

# Development of Student Worksheets on the Inquiry-Flipped Classroom Model on Addictive and Addictive Substance Material to Improve Student's Argumentation Abilities

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**Abstract:** This study aims to develop worksheets by following the syntax of the inquiry-flipped classroom learning model to improve argumentation skills on addictive and addictive substances, using the ADDIE development model (analysis, design, development, implementation, and evaluation). Research data was obtained by distributing questionnaires to validation design and material experts, teachers, and student responses. The results of this study were that the first percentage was 80% (valid) and the second validation was 92% (very valid), the first stage learning design validation was 87.5% (valid), and the second validation was 93.75% (very valid). Limited trials were carried out on teachers and students. They obtained practical criteria with a percentage of 90% and student responses of 84.68%, so it is feasible to use in learning. The developed student's worksheet can improve students' argumentation skills at level 1 by 13%, level 2 by 16%, level 3 by 25%, level 4 by 28%, and level 5 by 19%.

**Keywords:** Argumentation; Inquiry-flipped classroom; Students worksheet

## Introduction

Students carry out online learning activities from home while following the schedule, like face-to-face learning (Merdiyasi & Kristiani, 2021). Learning is an activity that actually involves two elements, believe the element of soul and element of body. The element of the body indicated must in line with the process of the soul to get change (Ula, 2013). Learning methods are then adapted to conditions that require face-to-face learning to be abolished and temporarily replaced with online or online learning. *Online learning* is a new alternative method that is suitable for current conditions. *Online learning* is an instructional activity that utilizes an internet network that has accessibility, connectivity, flexibility, and the ability to display various kinds of interactions in the process (Yuliani et al., 2020). Current learning is more directed at modernization activities in the hope of helping students digest subject matter in an interactive, productive, effective, constructive, and fun

way. Through the online mode of learning, students have flexibility in study time (Eliyarti & Zakirman, 2020)

Dewi (2020) revealed that online learning requires students to adapt and indirectly affects students' ability to absorb subject matter because it requires adjustments. Denni (2020) said that several senior teachers needed training first to use the online learning facilities properly. One solution to overcome this problem by implementing learning using technology-based media is blended learning, which teachers widely use to facilitate the learning process (Hidayat et al., 2020). Teaching material help teachers and students in the learning process (Titin et al., 2022).

Based on initial observations via telephone with science teachers at Junior High School 2 Sarolangun, learning science, especially chemistry material, students find chemistry lessons difficult to understand because of the abstract knowledge, lack of other learning resources either for teachers' guidance or for students and teachers, there are still limited tools. Learning, not using

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media in learning, student's worksheet, and assessment tools. Students' ability to reason still needs to improve due to the lack of good discussion space that can stimulate students to argue. The teacher still uses time in the learning process by explaining the material so students' space for argumentation is limited. Students need time to form basic concepts in order to be able to provide explanations of phenomena based on their theories and concepts.

Natural Science is a science that studies everything about phenomena that occur in nature, both living and non-living things (Hakim et al., 2022). In science learning, students are required to think critically in order to independently construct the concepts learned in their entirety so that they can be implemented to solve problems that exist around them (Sari et al., 2023). Science in learning also requires students to have 21st century abilities, which means learning Science requires students' thinking skills in solving existing problems (Wahyuni et al., 2022). Scientific argumentation is very important in the process of learning science in particular in biology because arguing is one of the activities of scientists which is very necessary in the learning process of students in explaining existing phenomena. In learning, students are challenged to express an opinion or argument. Students may hesitate and state his doubts in trying to understand a scientific concept that aims to enhance and develop a science (Rahayu & Effendi, 2020).

The inquiry learning model and flipped classroom are in process learning can be done simultaneously because the syntax of the model can be combined with each other to form a new learning model which can support learning to be more effective (Ramadani, 2019).

The low argumentation ability of Indonesian students is also indicated by the relatively low scientific literacy skills of Indonesian students in the Program of International Science Assessment (PISA) from 2003 to 2018 (Kemendikbud, 2016; Tohir, 2019). The PISA results prove that it is still difficult for students to find evidence on which to base arguments; this is because students have not been able to analyze the data obtained to become evidence to support claims (Pitorini et al., 2020). There are five levels of argumentation ability in the assessment; namely, level 1 students can give simple arguments in the form of simple statements or opinions, level 2 students can provide arguments consisting of opinions supported by good data, reasons, or assumptions, but do not contain any rebuttal, level 3 students can provide arguments with a series of opinions or statements with data, reasons, or assumptions which are sometimes accompanied by weak rebuttals, level 4 students are able to provide arguments with an opinion with an identifiable rebuttal. This argument may have several claims and reasons, but it is optional. At level 5, students can provide arguments

composed of long statements with more than one rebuttal (Purba et al., 2021).

The use of students worksheet in the learning process has a positive influence (Wahyuningsih et al., 2014). Students' worksheet is printed teaching material in the form of sheets of paper containing instructions for carrying out tasks that students must do theoretically and practically. Students worksheet functions as teaching material that minimizes the role of the teacher and activates students (Satura et al., 2021). Based on the research conducted (Ramadani et al., 2023) developing worksheets based on the inquiry-flipped classroom learning model on the material factors that affect the rate of reaction to improve argumentation skills has fulfilled aspects and was declared valid with a percentage of material expert validation of 86% and validation learning design 85%. Limited trials were carried out on teachers and students. They obtained practical criteria with a percentage of 85.22% and student responses of 83.75% to be considered suitable for learning. The developed student's worksheet can improve the argumentation skills of students who are at levels 1-2, increasing to levels 3-4, which remain scattered from levels 1-4.

## Method

The type of research used is research and development with the ADDIE model (Branch, 2009). The development of the ADDIE model has five stages: analysis, design, development, implementation, and evaluation. In the early stages of analyzing the needs and characteristics of students aims to determine conditions in the field with the expected conditions. Needs analysis analyzes school needs that can support or improve the quality of learning. The necessary needs are related to teaching materials. Then teaching materials must be determined to help educators and students in teaching and learning. The next stage is designing, where at this stage, learning objectives, searching for content references, determining content boundaries, and designing storyboards from student's worksheet are integrated with the stages of the inquiry-flipped classroom learning model to improve students' argumentation abilities. The learning media prototype will be validated at the development stage to determine its validity level. A limited response test was conducted using a revised prototype from the validator on teachers and students to see student and teacher responses to the students worksheet being developed (Rusdi, 2019). Then an evaluation is carried out to see whether the research procedure being built is following initial expectations or not until this evaluation stage can occur at each of the above stages. The evaluation occurs at each stage above

the initial formative evaluation because of the purpose of the revision needs. *Evaluation* is a process to provide value to the learning system (Priyadi, 2014). The practicality criterion is seen from the efficiency of teachers and students in using the product. According to Rusdi (2019), one evaluation is used to obtain the intrinsic aspects of the product, which include clarity, ease of use, sequence of use, and the completeness of the elements in the product. According to Rusdi (2019), small group evaluation focused on participant performance after using the product.

The data collection technique used in this study used indirect communication techniques through validity test questionnaires, student response questionnaire sheets, and teacher response questionnaire sheets. Each validator and respondent filling out the questionnaire will assess each aspect to measure—in the analysis of student's worksheet expert validation data using a Likert scale of 1-5 based on the validation sheet. The Likert scale is based on five points ranging from intervals (Setyosari, 2015).

The assessment of feasibility results was then analyzed in the following stages: calculating the frequency of scoring scores for each statement, calculating the total score for each statement, calculating the percentage of obtaining a score for each statement, and calculating the percentage of the overall average eligibility.

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## Result and Discussion

The resulting product is a student worksheet implemented in the inquiry-flipped classroom learning model to improve students' argumentation skills on addictive and addictive substances in class VIII Junior High School students. This student's worksheet research is through the ADDIE stages (Analyze, design, development, implementation, and evaluation).

### *Analyze*

At this stage, a needs analysis, material analysis, and student characteristics are carried out. It is done to see the needs of students. Based on the results of the researchers' interviews with science teachers in Junior High School, it can be analyzed that students' interest in learning science is still low, where the factors causing this low student interest have many factors ranging from school environment factors, family environment, community environment, and factors from the students themselves. One solution to increase students' interest in learning science is using tools such as worksheets, textbooks, learning media, and others. The learning

model used by the teacher is still focused on the teacher center; the teacher still has difficulty managing time when conducting experiments. To use various kinds of learning tools in the science learning process, the facilities and infrastructure in Junior High School are adequate, such as the availability of laboratories. However, students still need to be allowed to use cell phones in the school area but can use them at home. So, in the science learning process, learning tools and models are needed to support the learning process when the practicum method is implemented and increase student learning interest.

Based on the results of the student characteristic questionnaire it was found that the responses of students related to science learning in class were 50% answered it was normal, 31.25% answered it was fun, and 18.75% answered it was difficult. Based on this, half of the students already thought learning science was fun, but half of the students thought learning chemistry was ordinary and difficult. For this reason, teachers need to use learning tools in the learning process so that students can be more interested in learning science. It is in line with the results of the student questionnaire, where 84.38% of students agree that using teaching materials in learning will make learning more fun (not boring).

Furthermore, students' responses regarding the material of addictive substances and additives are material that is quite interesting to understand. Namely, 59.38% answered yes, and 40.62% answered no. It means that 59.38% of students think that addictive substances and additives are material that is quite interesting to understand. However, 65.63% of students are still experiencing difficulties in understanding the material of addictive substances and additives. Based on this, it is necessary to provide additional teaching materials to overcome students' difficulties in understanding the material of addictive substances and additives by applying the blended learning inquiry flipped classroom model and developing learning tools to improve students' argumentation abilities. It aligns with the results of the questionnaire of students applying the blended learning inquiry flipped classroom model and developing learning tools to improve students' argumentation abilities, where 68.75% of students agreed. Students' argumentation skills based on the opinion of the class teacher with a total of 32 students at SMP N 2 Sarolangun showed results at level 1 43.75%, level 2 as much as 34.38%, level 3 15.63%, and level 4 6.25%. At this level, students can think abstractly and logically by conducting experiments based on their hypotheses and then conducting experiments using the scientific method (Slavin, 2011).

### *Design*

An initial design is carried out to determine the contents of the student's worksheet following the students' material, curriculum, and character. Steps that must be taken are determining the development team and the resources needed, compiling the development schedule, selecting and determining the scope, structure, and sequence of learning materials, making storyboards, and determining product specifications. Determine the development team consisting of the main developer (researcher), expert team validators, namely instrument experts, material experts, and design experts, practicing validators, namely teachers and students (module users), and Making a development schedule aims to confirm the schedules to be done. The scope, structure, and sequence of learning materials in the development of student's worksheet are contained in the material concept map; the initial design is in the form of basic competencies formulation, objectives, indicators, instructions, materials, and student activities adapted to the syntax of the inquiry-flipped classroom learning model. Tools such as laptops, smartphones, and internet networks are used in the development process. In developing students' worksheet, they used Canva software. They made a storyboard containing cover pages, instructions, concept maps, basic competencies, objectives, materials, and practice questions following the activities at the inquiry-flipped classroom learning model stage.

### *Development*

Student's worksheet that has been designed is validated by material experts and learning design. Validation by material and design experts uses an instrument as a questionnaire; in the material and design validation questionnaire, there are suggestions for improvement regarding student's worksheet. Student's worksheet is assessed based on the instrument that has been made. Student's worksheet is assessed based on material experts with nine aspects: material coverage, material accuracy, sophistication, suitability for students, readability, straightforwardness, motivating ability, coherence and sequence of thought lines, and use of terms and symbols. Learning design validator with nine aspects, namely recognizing the need for learning, analyzing students and the environment, analyzing tasks, objectives, sequences, and strategies, designing messages, developing and practicing, and efficiency (Morrison et al., 2013). The data sources in this study are questionnaires, interview sheets, and observations. The questionnaire is in the form of a questionnaire containing statements related to the overall assessment of the student's worksheet that has been developed, accompanied by answer choices. It aims to obtain data regarding validity and assessment from teachers' and

students' responses to the products developed. All data collection instruments used will be examined for feasibility first.

After the material expert sees and reads the learning device implemented in the flipped classroom inquiry learning model, the material expert assesses the material contained in the learning device by assessing the questionnaire and providing comments and suggestions regarding addictive and addictive substance material. After the learning device has been revised according to comments and suggestions, the learning device is shown again to the material expert to see the revised results. Material validation by material experts was carried out two times, the results of material validation in the first stage were 80% (valid), and the second validation was 92% (very valid). After the design expert has seen and read the learning device developed, the design expert provides an assessment regarding the design of the learning device by providing an assessment of the questionnaire and providing comments and suggestions on the learning device that is implemented in the flipped classroom inquiry model on addictive substances and additives. After the learning device has been revised according to comments and suggestions, the learning device is shown again to the design expert to see the revised results. Design validation by design experts was carried out twice; the results of design validation in the first stage were 87.5% (valid) and 93.75% in the second (very valid) validation.

*Implementation and Evaluation Stage*

The one-on-one evaluation was carried out to obtain initial input regarding the product produced by one science subject teacher who is experienced and competent in his field. After the science teacher saw and read the learning tools that were implemented in the inquiry-flipped classroom model to improve argumentation skills on addictive substances and additives, then the teacher was asked to provide an assessment of the learning devices by giving an assessment to the questionnaire and providing comments and suggestions in the suggestions column improvements contained in the questionnaire Based on the results of the calculation on the results of the teacher's response, namely 90 with very valid or appropriate criteria. After the learning device has been revised according to comments and suggestions, it can be followed by a group evaluation.

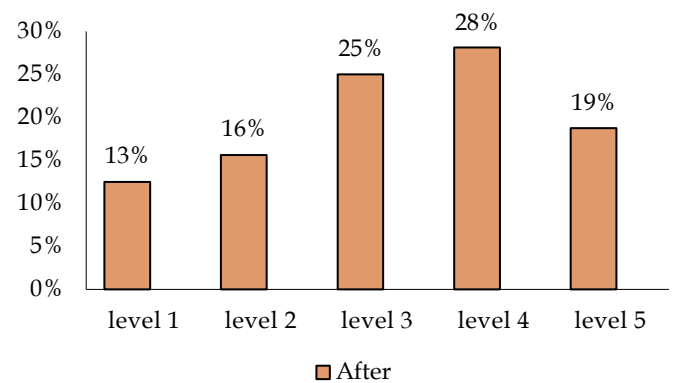
Group evaluation was conducted by asking for opinions from respondents, namely 32 class VIII Junior High School students, by showing the learning tools implemented in the inquiry-flipped classroom learning model. After that, 32 class VIII students were asked to fill out a questionnaire that had been provided. As for the student response questionnaire results at the group

evaluation stage of the student's worksheet, the student response results were obtained with a percentage of 84.68%. Based on the practicality percentage interpretation criterion, the group evaluation (student responses) is obtained with practical does not need revision. So based on the calculated data from the teacher's assessment and student responses above, it can be obtained that the learning tools implemented in the inquiry-flipped classroom model to increase student arguments on addictive substances and additives meet practicality criteria, namely practical or can be tested without.



**Figure 1.** Small group evaluation documentation

After the learning device is implemented in the inquiry-flipped classroom learning model, it can increase students' ability to reason with the graph as follows:



**Figure 2.** Graph of students' argumentation ability after implementation

There are five levels of argumentation ability in the assessment; namely, level 1 students can give simple arguments in the form of simple statements or opinions, level 2 students can provide arguments consisting of opinions supported by good data, reasons, or assumptions, but do not contain any rebuttal, level 3 students can provide arguments with a series of

opinions or statements with data, reasons, or assumptions which are sometimes accompanied by weak rebuttals, level 4 students can provide arguments with an opinion with an identifiable rebuttal. This argument may have several claims and reasons, but it is optional. At level 5, students can provide arguments composed of long statements with more than one rebuttal (Erduran et al., 2004). After applying the student's worksheet implemented in the inquiry-flipped classroom model, students' argumentation abilities increased, as seen in the graph of students who had argumentation skills at level 1 at as much as 13%, level 2 at 16%, level 3 at 25%, level 4 28%, level 5 19%. The development of information technology has an unavoidable influence on the world of education so changes are needed, especially in the learning process at school (Jamalludin et al., 2023). Students are accustomed to taking part in teaching and learning activities online, claim (Dharin et al., 2023).

Students' arguments are classified into five levels. Level 1 shows the argument in the form of a superficial claim with the opposite claim. Level 2 shows the argument in the form of a claim accompanied by grounds, rebuttal, warrant, or backing but without rebuttal. Level 3 shows the argument contains a series of claims accompanied by grounds, warrant, or backing and occasionally weak rebuttal. Level 4 shows that the argument contains a claim accompanied by a rebuttal that can be identified clearly and precisely and contains several claims. Level 5 indicates the argument is broad but still related to the learning material, with more than one clear (Purba et al., 2021). Argumentation is a logical and rational conversation that aims to find a relationship between an idea and the evidence used to support the concept (Akili et al., 2022). The teacher, as a facilitator, must also use a learning method or model that follows the learning objectives and is attractive to students so that students are interested in participating in the learning process and understanding the essence of the material presented (Triana, 2021). Students who only have knowledge skills will certainly experience difficulties in facing challenges in the 21st Century (Nasiruddin et al., 2023).

According to Sihkabuden, (2011), blended learning is capable of activating or provoking students according to the competencies achieved, material characteristics, student characteristics and facilities and infrastructure, both web and face-to-face, so that they can interact optimally. Argues that research on developing the syntax of inquiry learning models combined with the flipped classroom (online learning) results in a new learning model innovation to improve students' argumentation skills (Ramadani, 2019). Especially since the Covid-19 pandemic hit, acquirers in Indonesia are experiencing an education crisis, so

acquires are carried out by acquirers online. Acquireonline is an effort to obtain activities that prohibit universities from conducting face-to-face meetings, obtaining them through the internet using various platforms such as Zoom meetings, google classrooms, and video calls via WA (Suliyanthini & Yulianur, 2023). One of the efforts that can be made by the world of education is to develop various learning components based on digital technology, such as learning videos (Razak et al., 2023). One of the learning models that can be used to improve student learning outcomes (Payu, 2023). With the development of today's technology, many learning activities are switching to online methods so that students can learn independently naturally, ICT continues to create new breakthroughs in learning (Nurfazliana & Jumadi, 2023).

According to research (Novitasari et al., 2022) that has implemented by doing learning In the Student worksheet validation stage, obtained of 85.04% which is included in the category very valid. At the practical stage by implementing using Student Worksheet, obtained by 96% where entered in the very practical category. At stages implementation using the ADDIE method, an N-gain score of 0.81 was obtained fall into the medium category. Student Worksheets (LKPD) can be used to improve students' creative thinking skills which involve hands-on activities such as investigations and thinking activities such as analyzing data from investigation results (Tarihoran & Anas, 2023). Education in Indonesia needs to take into account the needs of the 21st century, not only academic knowledge but more leading to high innovation and creativity that follows the development of technology to be able to compete in the global world (Martinopa & Amini, 2023).

## Conclusion

Students worksheet based on the inquiry-flipped classroom learning model on addictive and addictive substance material in class VIII SMP students to improve argumentation skills has fulfilled aspects and was declared valid with the percentage of material expert validation in the first stage; namely, 80% (valid) and the second validation was 92% (very valid), and the validation of the first stage of learning design is 87.5% (valid). The second validation is 93.75% (very valid). Limited trials were carried out on teachers and students. They obtained practical criteria with a percentage of 90% and student responses of 84.68%, so it is feasible to use in learning. The developed student's worksheet can improve students' argumentation skills at level 1 by 13%, level 2 by 16%, level 3 by 25%, level 4 by 28%, and level 5 by 19%.

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