JURNAL PENDIDIKAN KIMIA
ISSN: 2085-3653| e-ISSN: 2549-3116
Vol. 14 | No. 1 |9 - 18| April | 2022
https://doi.org/10.24114/jpkim.v14i1.33306

Analysis of the needs of teachers and students on the inquiry-flipped classroom model in chemistry lessons

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Received: 12 March 2022 **Revised:** 01 April 2022 **Accepted:** 01 April 2022

ARTICLE INFO

Keywords:
Chemical bond
Flipped classroom
Inquiry
Self efficacy
21st century learning

ABSTRACT

This study was conducted with the aim of looking at how the general description of student characteristics, material analysis, infrastructure, and problems in chemistry learning were used to support research on the use of inquiry based - flipped classroom E-LKPD in order to maximize the teacher's efforts to improve creative and self -thinking skills student efficacy. This research is a quantitative descriptive analysis research. data collection using interview and observation techniques. Interviews were conducted with teachers of chemistry subjects. The sample of students was taken by random sampling. The research subjects were 47 state high school students in Jambi City. The results showed that 78.7% of students had difficulty understanding chemistry lessons, and 61.7% of students had difficulty understanding chemical concepts, and 51.1% of students had difficulty understanding chemistry questions. The results of the study also said that 97.9% of students needed learning multimedia (e-LKPD). Based on the results of the study, it can be concluded that the inquiry-flipped Classroom model assisted by e-LKPD can be used as a solution to meet the needs of students and teachers, because this learning model is oriented towards student activity and uses technology in the learning process.

1. Introduction

The progress of innovation is so rapid today greatly affects all fields, especially the field of teaching. In the realm of teaching, innovation is so persuasive in a learning system called 21st century learning. Training in the 21st century is very likely to be the main learning idea that must be created, because when viewed from a narrow and undeniable world of work, it is not sufficient if students are only equipped with mental abilities (Ariyanto et al. 2020). 21st century learning itself emphasizes students to have skills, information skills, behavioral abilities, and innovation authority. This is in accordance with the assessment (Abidin, 2012) that in the learning system there are about four abilities that must be mastered by students, especially the ability to think imaginatively, have high cognitive abilities, convey, think basic and work together. So that students become better prepared to face difficulties in the future.

Apart from innovative, basic, educational, cooperative, correspondence and critical thinking skills. As we may be aware that currently teaching schools in Indonesia expects everything to be innovation-based and requires all training partners to master ICT mastery skills. Students and lecturers, and even student guardians must also be proficient in innovation and correspondence media. With the aim that they can convey well, think fundamentally in dealing with problems and have the option to work together. Computerization capabilities in the 21st century are fully directed to meet the needs of the world of work that currently uses Information and Communication Technology (ICT) (van Laar et al. 2017).

As a result of the rapid utilization of innovation, students are expected to have the option to achieve learning outcomes according to 21st century instruction. To achieve correct learning outcomes, of course, cannot be separated from the task of educators, teachers must have the choice to make adult learning which is intended as a helper in carrying out exercise learning because it is very influential. procedures, models, content, media, and evaluation (Kurniawan et al. 2019). To be able to make the learning atmosphere in the homeroom stronger, where students are coordinated to carry out logical searches that make students the basic job and educators only as facilitators. So that students can develop basic, creative, imaginative, cooperative reasoning abilities in accordance with 21st century abilities.

During the time spent studying science, any material we don't know is very close to our regular routine. The substance of matter has a quality that is closely related to the reality and ideas of science in everyday life. But in reality in the field students only understand scientific ideas seen from reading only and the material provided by the teacher, so students do not have an idea about the relationship between the substance of ideas in everyday life (Herdiawan et al. 2019).

Despite the abundance of science work in everyday life, it happens that many students are less interested in concentrating on science. One of the reasons is because the way educators deliver material is too boring (Utami & Muhtadi, 2020). As shown by Putri et al (2015), that in the learning system there are still teachers who transfer information by utilizing speech techniques. Then the teacher only presents hypothetical material and examines questions when the most common way of educating and learning exercises occurs, while students only pay attention to the educator. This causes students to be less innovative in dealing with problems, lack of friendly cooperation, and less productive teaching and learning activities. This is in accordance with the assessment (Triwahyudi et al. 2021), in addition to focusing on the substance of the chemical material in order to have choices to achieve learning objectives, there are many things that must be considered, for example the quality of students, where the learning system must have choices to shape the personality and character of students who can collaborate with individuals in their current situation.

Therefore, learning tools are needed that can help learning by handling. Learning tools, for example, learning implementation plans (RPP) and learning media as E-LKPD. For the model to be used, it is of course important to consider both the student's attributes and the quality of the synthetic material to be taught. One model that can be applied is the mastery model that applies significant abilities, such as critical thinking, independent learning, collaboration, and obtaining extensive information (Putra, 2013). A teacher must of course be more creative and better at choosing materials and learning models that match the attributes of the material. Where in the material displayed there are recordings, pictures, activities of synthetic materials arranged by taking into account the stages of certain models, techniques and methodologies. As shown by Haryanto et al (2020), the use of broadcast material in the learning system has benefits for students, including generating inspiration, creating creativity, generating initial information, empowering methods related to obtaining, thinking and thinking rationally, correspondence and associations, students, and add different skill upgrades.

One way to overcome the problems experienced by students so that students can easily understand the concept of chemical bonding material, one model that can be applied is the inquiry learning model. According to Agustanti (2012), the inquiry learning model has advantages because

students conduct research repeatedly and with ongoing guidance, and encourage students to be able to think and solve problems on the problems they are facing. Behind its advantages, the learning model also has a weakness, namely in its implementation it takes a long time so that teachers often have difficulty adjusting learning to a predetermined time (Majid, 2014; Silaban, 2021). Then with the perceived obstacles in the implementation of inquiry-based learning, this is in line with the opinion (Effendi-Hasibuan et al. 2019) that one of the causes is the lack of time or a little during the learning process because the inquiry learning steps are too long and structured. Weaknesses in this inquiry model can be minimized with the help of online learning, namely the flipped classroom approach.

Flipped homeroom can be used as an answer to overcome these problems, the Flipped classroom-based learning approach is a student-focused learning method to overcome the achievement of further learning (Damayanti & Sutama, 2016). This learning approach provides time outside the study room, especially at home to see and concentrate on the material as contemplated in class, students are given learning materials as recordings and read carefully the material that will be taught in class. The distribution of learning time in class is encouraged, which students use to collaborate with friends, practice, and get critique of their learning progress (Milman, 2012). This shows that dynamic progress by applying a flipped study hall approach that is upheld by cooperatives greatly affects student learning outcomes (Rau et al. 2017).

The use of the request learning model and the flipped homeroom should be done simultaneously in the learning system or join. Because the punctuation model can be combined with each other and the structure of the learning model can uphold thinking how to become stronger and ready to further develop students' inventive reasoning abilities. The combination of the directed inquiry learning model with the flipped homeroom approach has been made by previous analysts, especially the progress of the flipped demand learning model to further develop argumentation skills. The punctuation that has been made consists of 8 stages, namely special direction, looking for problems, investigating, forming theories, gathering information, testing speculation, ending, and post-testing (Purba et al. 2021). However, these advances have not been directed into learning systems and follow the notion of past scientists that advances in these models should be possible to work on different abilities.

In practice, the incorporation of the inquiry-flipped classroom learning model is in line with the research conducted Lestari et al (2020) which has implemented the directed request flipped study classroom learning model, which is the background for exploring the use of the direct request model. Joining a reverse homeroom approach can work on student capacities. students' inventive reasoning on the response level material. He also said that the directed demand for the flipped study hall learning model could be used as an option for teachers to make smart learning exercises in the homeroom so that they are smarter in producing learning outcomes. follow the goals to be achieved. According to Damayanti & Sutama (2016), the guided inquiry learning model has an effect on the results of independent creative thinking abilities. This is because students are given learning treatment with a flipped classroom approach assisted by learning videos recorded by the teacher. So that with the flipped classroom approach students already have the provision and information related to the material to be studied in class and make students more active in the problem solving process in class.

Based on the description above, this exploration is directed to get an overview of the characteristics of students as rules, examination of materials, frameworks, and problems in advancing and then used as research assistance on the use of E-LKPD-based flipped homeroom requests to encourage instructors' efforts in developing further reasoning abilities imagination and student survival.

2. Methods

This research is a quantitative elucidating investigation. Information should determine how quality students, materials, and foundations are currently in school. The place of exploration is in a high school located in Jambi City. This school exam was chosen by purposive testing because it is an unrivaled and most loved school nearby.

The instrument for collecting information was done by interview and perception procedures. Interviews were conducted with chemistry subject educators. The student sample was taken by arbitrary examination. The subjects of the exploration were 47 State Senior High School students in Jambi City who studied Mathematics and Chemistry. Perception instrument in the form of a survey filled out by students. Information from student encounters and perceptions is stunningly broken down.

3. Results and Discussion

This exploration is a basic report aimed at getting an overview of the attributes, needs of students and teachers regarding the use of learning models that are generally used in learning systems. From the results of the review as a survey, several important things that we can know are student conclusions about chemistry material and students' needs for learning materials that can help students in dealing with problems. So that with the material displayed, students do not only rely on textbooks and instructor explanations, but can progress freely. Then we also need to know what difficulties students face in concentrating on science.

The scientists led the review by circulating a survey as a google structure to class X SMAN students studying mathematics and chemistry. Exploration describes the findings obtained, dissected, and summarized according to the purpose of the examination. In relation to the division of majors, especially student attributes, positions held by students, and educational program exams, as described in Table 1.

In this study, the researchers also conducted interviews with high school chemistry teachers in the city of Jambi. Researcher come face to face advance by live with respondents. Interviews were conducted with the aim of get information regarding the learning model used in the learning process and motivation study students on the chemical material as described in Table 2.

In the learning process to find out the extent to which students abilities exist, an assessment is carried out both from the realm of cognitive, affective, and psychomotor assessments. The assessment was carried out as an effort to measure the achievement of learning objectives by students, based on the results of interviews with high school chemistry teachers in Jambi City said for cognitive assessment through the ideas used by students in solving problems, affective assessment was seen from the ideas expressed by students during the process. learning, and the last psychomotor assessment, namely as long as students carry out chemistry practicum in the laboratory. Chemical material in general has abstract characteristics which one of the reasons why most students consider subjects to be subjects to understand (Rosa & Pujiati, 2016; Lukman et al. 2022).

Based on the survey data, it was stated that most still many in understanding lessons the explanation from the teacher at school was not enough for them to understand the chemistry material as indicated by the survey data 78.7%. Because the explanation of chemistry contains concrete concepts, students are expected to have the ability to think critically and creatively studying chemistry, both in understanding concepts in solving. However, the reality is different from the field the concept of chemistry, then 51.1% of also have difficulties in chemistry questions by teachers.

Lack of understanding of the of chemistry that have been studied, caused 87.2% and 91.4% of students to be insecure in learning and understanding chemical material independently, especially

chemical material that contains reactions. This was also conveyed by the teacher through interviews, that students' self-confidence was low in studying chemistry because from the beginning students already had the mindset that chemistry was a difficult subject to understand. Even students also feel unsure of being able to do assignments by the teacher, as well as in working on chemistry test questions which are shown by data of 89.4% and 80.9%, respectively. The teacher also said that during the learning process, almost some students had low self-confidence in doing, this was due to the lack of students' understanding of the previously studied material. From these can see that students become more dependent on the teacher, thus making students less independent, less confident, and can even reduce students' interest and motivation to study chemistry. In line with the opinion of the teacher who said that there were some students who had low motivation and interest in learning chemistry.

Table 1. Student Needs Questionnaire Results

Question	Student Response	
	Yes	Not
Do you use E-LKPD/LKS to get data on examples of science?	57.4%	42.6%
Do you use the internet via smartphones to get learning resources when studying chemistry outside school hours?	87.2%	12.8%
Is it true that you are having trouble getting science examples?	78.7%	21.3%
Is the teacher's explanation sufficient for you to get the chemistry material?	12.8%	87.2%
whether the material Chemical Bonds including chemical materials that are difficult to understand?	66%	34%
Which sub-material of Chemical Bonds do you find difficult? • Stability of elements and Lewis structures • Comparison of properties of ionic compounds and covalent compounds	34% 48.8%	17.2%
What kind of problems did you encounter? • Difficulty in getting materials • Difficulty in getting questions	61.7% 51.1%	38.3% 48.9%
Do you ask the teacher for guidance to explain again in order to understand the material being studied?	77.5%	22.5%
Do you review/repeat chemistry material outside of school hours?	59.4%	40.6%
Do you believe that there are ready-made chemistry learning mixed media (E-LKPD) (containing photos, recordings, activities, and practice questions), so that the challenges you experience in learning chemistry can be overcome?	97.9%	2.1%
Have you ever argued (expressed opinion) scientifically during class discussions?	23.4%	76.6%
Do you often think of new ideas in solving chemistry problems?	17%	83%
Are you sure you can understand the chemical material that contains reactions even though the teacher doesn't explain?	12.8%	87.2%
Do you feel confident studying difficult chemistry independently?	8.6%	91.4%
Are you able to do difficult chemistry tasks independently?	10.6%	89.4%
Do you lack confidence in doing difficult chemistry test questions?	80.9%	19.1%
Do you have a phone/tablet (Android, IOS (Iphone), Windows Phone, and so on)?	100%	-
Does figuring out how to use various media (photos, recordings, activities, etc.) make learning fun?	93.6%	6.4%
Do you often use electronic media to study?	63.8%	36.2%

One of the chemical material that is difficult for students to understand is chemical bonding material, because chemical bonding material is a material that is classified as abstract and a concept that is difficult for students to understand. According to Sari (2015), from the characteristics of this material, it is difficult for students to understand the concept of chemical bonding. From the survey

results prove that the to think critically student is still low, as evidenced by 66%, students find it difficult to understand the material of chemical bonds, namely 82.8% of students find it difficult to understand the sub-materials of elemental stability, Lewis structure, and the comparison of the properties of ionic compounds and covalent compounds. This is the cause of students not having confidence in both studying the material and working on the questions assignments given by the teacher.

Table 2. Teacher Interview Data

Question	Answer
What learning models do you usually use in chemistry lessons?	Model Problem based learning, project based learning and inquiry
Does the model that you apply, students better understand the material of chemical bonds? Can you please give me the reason?	Yes, because students are faced directly with problems and try to find solutions to these problems.
What kind of approach do you usually use when teaching chemical bonding material to students?	Scientific approach
Have you ever given homework to students before learning starts at school?	Once but not very often
Have you ever applied the inquiry-flipped classroom learning model in the learning process of chemical bonding material?	For the inquiry model, it has been done before, but if it is combined with the flipped classroom approach, it has never been done
Do you use media in the learning process of chemical bonding material?	Yes
What kind of media do you use in learning chemical bonding material?	Powerpoint, learning videos, e-LKPD
According to you, how are students' motivation and interest in learning by using media in the learning process?	motivation and interest are quite good, but there are some students whose motivation and interest are still low.
How is the student's confidence in learning difficult chemistry? Include the reason?	Students' self-confidence is still low, because students already have the assumption that chemistry is difficult to learn.
How is the student's confidence in working on difficult chemistry questions?	Students are not confident in working on chemistry questions, because students still do not understand the material previously studied well.
Do students dare to express their opinions or ideas during the chemistry learning process in class?	Very few students dare to express their opinions during the chemistry learning process
In your opinion, what attitudes and skills need to be developed from the psychomotor, cognitive, and affective aspects of students?	Psychomotor: in carrying out chemistry practicum. Affective: in terms of expressing opinions or ideas. Cognitive: ideas used in solving problems
What are the difficulties experienced by students in studying chemical bonding material? And what is your solution in overcoming this?	Students find it difficult to understand abstract chemical concepts. By re-explaining the material they do not understand.
In your opinion, what obstacles often arise in the learning process of chemical bonding material?	Constraints students who are less interested in learning chemistry. So they are less enthusiastic about learning in class.

So the role of the is very important in improving students' critical thinking skills, this is in line with the opinion Bandura (1997) that think critically can train or increase confidence self-efficacy students' independence in completing tasks. confidence (self-efficacy) a person has will determine how he thinks, acts, and motivates himself to learn. critical thinking skills and self-efficacy are closely related to chemistry, because students can understand chemistry by thinking. Likewise with critical

thinking be trained learning chemistry, and critical thinking train self efficacy students. Based on the results of teacher interviews, they said that very few students had the courage to express their opinions during the chemistry learning process, because students felt less interested in learning chemistry so they became less enthusiastic about learning. Thus, in order to increase students' interest, motivation, and self-efficacy, especially in learning chemistry. A teacher must be able to create a learning atmosphere that can increase students' interest, motivation, and self-efficacy.

In addition to the ability to think critically still low, the creative thinking ability of students is also still low. This is evidenced in the learning process, 83% of students rarely think of new ideas in solving problems or overcoming chemistry problems at school. The learning process in the field is not optimal and effective, because in learning students have not been actively involved. This is because the learning model by still centered on teachers (Teacher centered). Learning activities this model are dominated by teachers who deliver material in the form of lectures, and students only act as passive recipients of information (Silaban, 2017). According to Kusmawan et al (2018) lack of ability to think creatively students n because the teacher uses a learning model is still teacher centered, where the teacher gives lessons, proves formulas, and gives examples of questions by means of lectures while students act as good listeners, so that is causes the low to creative students.

The progress of the education and learning process is influenced by the accuracy in the selection of learning models. The demand learning model is one model that can be used as an answer to the above problems, it is located to learn focused homeroom exercises and allows to learn how to use various learning assets, and not only make educators a learning asset (Udiani et al. 2017). Inquiry learning is designed to guide students, and involve students actively involved in learning activities. Based on the results of the interview, the teacher said that he used the PBL, PJBL, and inquiry models in chemistry learning, where students were easier to understand the material because students were faced directly with problems and tried to find solutions to solve these problems. In line with the survey data, 77.5% of students asked for teacher guidance to re-explain the material, so that they could understand the material being studied, and 87.2% of students used the internet via smartphones to obtain learning resources when studying chemistry outside school hours.

In the learning process, it turns out that 63.8% of students often use electronic-based media in learning. Where 57.4% of students admitted that they got information about learning chemistry through E-LKPD. The teacher also said that using learning media such as powerpoint, learning videos, e-LKPD in learning chemical bonding material. Then the approach used by the teacher when teaching chemical bonding material still uses the scientific approach. So the integration between the Inquiry model and the flipped classroom approach is very suitable to be applied in the chemistry learning process. As many as 97.9% of students hope that multimedia learning such as E-LKPD complements chemistry materials (photos, recordings, movements, and practice questions), to overcome the difficulties they experience during class conversations. This can be done with a flipped study hall approach known as converse class where the learning system uses innovation, which makes student learning exercises more dynamic and learning materials are given with care (Foster & Stagl, 2018).

Flipped study hall is a learning approach by giving time outside the classroom, especially at home to find and concentrate on the material to be studied in class first (Hidayati et al. 2018). In accordance with survey data obtained that 59.4% of students admitted to studying and repeating chemistry material outside of school hours. The teacher also said that he had given homework but not too often. So that by using technological tools such as laptops and smartphones as learning resources, it can help teach students to use technology for the learning process. This is in line with the opinion Butt (2014), who said that the essence of the flipped homeroom is "moving" material outside the conventional study room through appropriate videos or notes, and utilizing the right study space to work together and complete conversational exercises for critical thinking.

According to Lestari et al (2020), the demand for the inverse learning space learning model affects the consequences of students' innovative reasoning abilities and self-confidence. because students

are given learning treatment with an inverted study room approach assisted by recordings, movements and acquisition of material from various sources. The side effect of this study is reinforced by research Paristiowati et al (2017) which says that in addition to broadening students' inspiration, the use of the flipped study hall learning model can make students more confident when studying in class. This is because students' self-efficacy is still low, as evidenced by the review information, only 23% of students admitted to having argued (communicated) deductively during class conversations. In accordance with the results of the meeting of educators who said that in the application of the learning model the request had never been included with the flipped study hall approach in the chemistry learning process. So that by applying the flipped study hall request model in chemistry learning, it can provide arrangements for students and data related to the material to be studied before class and make students more dynamic in the critical thinking process and during the class conversation process so that they are more independent. adequacy can also be expanded.

4. Conclusion

Based on the results of the research conducted, it can be concluded as follows, that most students still have many difficulties in understanding chemistry lessons, even the explanations from teachers at school are not enough for them to understand the chemical material shown by the data as many as 78.7% of students have difficulty in understanding chemistry. obtain chemistry illustrations, and 61.7% of students have difficulty in getting compound ideas, and 51.1% of students have difficulty understanding chemistry questions. This is in accordance with the assessment of educators who said that students' independence was low in obtaining knowledge, considering that from the beginning students previously had the mentality that science was a difficult subject to understand. The educators also said that during the learning system, some students had low confidence in working on chemistry questions this was due to the lack of students' understanding of the recently concentrated material, especially compound material. So that the inquiry-flipped classroom model assisted by e-LKPD can be used as a solution to meet the needs of students and teachers, because this learning model has the advantage of being oriented to student activity and teaching students to use technology in the learning process.

Acknowledgment

The author may wish to thank all educators and students involved and ready to add to this exam. The authors also thank the speakers and individual students of the undergraduate science education program at the Jambi University Postgraduate Program.

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