does not provide other options for the world of education other than taking part in using it (Nurchaili, 2016). Intensive and effective use of the internet will have a significant influence on learning motivation which will be shown by learning

achievement, where the greater use of the internet as a learning medium will also increase learning motivation (Srinadi, 2015). In addition to this, the teacher also needs to develop active learning methods that can support student activity in learning. The active learning process carried out by each student through the learning process can build new ideas and knowledge and affect student learning outcomes (Dewi et al., 2019).

The development of science and technology is increasingly encouraging efforts to renew and utilize learning media in the teaching and learning process . The ability to develop and utilize learning media aimed at improving the quality of education is highly dependent on the ability of teachers and the capabilities of their human resources.

Quality learning can be achieved through several supporting factors including competent teachers in their fields, students who play an active role in learning, the availability of learning resources such as student handbooks, and no less important is the use of media in learning. The existence of the media becomes a very vital thing and cannot be underestimated. The use of media in the chemistry learning process plays a role in making the chemical material presented real and simpler, so that students more easily understand the material being taught (Indriani et al., 2017) .

Material bonding chemistry is one material that is quite difficult to learn by most students, s ne of the cause is a material bonding chemistry is abstract. Chemical bonding material is chemically learning topics are loaded with the concept and are abstractk and are not found in everyday life, for example can't see the atomic structure, and how the reaction of an atom d ith atom. This causes the students often had difficulty in understanding the material chemical bonding especially regarding the process of the formation of bonding chemistry especially bond ions and bond covalent (Dasopang, 2020). Based on problem is researchers plan to develop media KIT Tamoka (the Periodic Table, Model mole kul and Cards ties) in the learning process, especially in the chemical bonding material. The Tamoka KIT media is a media in the form of a box which contains the periodic table, atomic model and chemical bond model to make the process of chemical bond formation more real and attractive to students so that students more easily understand the concepts of chemical bonds.

In response to these problems, one of the learning models that can help students to develop mastery of concepts and science process skills is the guided inquiry model . Guided inquiry is a model that can train students in finding problems and solving them under the guidance of the teacher . Pursuant to the description described above, researchers will conduct a study entitled "Development Learning Media KIT Tamoka Highlights Lesson Institute of Chemistry Through Learning Model Inquiry guided Students Kelas X IPA at SMAN 7 Samarinda" The purpose of this study was to determine the validity, kepraktisa n and the effectiveness of using Tamoka's Media KIT.

II. Material And Methods

The research method used is research and development which adapts the ADDIE (Analysis Design Development Implementation Evaluation) model. This model was developed by Molenda and Reiser (2003). Which consists of the analysis phase, phase de science, product development phase (preparation, validation stage and phase of revision), the stage of implementation (test laps fantasy/small groups, revision of the trial results, trial courts/large group) and evaluation phase.Research is sealed there right in the 1st half of the month of September to the month of November 2019 in Samarinda school year SMAN 7 2019/2020. The population in this study were 102 students of class X IPA SMAN 7 Samarinda and a sample of 53 students. By referring to the ADDIE model developed by (Molenda, 2003), the researcher took 5 development steps in this process. The steps taken are as follows:

Analysis Phase (Analysis)

At this stage, the researcher analyzes the problems behind the emergence of this media development and analyzes the feasibility and requirements of the Tamoka KIT that will be made. Researchers also designing KIT Tamoka suite de ngan situation of students at SMAN 7 samarinda, KIT Tamoka adjust to the learning objectives, identify what material in accordance with the KIT Tamoka and designing the structure of the KIT Tamoka.

Design Phase (Design)

In this stage, the researcher realizes the things that have been analyzed by making what is needed. Steps on step are as follows: m eny Usun map needs Tamoka KIT, to decide name KIT Tamoka. The name of KIT Tamoka is determined based on the basic competencies, indicators , and learning materials listed in the 2013 curriculum.

Development Phase (Development)

At this stage, the KIT Tamoka began to be developed by researchers according to a predetermined design , after that the KIT Tamoka that had been made was validated by material experts and media experts. If

the Tamoka KIT made has not reached the valid or appropriate criteria, the researcher will revise the Tamoka KIT according to the advice of media experts and material experts. After the Tamoka KIT is said to be valid, the researcher will conduct a field trial. Product Validation is carried out in several stages, namely:

Preparation Phase

The preparation stage is carried out by compiling a validation sheet of learning media and learning tools based on the BSNP. The preparation of the validation sheet for learning media and learning tools is used as a feasibility sheet for learning media which will be determined by the validator.

Validation Stage

The validation stage consists of validation of learning media and learning tools and validation by practitioners (chemistry teachers). The validation of learning media aims to obtain appropriate learning media for KIT Tamoka. Meanwhile, validation of learning tools aims to obtain appropriate learning tools in the form of lesson plans, evaluation questions and worksheets. The validator of learning media consists of material experts as well as chemistry learning media experts, while the learning device validators are expert lecturers in the manufacture of chemistry learning devices. While the validity of learning media and learning tools from practitioners, namely chemistry teachers, which aims to get improvements to learning media and learning tools developed. This is because the teacher is a source of information who knows the conditions of learning in schools so that they can provide suggestions and improvements to the developed media.

Revision Stage

This stage is carried out to correct deficiencies in learning media and learning tools from the assessment of validators of media experts, material experts and practitioners.

Stage of Use (Implementation)

At the use stage, it is done after the media and learning tools are validated by the validator and valid learning tools and learning media are obtained from the validator. This stage is carried out in two stages , namely stages of the first and second phase, the first phase is done for s small scorpion, which is 6 SMAN 7 Samarinda (members of the sample), after the first stage, followed by improvements on the advice of practitioners and observer , if there is a shortage. After repairs were made, it was continued with the use of learning tools and learning media on a large scale, namely class X IPA SMAN 7 Samarinda , totaling 53 students . The use of media in the second stage is not only to measure the quality of learning media but also to know the effectiveness of learning media.

Stage of Evaluation (Evaluation)

This stage is an evaluation activity for a series of comprehensive research activities to further refine learning media products and learning tools used in research.

In addition to the research procedures listed above, in this research The instruments used in data collection were validation sheets, student response questionnaire sheets, evaluation question sheets, observations, and documentation. The data analysis technique used is the analysis of validity, practicality and effectiveness.

Validity

Data on the validity of learning media in this study were obtained based on media expert validity sheet and learning device expert. Data obtained from the expert validators of learning devices, learning materials, and media in the form of scores of validation results are then written in tabular form. Processing the sheet using the formula :

$$\text{Validity} = \frac{\sum \text{Validation Component Score}}{\sum \text{Maximum Score}} \text{ x } 100\ \%$$

Purwanto (2009), Validity results with known percentages can be matched with validity criteria as presented in table 1:

Table 1. Validity Criteria for Learning Media

Percentage (%)	Category
90 ─ 100	Very Valid

75 ─ 89	Valid
65 ─ 74	Fair Valid
50 ─ 64	Less Valid
0 ─ 49	Very Invalid

Practicality

Data analysis of the practicality of learning media was obtained based on student response questionnaires that became the research object. Practical analysis techniques through questionnaires are given directly to students who are the object of research.

This student response questionnaire aims to determine the practicality of learning media and learning tools and student responses to the learning process that has been made during the learning process.

$$\text{Practicality}\,(\%) = \frac{\sum \text{Total Students Score}}{\sum \text{Maximum Score}} \text{ x } 100\ \%$$

Table 2. Assessment Criteria for Data Percentage Practicality of Media

Percentage (%)	Category
90 ─ 100	Very Practical
75 ─ 89	Practical
65 ─ 74	Fair Practical
50 ─ 64	Less Practical
0 ─ 49	Very Impractical

The Effectiveness

Effectiveness analysis in this study was carried out in two ways, namely effectiveness based on the value of completeness and effectiveness analysis with N-Gain calculation.

Analysis Of The Effectiveness Based On The Value Of Completeness

The data on the effectiveness of the learning media was obtained based on the results of the knowledge (cognitive) test at the end of the lesson. Based on the test results, the learning outcomes of knowledge (cognitive) are determined to be complete. Minimum Completeness Criteria (KKM) for chemistry subjects at SMA Negeri 7 Samarinda is 75. Based on the assessment guide by the education unit for SMA (2017), the criteria for completeness of student learning outcomes can be seen in table 3 below:

Table 3. Value Minimum Completeness Criteria (KKM)

Interval Score	Frequency
> 75	Number Of Students Completed
< 75	Number Of Students Incomplete

If 80% of all students can achieve the learning objectives (completed), then it can be stated that the Tamoka KIT media is made effective. The following are the criteria for assessing learning outcomes based on the Drafting Team of the Directorate of High School Development, Directorate General of Primary and Secondary Education (2016) in table 4 :

Table 4. Assessment Criteria for Learning Outcomes

Percentage (%)	Category
90 ─ 100	Very Good
75 ─ 89	Good
65 ─ 74	Fair
50 ─ 64	Less
0 ─ 49	Very Less

Effectiveness Analysis With N-Gain Calculation

To determine the effectiveness of the learning media of KIT Tamoka in improving learning outcomes and mastery of concepts, a normalized gain value analysis was carried out. Calculation This aims to determine the increase in the scores pretest and post-test of the two classes. The N-gain formula, according to (Meltzer, 2012) is as follows:

$$\text{N-Gain} = \frac{S_f - S_i}{\text{Maximum Score} - S_i}$$

Note:
S_f = Final score (*Post Test*)
S_i = Initial score (*Pre-test*)

Then the normalized n-gain is interpreted according to the criteria according to (Hake RR, 1999) as shown in table 5 below:

Table 5. Criteria for the Effectiveness of Learning Media

Interval	Criteria
$g \leq 0,3$	Ineffective
$0,3 < g < 0,7$	Effective
$g \geq 0,70$	Very Effective

III. Results

Research on the development of learning media and learning tools in this study uses the ADDIE approach (*Analysis*, *Design*, *Development*, *Implementation*, and *Evaluation*). The first step will be implemented phase analysis*(Analysis)*, the second step will be implemented stage design*(design)*, the third step will be carried out a stage of development*(development)*, and the fourth step will be carried out a stage of use*(Implementation)*, where each of these stages will be evaluated*(evaluation*), of the five stages in which there are stages that the researcher went through including the preparation stage, validation stage, revision stage and small group trial stage, revision of test results, large group trial, product development results. The following describes the results of research at each step in the development:

Recapitulation of the Validation Results of the Expert Team and Learning Practitioners.

Table 6. Recapitulation of Media Validation Results Team of Experts and Learning Practitioners

Assessment Aspects	Score	Conclusion
Media expert	91	Very Good
Practitioner	96	Very Good
Average	**93,50**	**Very Good**

Table 7. Recapitulation of RPP Validation Results Team of Experts and Learning Practitioners

Assessment Aspects	Score	Conclusion
Device Expert	77	Fair
Practitioner	88	Good
Average	**82,5**	**Good**

Table 8. Recapitulation of the Validation Results of the Expert Team and Learning Practitioners

Assessment Aspects	Score	Conclusion
Device Expert	82	Good
Practitioner	90	Very Good
Average	**86**	**Good**

Table 9. Recapitulation of LKS Validation Results Expert Team and Learning Practitioner

Assessment Aspects	Score	Conclusion

Device Expert	76	Fair	
Practitioner	89		Good
Average	**82,5**		**Good**

Table 10. Recapitulation of the Validation Results of Student Response Questionnaire Instruments Expert Team and Learning Practitioners

Assessment Aspects	Score	Conclusion
Device Expert	82	Good
Practitioner	87	Good
Average	**84,5**	**Good**

Recapitulation of Practicality Test Results / Student Response Questionnaire Results.

Table 11. Recapitulation of Student Response Questionnaire Results

Class	Percentage	Criteria
Small	91,79	Very Practical
Big	91,29	Very Practical
Average	**91,54**	**Very Practical**

Recapitulation of Effectiveness Test Results. KKM/ Completeness and N-Gain

Table 12. Recapitulation of Completeness

Class	Completeness (%)	Criteria
Small	100 %	Effective
Large	100 %	Effective
Average	**100 %**	**Effective**

Table 13. Recapitulation of Effectiveness Test Results (N-Gain)

Class	N-Gain	Criteria
Small	0,496	Effective
Large	0,398	Effective
Average	**0,447**	**Effective**

IV. Discussion

Media Validation by Media Experts and Learning Practitioners

The results of media validation by material experts consist of five aspects of assessment, namely: content feasibility aspects, linguistic aspects and presentation aspects, technical feasibility aspects, and media effects on learning strategies.

The results of validation by media expert validators on the aspect of content feasibility are 85% with good and valid categories, on the linguistic feasibility aspect of 93% with very good and very valid categories, on the aspect of presentation feasibility of 88% with good and valid categories, on the feasibility aspect technical aspects of 88% with good and valid categories, and in the media aspect of learning strategies by 90% with very good and very valid categories. From the data obtained, an average assessment of 89% of the media expert validators.

Data from validation results apart from media expert validators were also obtained from learning practitioners who gave an average validation result of the five aspects of 96% with very good and very valid categories. The difference in the validation results from expert validators and practitioners is because after suggestions and improvements from expert validators, according to the validity criteria according to Purwanto (2009), the value is in the very valid criteria. Based on the results of the validation, it can be concluded that the quality of the KIT Tamoka learning media developed has very good quality (very valid) and is feasible to use.

Validation Learning RPP

The assessment of the quality of the lesson plans consists of several aspects, including aspects of learning objectives, learning activities, time allocation, and presentation methods.

Table 14. Values of Lesson Plan Quality from Validators and Practitioners

Aspect	Validator	Category	Practitioner	Category
Material	78	Fair	88	Good
Content	79	Fair	92	Very Good
Language	90	Very Good	90	Very Good
Average	**82**	**Good**	**90**	**Very Good**

Based on Table 4.8, the results of the assessment of the quality of the lesson plans from expert lecturers and practitioners gave an average value in the categories of good enough, good, and very good, so it can be concluded that the lesson plans made have good quality to be used in learning with few revisions.

Evaluation Questions

Quality of evaluation questions is viewed from the aspect of material, content, and language. Making evaluation questions aims to measure the cognitive aspects of students. Evaluation questions that have good quality are expected to measure students' cognitive aspects validly and accurately. The evaluation questions in this study were made in the form of multiple-choice questions.

The results of the evaluation of the quality of the evaluation questions from expert lecturers and practitioners gave an average score with a good category so that the evaluation questions had the good quality to be used in learning with little revision

Student Worksheets (LKS)

The quality of LKS is viewed from the aspects of instructions, content, procedures, and questions. Making worksheets aims to guide students to understand the concept of chemical bonding material and instructions to conduct experiments using the learning media of KIT Tamoka.

Table 15. LKS Scores From Validators And Practitioners

Aspect	Validator	Category	Practitioner	Category
Aspects Of Clues	80	Good	90	Very Good
Content Eligibility	76	Fair Good	89	Good
Procedure	80	Good	80	Good
Question	80	Good	87	Good
Average	**79**	**Fair Good**	**87**	**Good**

Based on Table 4.10, the results of the assessment of the quality of the guidebooks and worksheets from expert lecturers and practitioners gave an average score with a good category so that the evaluation questions had good quality so that the worksheets made had the good quality to be used in learning with few revisions.

Effectiveness of Learning Devices and Learning Media

The value of the effectiveness of media and learning tools is measured from the learning outcomes of cognitive aspects, affective aspects, and psychomotor aspects.

The effectiveness of learning devices and learning media can be seen from the cognitive aspect of students in terms of the score post-test at the first meeting obtaining an average score of 83 with good ability category, at the second meeting 84 with good ability category. While the average value of the daily test obtained a value of 86 with a good ability category. The final score of the cognitive learning outcomes of SMA Negeri 7 Samarinda students is 84. The final score is obtained from 30% post-test for the first meeting, 30% for post-test for the second meeting, 40% for daily tests. The Minimum Completeness Criteria Standard (KKM) at SMA Negeri 7 Samarinda is 75, so that the final score from the cognitive aspect is 84 including complete with good category, so it can be concluded that students can understand the concept well and the learning objectives can be achieved well.

They were judging from the affective aspect of students through the observation sheet. At the first meeting, an average score of 87; at the second meeting, an average score of 87. The average value of the two meetings was 87, with a good category, so it can be concluded that the learning process can run well, and students are very active in responding to learning using the Tamoka KIT media, which is applied through a guided inquiry learning model.

The psychomotor aspects of students are viewed from the results of the observation sheet. At the first meeting, the average score was 87. At the second meeting, the average score was 88. The average value of the two meetings was 88, with a good category, so it can be concluded that the learning process can run well and students can use learning media well, which is applied through the guided inquiry learning model. Based on these data, the use of the Tamoka KIT in chemical bonding learning activities through the guided inquiry learning model can be concluded to be effective.

Media Effectiveness Analysis by Calculation of N-gain.

Gain is the difference between the post-test and pretest scores, and the gain shows an increase in students' understanding or mastery of concepts after the learning is carried out by the teacher. Based on the calculation result data as in table 16, gain as follows:

Table 16. Test Result N-gain

Score	**Small Class**	**Large Class**
Si	79,22	77,95
Sf	87,05	83,95
Smacks	95	93
n-gain	0,496	0,398
Description	**Effective**	**Effective**

Based on these data, the results of the n-gain calculation in the small class are 0.496 and in the large class are 0.398, meaning that in the small class and large class trials, there is an increase in learning outcomes in the medium category because 0.7 > g 0.3.

The practicality of Learning Devices and Learning Media

Practicality is assessed from student response questionnaires taken from student assessments of the Tamoka KIT media used during the chemical learning process on chemical bonding material. Based on the results of the student response questionnaire, students' responses or responses regarding the learning media and learning process were obtained. The percentage value obtained from students of SMA Negeri 7 Samarinda in the small class is 92%, and the large class is 91% in the very practical category, which is very practical to achieve learning objectives on chemical bonding material.

V. Conclusion

The validity of the Tamoka KIT learning media and the chemistry learning tools carried out by media expert validators has a valid category with an average percentage of 89%. The validity of the Tamoka KIT media and learning tools carried out by learning practitioners has a very valid category with an average percentage of 96%.

The effectiveness of instructional media and learning tools KIT Tamoka chemical d ikembangkan seen from the posttest own effectiveness by category are effective, because the mastery learning value by 84%, whereas the results of effectiveness based on a calculation of N-Gain for small class 0,496 with effective category and class is 0.398 in the effective category so it can be concluded that the use of KIT Tamoka can improve student learning outcomes.

Practicality f instructional media and devices pemb KIT Tamoka elajaran chemistry done with a questionnaire response to the students, of the results obtained by the practicality of a small class is 92% and 91% large classes are categorized as very practical.

References

[1]. Dasopang, K. (2020). Pengembangan KIT Pembelajaran Dari Limbah Pada Materi Ikatan Kimia Untuk Meningkatkan Motivasi Dan Hasil Belajar Siswa SMA Kelas X. Universitas Negeri Medan.

[2]. Ghozali, I. (2017). Pendekatan Scientific Learning Dalam Meningkatkan Prestasi Belajar Siswa. PEDAGOGIK: Jurnal Pendidikan, 4(1).

[3]. Hake RR. (1999). Analyzing change/gain score. In American Education Research Methodology. httf:/lists. asu. edu/cgibin/wa A (Vol. 2).

[4]. Indriani, E., Sahputra, R., & Hadi, L. (2017). Pengembangan Media Komponen Instrumen Terpadu (KIT) Ikatan Kimia. Jurnal

Pendidikan Dan Pembelajaran Khatulistiwa, 6(10).
[5]. Meltzer, D. E. (2012). The Relationship between Mathematics Preparation and Conceptual Learning Gain in Physics: A Possible "Hidden Variable" in Diagnostic Pretest Scores: Department of Physics and Astronomy, Iowa State University, Ames, Iowa 50011. Diakses Pada Tanggal, 29.
[6]. Molenda, M. (2003). In search of the elusive ADDIE model. Performance Improvement, 42(5), 34– 37.
[7]. Purwanto. (2009). Evaluasi Hasil Belajar. Pustaka Pelajar.
[8]. Sufairoh. (2016). Pendekatan Saintifik dan Model Pembelajaran. Bahastra, 5(3), 125.
[9]. Tangkas, I. M. (2012). Pengaruh implementasi model pembelajaran inkuiri terbimbing terhadap kemampuan pemahaman konsep dan keterampilan proses sains siswa kelas X SMAN 3 Amlapura. Jurnal Pendidikan Dan Pembelajaran IP.A Indonesia, 2(1).
[10]. Widoyoko. (2012). Teknik Penyusunan Instrumen Penelitian. Pustaka pelajar.
[11]. Wulanningsih, S. (2012). Pengaruh model pembelajaran inkuiri terbimbing terhadap keterampilan proses sains ditinjau dari kemampuan akademik siswa SMA Negeri 5 Surakarta. Surakarta: Indonesia.

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