

Development of Learning Tools GOAL (Graphic Organizer-Based Argumentation Learning) Model to Improve Students' Argumentation Skills

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Abstract

This study aims to develop a learning tools GOAL model (Graphic Organizer-Based Argumentation Learning). The set of GOAL model is expected to be a chemistry learning tool that can improve students' argumentation skills. This study uses a Research and Development methodology with a 4-D design consisting of Define, Design, Develop and Disseminate. The results showed that: 1) the developed GOAL model tools consisting of lesson plans, LKPD, teaching materials, and assessment instruments with good validity. 2) GOAL model tools are easy to use by teachers and students during the learning process in class, and 3) GOAL model learning tools have high effectiveness in improving students' argumentation skills. These results indicate that the GOAL model can be applied in chemistry learning to improve students' argumentation skills.

Keyword: learning tools; GOAL model; argumentation skills

Abstrak

Penelitian ini bertujuan untuk mengembangkan perangkat pembelajaran model GOAL (*Graphic Organizer-Based Argumentation Learning*). Perangkat model GOAL ini diharapkan dapat menjadi perangkat pembelajaran kimia yang dapat meningkatkan keterampilan argumentasi siswa. Penelitian ini menggunakan metodologi *Research and Development* dengan desai 4-D yang terdiri dari *Define* (Pendefinisian), *Design* (Perancangan), *Develop* (Pengembangan) dan *Disseminate* (Penyebaran). Hasil penelitian menunjukkan bahwa: 1) perangkat model GOAL yang dikembangkan terdiri dari RPP, LKPD, bahan ajar, dan Instrumen penilaian memiliki validitas yang baik sehingga dapat digunakan dalam pembelajaran kimia. 2) perangkat model GOAL memiliki kepraktisan yang mudah digunakan baik oleh guru maupun oleh siswa selama proses pembelajaran di kelas, dan 3) perangkat pembelajaran model GOAL memiliki efektivitas yang tinggi dalam meningkatkan kemampuan argumentasi siswa. Hasil tersebut menunjukkan bahwa perangkat model GOAL yang dikembangkan dapat diterapkan dalam pembelajaran kimia dalam upaya meningkatkan keterampilan berargumentasi para siswa.

Kata kunci: perangkat pembelajaran; model GOAL; kemampuan berargumentasi

Introduction

Chemistry is a kind of science that studies the structure and composition of matter, changes experienced by matter, and other phenomena that accompany changes in matter. Chemistry is in line with the nature of science, it is not only oriented to knowledge products but also to the development of various skills. Through a series of chemistry learning processes, it is expected to improve students' skills by the needs of the times.

The development of these skills already contained in core and basic competencies, one of the skills that need to be develop for students is reasoning skills. Reasoning skills are related to students' ability to provide scientific arguments and evidence regarding learning material.

Argumentation skills are important skills to be developed in students. This skill is one of the competencies needed in science learning (Faize et al., 2018). This is because students' thinking skills can develop through the practice of argumentation skills.

In addition, scientific argumentation skills can also make students more critical of the subject matter. However, these skills are still rarely trained in science learning processes and laboratory activities. Even though this skill has a relationship with student learning achievement.

The results of several research show that students' argumentation skills are still low. PISA results for Indonesian student related to reasoning and argumentation skills still low scores (Pratiwi I, 2019). Moreover, other research states that students' argumentation skills are still at low and moderate levels or can only show claims with data (Devi N, et al, 2018).

The low level of students' argumentation skills is caused by the learning process that only focuses on the knowledge aspect and does not provide a portion of student activities to apply, reason, and use the knowledge they have acquired. This fact shows that the learning process needs tools and strategies that can accommodate activities centered on student

activities in reasoning, arguing, and applying knowledge.

Learning models that have been used to accommodate student activities include the Argumentation Driven Inquiry (ADI) model. This ADI model can improve the argumentation ability of high school students (Septyastuti, H. L., Sulistina, O., & Sigit, D, 2018). In line with that, the results of research by Shinta, Suciati, and Amalia (2017) also found that the ADI model can improve students' argumentation skills accompanied by scientific explanations of chemical bonding material.

However, this ADI model has not accommodated students' argumentation abilities optimally. This model emphasizes the process of argument-based investigation and scientific evidence. Meanwhile, the development of argumentation skills requires a clear and systematic learning model that leads to the ability to argue with different backgrounds. The model that can accommodate these skills is the GOAL (Graphic Organizer-Based Argumentation Learning) model.

The GOAL model has student-centered characteristics as a subject who learns according to his interests and talents. In this model, mastery of the subject matter is not the end of the learning process, but only a goal for the formation of student behavior (Erika F, 2019). The GOAL model is designed to practice verbal and written argumentation skills. This skill is a behavioral demand that must be possessed by students to express student ideas. Through the GOAL model activities, students are specifically directed to develop their argumentation skills starting from submitting ideas, propositions, or statements (claims), using evidence and facts to support claims (data), proposing rules, principles, etc., explaining the relationship between data and claims (warrant), put forward assumptions that justify the backing, and the ability to provide information that explains the truth of a claim (qualifier) (Erika F, 2019).

Based on this explanation, this article will explain the development of the GOAL learning model. This model was developed to

accommodate the development of students' argumentation skills. Learning tools with the GOAL model are developed through systematic development stages and produce valid learning tools to be implemented in learning activities, especially in chemistry learning.

Method

This study uses research and development (R&D) with a 4-D model consisting of 4 main stages: Define, Design, Develop and Disseminate (Triyanto, 2010). This model chooses to produce a product in the form of developing the GOAL Model Learning Tool.

The product in this study is a learning device as a form of the operational model. Learning tools consist of Learning Implementation Plan (RPP), LKPD, Teaching Materials, and Assessment Instruments. This learning device is tested for its feasibility with validity and trials. This process is to determine the improvement of students' argumentative abilities after learning with the GOAL Model learning device. This study involved 12 students of class XI in high school in Kutai Kartanegara Regency.

Result and Discussion

This research is development research to produce a developed product, namely the tools of the GOAL learning model (Graphic Organizer-Based Argumentation Learning) on the material for the Development of Atomic Theory. This research was conducted at SMAN 1 Muara Kaman with online learning on a small-scale object, namely 12 students of class X. The large scale consists of class X MIPA 1 and X MIPA 2.

The researcher found that the learning tools used by the teacher in class X for the material on the development of atomic theory were only to fulfill the school's administrative obligations. In addition, the learning tools have not been adapted to the needs of students. This condition occurs because of the lack of information and the ability of teachers to develop appropriate

learning tools. Especially in online learning during the Covid-19 pandemic.

Learning tools that support emergency conditions are still limited. This research consists of five activities, namely preliminary and final analysis, student analysis, material analysis, task analysis, and formulation or specification of learning objectives.

Validity of GOAL Learning Model Tools (Graphic Organizer Based Argumentation Learning)

Validity assessment is carried out by media experts, material experts, and assessment experts. Validation aims to determine the validity of the GOAL learning model device. The indicators used in the validation process consist of content validation and construct validation from experts and practitioners. Aspects of the validity of a learning device are assessed from (1) content validity, namely the device developed is based on theoretical rationale, and (2) construct validity, namely, there is internal consistency between the components of the device with one another (Nieveen, 1999).

When the learning tools are assessed as valid and reliable by the validator, the learning tools are feasible to be used in the teaching and learning process. The validation of learning tools was carried out by media experts, material experts, and assessment experts. The average of validation score from media experts is 95% with very valid criteria, and the average score from material experts is 81.52 with very valid criteria.

This result is in line with previous research that showed the validity of developing the GOAL learning model to improve self-efficacy and argumentative skill of prospective chemistry teachers get very valid criteria with a scale of 4.00 and a reliability of 1.00 with very reliable (Erika, F, et al. 2018). The results of the validation of the GOAL model learning tools in the very valid and reliable. Thus the GOAL model learning tool developed can be used as a guide in chemistry learning to improve students' argumentation skills.

Validity of Lesson Plan

The GOAL Model learning tools consist of several components that are interconnected with another one. The Learning Planning Plan (RPP) was designed using the GOAL Model. Based on the results of expert validation, the lesson plans get very valid and reliable criteria. Mulyasa (2006) stated that the planning of learning programs is essentially a short-term program to estimate a projection of implementation in learning activities. The components contained in the lesson plan were developed based on the Minister of Education and Culture Regulation Number 22 of 2016 so that students can practice argumentation skills.

The lesson plan developed based on the principles of preparation as stated in Permendikbud No. 22 of 2016. The lesson plan developed adopts the phases in the GOAL Model syntax. This can be seen from the activities carried out, namely identifying chemical problems, formulating problems, proposing hypotheses, formulating learning objectives, conducting investigative activities, making arguments, presenting chemical arguments, and making conclusions.

The lesson plan developed with the GOAL Model syntax is adjusted to the Minister of Education and Culture Decree No. 4 of 2020. This letter provides information on the implementation of education policies in the emergency period of the spread of coronavirus disease (COVID-19). Based on the validation results, shows that the lesson plan gets an average score of for the 3 indicators of 95% and is included in the valid criteria.

The lesson plan on the GOAL model has a good format because it contains all the components, the stages in learning activities based on the GOAL Model have been described clearly, the language used is short, clear, and does not cause double understanding, and is in accordance with good and good Indonesian rules. Correct. The time aspect gets a good score because it is in accordance with the level of upper secondary education and according to the lesson schedule.

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Validity of LKPD

The Student Worksheet (LKPD) is by the standards of Government Regulation No. 19 of 2005 article 43 Point 5 regarding the national education standards, namely the appropriateness of content, language, graphics, and presentation. Based on the results of the LKPD validation, the category is very valid and reliable. Student Worksheet was developed adopting the GOAL Model syntax can support students in improving their argumentation skills.

Worksheet of the GOAL model has good format and has complete components that can support students. Worksheet of the GOAL model has an attractive appearance. The pictures and font sizes in worksheet are clear, the language in the worksheet is included in the good category because it is communicative. Overall, the worksheet in this study is in a good category. Worksheet can provide visual stimulation and has an attractive and clear appearance.

There are two worksheets in the GOAL model, namely worksheet A and worksheet B. These two worksheets are interconnected. Both worksheets contain activities designed to make students perform argumentative skills by the GOAL Model. This implementation agrees with Triyanto (2009) worksheet contains a set of fundamental activities that students do to maximize understanding. After that, the worksheet is also used to build basic abilities according to indicators of achievement of learning outcomes.

The process of developing worksheets A and B takes into account the lesson plan. The worksheet development adopts the phases in the GOAL Model syntax. This can be seen from the activities carried out, namely identifying chemical problems, formulating problems, proposing hypotheses, formulating learning objectives, conducting investigative activities, making arguments, presenting chemical arguments, and making conclusions.

Worksheet A contains an exercise in filling out the Graphic Organizer Chemistry Argument, which is a characteristic of the GOAL Model worksheet. Graphic Organizer can change the form of abstract concepts into

a form of visual representation that can make students have long and short-term memory (Miftah and Orlando, 2016). Therefore, the application of the Graphic Organizer in the development of learning tools is expected to help students be more active and effective so as to create an original understanding in the minds of each student.

In the phase of transforming chemical arguments through writing, students are given worksheet B which contains a Simple Scientific Essay. Worksheet B is specifically used to develop essay writing skills. Practicing writing essays is a new thing for class X high school students. Based on the student response questionnaire, the GOAL Model worksheet is novel and interesting even though the students have difficulty in every stage of the learning process.

Validity of Learning Material

The feasibility of teaching materials is seen from the ability of the teaching materials to meet the feasibility assessment standards from the National Education Standards Agency. Based on this, the results of the LKPD validation show an average score of 94% and in the very valid and reliable criteria. Teaching materials are developed while still adopting the GOAL Model. Where in the textbook, students are still faced with practicing argumentation skills and practicing writing sample essays. The teaching materials developed have a good format because it can be used to support the learning process, the distribution of the material is sequential and clear, has attractiveness, the type and size of the letters are legible, the language used in the teaching materials is good because it is by the rules of the Indonesian language. good and right and effective. Overall, the teaching materials are good because they can provide benefits to students to add insight into knowledge about molecular shape material.

According to the National Center for Competency Based Training (2007), teaching materials are all forms of materials used to assist teachers or instructors in carrying out the learning process. The teaching materials in the development of this device already

contain brief material from the development of atomic theory. Teaching materials contain practice questions on the appropriate material learned regarding the content and knowledge that must be mastered by students. The skill exercises are equipped with a Graphic Organizer as attached to the worksheet as well as a Simple Essay Practice. Based on the validation results, the teaching materials are included in the valid criteria.

Validity of assessment instrument

An instrument is a tool used to measure an object to obtain data (Yusup, 2018). The development of assessment instruments must meet the criteria for use (Ruhimat et.al, 2013). Based on the results of the validation of the Assessment Instrument, a score of 94% was obtained which indicated the criteria were very valid and reliable. So that the assessment instrument in the development of the GOAL Model learning device can be tested at the beginning and the end of the study.

The assessment instrument consists of descriptive questions that support the practice of argumentation skills that are adjusted to the indicators of argumentation skills. Based on the validation results, the Assessment Instrument is included in the valid validity criteria. The assessment instrument developed has a good language structure and question writing because it is easy to understand, uses clear command sentences, does not cause multiple interpretations, questions are by indicators, and questions are formulated using simple and communicative language.

The Practicality of the GOAL Learning Model Tools (Graphic Organizer-Based Argumentation Learning)

The practical aspect is a criterion for the quality of learning tools in terms of the ease with which teachers and students use learning tools that have been developed (Nieveen, 1999). Therefore, in developing learning tools, it should be adjusted to the expectations and needs in the field. The practicality of learning devices can be seen based on the results of the analysis of teacher observation sheets and student

observation sheets carried out during the learning process which is filled out by the observer.

Faize et al. (2018) state that one productive way to help students achieve science education outcomes is to provide more opportunities to learn about scientific argumentation in the classroom. The research conducted on a small-scale object, namely 12 students of class X. The large scale consists of two classes namely; X MIPA 1 and X MIPA 2. The results showed that the average score of the implementation of the GOAL learning model phase carried out by the teacher is in the Very Good criteria on a small scale. The same thing is shown in the results of trials on a large scale which shows that the average of the implementation of the GOAL learning model phase carried out by teachers is included in the Very Good criteria.

The implementation of learning is not only seen from the teacher's side (teacher observation) but also observes student activities. The analysis of students activities showed that the overall implementation of the GOAL learning model is in the Very Good category. The practicality test of the GOAL Model learning tools is in line with the opinion of Rahayu et al (2019) where it is said that the practicality of learning tools is in the very good category. The practical category shows that this learning tool is easy to use and easy to interpret. The biggest problem with the implementation of this learning tool is the difficulty in time management, the students' unfamiliarity with practicing argumentation skills, and the difficulty in developing the given problem situation.

The Effectiveness of the GOAL Learning Model Tools (Graphic Organizer-Based Argumentation Learning)

The effectiveness of the GOAL Model Learning Device (Graphic Organizer-Based Argumentation Learning) on the material for the development of Atomic Theory is reviewed based on the learning outcomes and student activities during the teaching and learning process. Student learning outcomes are carried out at SMAN 1 Muara

Kaman through online learning, both on small and large-scale trials. Student learning outcomes are obtained from the pre-test and post-test scores. Pre Test is conducted to see the extent of the student's initial abilities before the learning process begins, then after learning begins and is given the GOAL Model Learning Tool (Graphic Organizer-Based Argumentation Learning) followed by taking the post-test results.

According to Reigeluth (1999), the most important aspect of effectiveness is knowing the degree of application of a theory or model in a particular situation. The improvement of students' argumentation skills was obtained from the results of the N-Gain test, then continued with the Effect size test to determine the effectiveness of the GOAL Model learning tool to increase students' argumentation skills. The results of the N-Gain Test and Effect Size Test for all sample groups indicate that the overall N-Gain average for both classes is in the medium category. The increase obtained from the results of the N-Gain test then continued with the Effect Size test. The result of the Effect Size test shows the effectiveness of the GOAL Model learning tool to improve students' argumentation skills, including the high category.

Students who receive science learning must be able to present accurate statements, communicate back, respond to arguments and compare the resulting arguments (Kosntantinidou and Margono, 2013). Therefore, this research develops learning tools that focus on improving students' argumentation skills. The GOAL Model learning tool is a learning tool developed to support the process of improving students' argumentation skills. In this learning tool, there is an argumentation skill test. The argumentation skill test in this study consisted of five questions in the form of a description.

The learning process that implements good argumentation in discourse, both oral and written, has the concept of presenting structured and patterned arguments, which can make it easier for someone to understand well the arguments presented. This is closely related

to the context of learning, one of which is the presentation of learning materials during the learning process. The concept of learning material presented in an argumentative manner based on complete argument patterns, during the learning process will be able to lead students to obtain complete knowledge.

These results are in line with the opinion of Lazarow (2009) that through clear teaching by utilizing Toulmin's Argument Pattern and efforts to build student arguments. Toulmin's argument pattern is one of the basics for developing the GOAL model which in each stage develops a process that leads to argumentation skills. The results show that Toulmin's argument pattern can be considered a significant mental builder for students, as a well-structured form that can be a significant mediator of students' argumentation efforts. It also proposes that through an appropriate learning model, students become able to assess their arguments and keep track of the development of their argument skills something that can be an intrinsic motivation for themselves.

Conclusion

The argumentation skill is important skills for students in this era. The development of argumentation skill can develop in various ways related to the learning process. In this study, the GOAL model learning tools consisted of lesson plans, teaching materials, worksheet and assessment instruments. The results showed that the GOAL learning model has a high validity for implementation in classroom learning. In addition, the GOAL model tools has practicality in its use during learning process for teachers and students. Furthermore, the test results show that the GOAL learning model has good effectiveness in improving students' argumentation skills in atomic model material chemistry learning.

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