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Didactical Design Based on Sharing and Jumping Tasks on Reaction Rate Law

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Abstract

In improving the quality of learning, it is necessary to develop a learning design that can facilitate the characteristics of students. The didactical design can facilitate the characteristics of students through sharing and jumping tasks. Sharing task is used to facilitate slow learner while jumping task is used to facilitate fast learner. Jumping task is not only beneficial for students with high academic ability, but also provides benefits for students with low academic ability. The purpose of this study is to develop the didactical design based on sharing and jumping tasks to enhance learning quality on the topic of reaction rate law. The research method used is didactical design research (DDR). Didactical design consisted of three steps i.e. (a) analysis of didactical situation before learning (prospective), (b) analysis of didactical situation during learning (metapedadidactical), and (c) analysis of didactical situation after learning (retrospective). The data was collected by test, observation, interview, documentation and recording (audio and video). The result showed that the didactical design on the topic of reaction rate law was valid

Keywords: didactical design; jumping tasks; sharing tasks

Abstrak

Dalam meningkatkan kualitas pembelajaran maka perlu dikembangkan suatu desain pembelajaran yang dapat memfasilitasi berbagai karakteristik siswa. *Didactical Design* dapat memfasilitasi berbagai karakteristik siswa melalui *sharing tasks* dan *jumping tasks*. *Sharing tasks* digunakan untuk memfasilitasi siswa yang lambat belajar sedangkan *jumping tasks* digunakan untuk memfasilitasi siswa yang cepat belajar. *Jumping tasks* tidak hanya bermanfaat bagi siswa yang berkemampuan akademik tinggi, tetapi juga memberikan manfaat bagi siswa yang berkemampuan akademik rendah. Tujuan penelitian ini adalah mengembangkan *Didactical Design* berbasis *sharing tasks* dan *jumping tasks* untuk meningkatkan kualitas pembelajaran pada topik hukum laju reaksi. Metode penelitian yang digunakan adalah *Didactical Design Research* (DDR). *Didactical Design Research* terdiri dari tiga langkah yaitu (a) analisis situasi didaktis sebelum pembelajaran (prospektif), (b) analisis situasi didaktis selama pembelajaran (metapedadidaktik), dan (c) analisis situasi didaktis setelah pembelajaran (retrospektif). Pengumpulan data dilakukan dengan tes, observasi, wawancara, dokumentasi dan rekaman (audio dan video). Hasil penelitian menunjukkan bahwa desain didaktis pada topik hukum laju reaksi valid.

Keywords: *didactical design; jumping tasks; sharing tasks*

Introduction

The success of a learning process is closely tied to the teacher's role in developing a lesson plan. The more detailed the lesson plan that is prepared, the greater the success of the learning process (Fauzi & Suryadi, 2020). Several factors can cause a learning process to be unsuccessful, including unpredictable questions from students, the varying speeds at which students understand the material presented, and the teacher's focus solely on completing the material without considering the learning obstacles faced by students (Zendrato, 2016).

Learning obstacles are conditions in the learning process characterized by certain obstacles in achieving learning outcomes (Sulistiawati et al., 2015). There are three types of learning obstacles, 1) ontogenic obstacle, is a learning obstacle caused by the limitations of the student in self-development or related to the mental readiness of student learning, 2) didactical obstacle, is a learning obstacle caused by the method or approach used by the teacher, or it could be from the presentation of textbooks, and 3) epistemological obstacle, is a learning obstacle caused by the limited knowledge that students have in certain context. If students are faced by different context, then the knowledge they possessed cannot be used or they will experience difficulty in using it (Cesaria & Herman, 2019; Unaenah et al., 2024)

Didactic design is a learning design that can overcome students' learning obstacles (Zahroh et al., 2016). Didactic design is structured based on didactic situations by considering the diversity of student responses to didactic situations, namely by preparing predictions and anticipations of student responses (Suryadi, 2010). Thus, various learning obstacles that arise can be precisely addressed by the teacher, and the learning process becomes more optimal (Suryadi, 2013; Sukri et al., 2023).

The didactical design can facilitate collaboration through sharing and jumping tasks. In the sharing task, there was collaboration among students both within groups and between groups, as they worked together to complete the sharing task. Jumping task is not only beneficial for students with high academic ability, but also provides benefits for students with low academic ability (Asari, 2017). In the jumping task, students utilize, apply, and deepen the concepts they have acquired in previous activities (Masaaki, 2012).

Based on a preliminary study in the form of interviews conducted by the researcher with chemistry teachers at a high school in Bandung, it was revealed that the learning on the topic of the law of reaction rates has not met the demands of the 2013 curriculum, and the learning is still teacher centered. This is in line with the research findings of Jayatri (2017) and Cahyani (2017), who conducted preliminary observations at a high school in Bandung, indicating that the learning process is still teacher-centered.

Based on the analysis of the Lesson Plan at one of the high schools in Bandung, it shows that the learning design has not anticipated student responses and does not reflect the presence of sharing and jumping tasks. The lack of anticipation of student responses in lesson planning can impact the learning process for each student, leading to less optimal outcomes. This is partly because some students' responses to the developed didactic situation are beyond the teacher's thinking or have not been explored. As a result, the various learning obstacles that arise are not appropriately addressed by the teacher or are not addressed at all, which can lead to the learning process not occurring. (Suryadi, 2010). The lack of sharing and jumping tasks affects the occurrence of collaboration in learning.

Based on previous research studies, one of which is by Nurlaeli (2017), who conducted a study on collaborative learning through sharing tasks and jumping tasks on the topic of constant comparison law. The results of the study indicate that the design of collaborative learning through sharing tasks allows students to build their own conceptual knowledge by learning from each other within groups and even across groups. Meanwhile, the jumping task learning approach provides challenges to students according to their abilities and offers all students the opportunity to learn together. In addition, with the preparation for anticipation or assistance, teachers can be responsive to the differing needs and thinking abilities of students. Furthermore, teachers can provide support when students encounter difficulties. Thus, a more meaningful learning experience is created. So, broadly speaking, the research results indicate that didactic design can be an alternative to improving the quality of learning.

Based on that background, it is necessary to design learning that can facilitate the characteristics of students, predict and anticipate student responses during the learning process, namely through the didactical design based on sharing and jumping tasks on the topic of reaction rate law.

Method

The research design used is didactical design research (DDR). Didactical design consisted of three steps i.e. (a) analysis of didactical situation before learning (prospective), (b) analysis metapedadidactical, and (c) analysis retrospective (Suryadi, 2010).

The research was conducted at one of the high schools in Bandung, Indonesia. The result of didactical design will be validated empirically on the students of grade XI Science Program.

The data was collected by interviewing teachers, observation through analyzing lesson plans, analyzing the curriculum syllabus, reviewing several chemistry books related to the subject. The results of this will be a consideration in determining the sharing and jumping tasks that will be used in lesson design.

Result and Discussion

In developing the didactical design, teacher activity is designed not only to focus on students and learning materials but also on the relationships between students and learning materials. The didactical design is collaboratively designed between researchers and teachers by predicting students' responses. Sharing and jumping tasks will be applied in didactical design. Sharing task is expected to facilitate slower learners and jumping task to facilitate faster learners. Jumping tasks are not only beneficial for fast learners, but they also provide significant advantages for slow learners, as they will truly understand the fundamental material while working on jumping tasks.

The didactical design is created in the form of Chapter Design and Lesson Design. Chapter Design contains detailed material that is organized by selecting essential content, allocating time, learning methods, learning objectives, and evaluation methods (Fauziyah et al., 2021; Susetyarini & Miharja, 2017).

This chapter design is accompanied by the stages of repersonalization and recontextualization. The process of repersonalization can expand and deepen the understanding of the material, as well as improve the perspective on how to facilitate student learning (Suryadi, 2014).

The process of recontextualization and repersonalization aims to explore teaching materials related to their application in various contexts as well as the connections between concepts before and after the material. This step is very important for mapping the diversity of thinking styles and the potential difficulties faced by students. Anticipation is also necessary in relation to the aspects of interaction among students as well as between students and teachers. This aims to provide students with the opportunity to independently reach their actual abilities and to create space through interaction to achieve their potential abilities. Repersonalization was carried out by examining four chemistry books, namely

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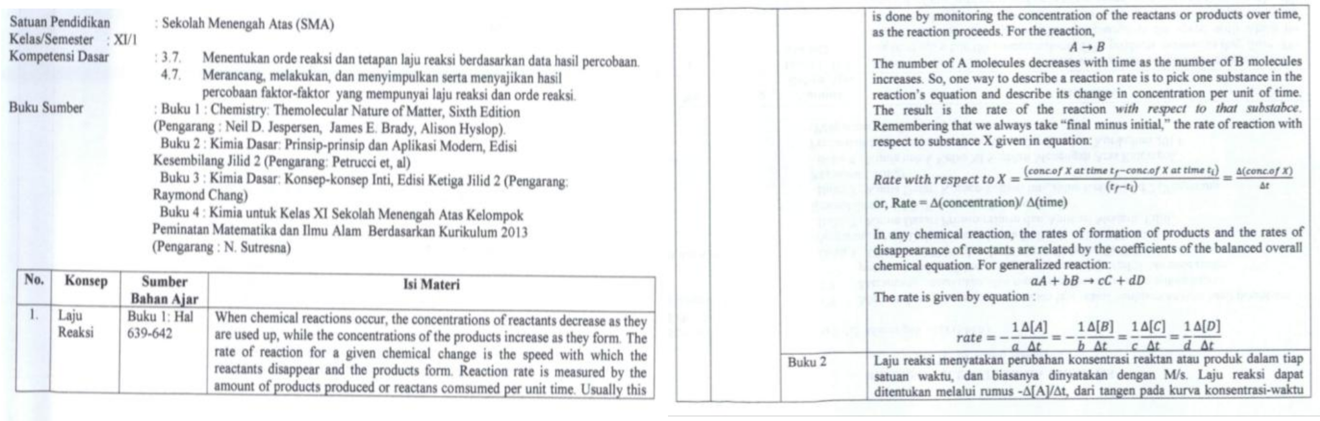
three university chemistry textbooks and one school chemistry book (Figure 1). Recontextualization was conducted by reviewing the 2013 curriculum syllabus revised in 2016 and analyzing the lesson plans. (Table 1).

Figure 1

Repersonalization of the Didactical design of the topic of Reaction Rates Law



Satuan Pendidikan : Sekolah Menengah Atas (SMA)
Kelas/Semester : XI/1
Kompetensi Dasar : 3.7. Menentukan orde reaksi dan tetapan laju reaksi berdasarkan data hasil percobaan.
4.7. Merancang, melakukan, dan menyimpulkan serta menyajikan hasil percobaan faktor-faktor yang mempunyai laju reaksi dan orde reaksi.
Buku Sumber : Buku 1 : Chemistry: Themolecular Nature of Matter, Sixth Edition (Pengarang : Neil D. Jespersen, James E. Brady, Alison Hyslop).
Buku 2 : Kimia Dasar: Prinsip-prinsip dan Aplikasi Modern, Edisi Kesembilang Jilid 2 (Pengarang: Petrucci et, al)
Buku 3 : Kimia Dasar: Konsep-konsep Inti, Edisi Ketiga Jilid 2 (Pengarang: Raymond Chang)
Buku 4 : Kimia untuk Kelas XI Sekolah Menengah Atas Kelompok Peminatan Matematika dan Ilmu Alam Berdasarkan Kurikulum 2013 (Pengarang : N. Sutresna)

No.	Konsep	Sumber Bahan Ajar	Isi Materi
1.	Laju Reaksi	Buku 1: Hal 639-642	When chemical reactions occur, the concentrations of reactants decrease as they are used up, while the concentrations of the products increase as they form. The rate of reaction for a given chemical change is the speed with which the reactants disappear and the products form. Reaction rate is measured by the amount of products produced or reactans comsumed per unit time. Usually this is done by monitoring the concentration of the reactans or products over time, as the reaction proceeds. For the reaction, $A \rightarrow B$ The number of A molecules decreases with time as the number of B molecules increases. So, one way to describe a reaction rate is to pick one substance in the reaction's equation and describe its change in concentration per unit of time. The result is the rate of the reaction *with respect to that substabce*. Remembering that we always take "final minus initial," the rate of reaction with respect to substance X given in equation: $Rate\ with\ respect\ to\ X = \frac{(conc.of\ X\ at\ time\ t_f - conc.of\ X\ at\ time\ t_i)}{(t_f - t_i)} = \frac{\Delta(conc.of\ X)}{\Delta t}$ or, Rate = Δ(concentration)/ Δ(time) In any chemical reaction, the rates of formation of products and the rates of disappearance of reactants are related by the coefficients of the balanced overall chemical equation. For generalized reaction: $aA + bB \rightarrow cC + dD$ The rate is given by equation : $rate = -\frac{1}{a}\frac{\Delta[A]}{\Delta t} = -\frac{1}{b}\frac{\Delta[B]}{\Delta t} = \frac{1}{c}\frac{\Delta[C]}{\Delta t} = \frac{1}{d}\frac{\Delta[D]}{\Delta t}$
		Buku 2	Laju reaksi menyatakan perubahan konsentrasi reaktan atau produk dalam tiap satuan waktu, dan biasanya dinyatakan dengan M/s. Laju reaksi dapat ditentukan melalui rumus -Δ[A]/Δt, dari tangen pada kurva konsentrasi-waktu

Table 1

The Analysis of 2016 Revised Syllabus

Basic Competencies (KD)	Learning Materials	Learning Activities
3.7: Determining the order of reaction and the rate constant based on experimental results, 4.7: Designing, conducting, concluding, and presenting the results of experiments on the factors that influence reaction rates and reaction orders.	The law of reaction rate and the determinants of reaction rate.	-Discussing how to determine the order of a reaction and the rate equation. -Processing and analyzing data to determine the order of the reaction and the rate equation.

Based on the analysis of lesson plan (Figure 2), the learning activities are more focused on how the teacher teaches rather than on how the students learn. Lesson plan is still an outline of the learning activities. Additionally, the lesson plan has not anticipated student responses, teachers also cannot predict how students will respond when they encounter difficulties in learning.

The lack of anticipation of student responses in lesson planning can lead to less optimal learning for each student. This is partly due to some student responses to the developed didactic situation being beyond the teacher's thinking or not being explored. As a result, the various learning obstacles that arise are not appropriately addressed by the teacher or are not addressed at all, which can lead to a breakdown in the learning process.

Figure 2
The Lesson Plan on the Topic of Reaction Rate Law

Rincian Kegiatan	Waktu
Pendahuluan/Kegiatan Awal • Sebelum memulai pelajaran siswa berdoa dan mengkondisikan untuk belajarS • Guru memberi apersepsi dengan konsep mol • Guru menyampaikan tujuan pembelajaran. • Guru menyampaikan pokok-pokok/cakupan materi pembelajaran.	15 menit
Kegiatan Inti Mengamati • Siswa diminta mencari informasi dengan cara membaca/ melihat/ mengamati reaksi yang berjalan sangat cepat dan reaksi yang berjalan sangat lambat, contoh petasan, perkaratan (korosi). • Siswa diminta mengkaji literatur mengenai konsep laju reaksi. **Menanyakan** • Siswa melakukan tanya jawab bersama guru mengenai konsep laju reaksi	60 menit

Rincian Kegiatan	Waktu
Mengeksplorasi • Siswa berkelompok mengerjakan LKS • Siswa diminta untuk mencari informasi dari sumber lain mengenai laju reaksi. **Mengasosiasi** • Siswa berkelompok mendiskusikan temuannya mengenai laju reaksi dalam LKS. • Siswa berkelompok diminta menyimpulkan hasil diskusinya. **Mengomunikasikan** • Perwakilan masing-masing kelompok mempresentasikan hasil diskusi mengenai konsep laju reaksi.	
Penutup • Siswa bersama guru menyimpulkan materi pembelajaran yang telah dipelajari. • Siswa merefleksi penguasaan materi yang telah dipelajari. • Siswa saling memberikan umpan balik hasil evaluasi pembelajaran yang telah dicapai.	15 menit

Based on the recontextualization and repersonalization that has been carried out, the essential concepts for the topic of reaction rate law includes reaction rate, rate laws, reaction order and rate constants. The time allocation used in this didactical design is 2×40 minutes. The learning objectives for the topic of reaction rates are aligned with the essential material and the 2013 curriculum syllabus revised in 2016. It is expected that students will be able to express the rate of concentration change, determine the rate law, ascertain the order of reaction based on experimental data, and calculate the rate constant based on experimental data.

The learning methods used in this didactical design are demonstration and discussion. The didactical design developed in the form of Chapter Design and Lesson Design through the presentation of phenomena followed by experiments or demonstrations can provide students with a conceptual understanding (Khaerudin, 2023).

Based on the repersonalization and recontextualization that has been carried out, a design chapter has been obtained which will then be developed into a Lesson Design. The Lesson Design is a derivative of the Chapter Design, adding learning steps in the form of predictions of student responses to the chosen activities and the teacher's anticipation of the predicted student responses (Khaerudin, 2023)

According to Masaaki (2012), there are three factors that determine the quality of learning, namely (1) the quality of the tasks given or lesson plans, (2) dialogue and collaboration, (3) the activity, enthusiasm, cognition, and emotions of students. The quality of tasks given is what is interesting to the students, namely if they are given tasks that are worth studying or challenges with a high level of difficulty, students will be motivated and enthusiastic to learn.

In this study, lesson design consists of sharing tasks and jumping tasks. Sharing tasks can facilitate students with tasks that are worth studying, while jumping tasks can facilitate students with challenging tasks of high difficulty that can motivate and excite students to learn. Thus, this can improve the quality of learning.

The lesson design consists of three columns that present the three main learning activities, namely the introductory activity, the core activity, and the closing activity. The three areas at the top are for presenting tasks and teacher anticipation/support. The three areas at the bottom are for presenting predictions of student responses.

Lesson design includes tasks, teacher predictions of student responses. And anticipation/support. The tasks given illustrate the relationship between the teacher and the students (HP). Predictions of student responses indicate the relationship between the students and the material (HD), while the anticipation/support provided by the teacher reflects the relationship between the teacher and the material. (ADP).

In the middle section of the Lesson Design, there is a wavy line called the Hypothetical Learning Trajectory (HLT). HLT is a representation of the learning process of students from the initial activities to the achievement of learning objectives (Fuadiah, 2017).

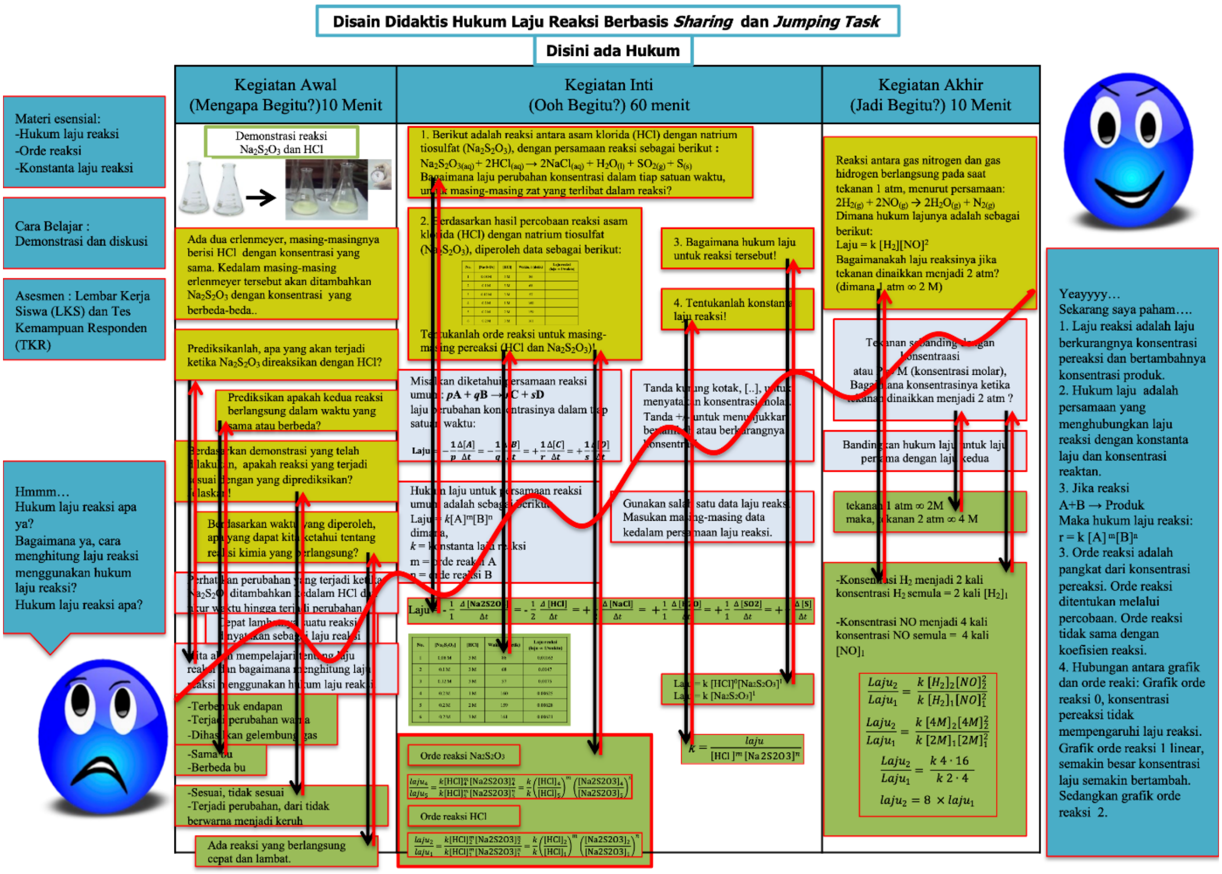
When students can complete the assigned tasks, their motivation and enthusiasm for engaging in learning activities will increase (the upper point). However, it is also possible for students to encounter obstacles that cause their motivation to decrease (the lower point). When students are at the lower point, teachers must help them overcome these obstacles. So that students can regain their enthusiasm and motivation to engage in learning activities (the upper point again) (Suryadi, 2014).

In Lesson Design, there are upward arrows (pointing to the peak or top point) and downward arrows (pointing to the valley or bottom point). The upward arrow indicates the predicted response of the students, while the downward arrow represents the tasks and teacher support/anticipation. The number of waves corresponds to the number of tasks given. The Lesson Design can be seen in the Figure 3.

In the implementation of didactical design, students are divided into small groups. Meanwhile, the students' seating in this activity is arranged in a U-shape. This aims to create a more conducive pedagogical situation as it makes the teacher's mobility easier (Suryadi, 2013). In addition, the seating arrangement for students in the shape of a "U" is very suitable for facilitating dialogue and sharing among students. When seated in a "U" formation, students can see the expressions of their peers who are expressing their opinions (Maasaki, 2012).

Figure 3

Lesson Design of The Reaction Rate Law



In the initial activity, the teacher asked several students to come forward and demonstrate the reaction between hydrochloric acid (HCl) and sodium thiosulfate. ($Na_2S_2O_3$,). The demonstration carried out by the students was guided by the teacher. However, before the demonstration is carried out, the teacher emphasizes to all the students that the two Erlenmeyer flasks containing HCl have the same concentration.

The teacher asks the students to predict what will happen if sodium thiosulfate ($Na_2S_2O_3$) with different concentrations is added to each Erlenmeyer flask? Will the reaction times be the same? The predicted response from students based on the question posed is that a precipitate will form and gas bubbles will be produced. Meanwhile, the predicted response from students regarding the reaction times is that they will be different. The teacher's anticipation of the students' response is to direct them to pay attention to the changes that occur when sodium thiosulfate ($Na_2S_2O_3$) is added to HCl during the demonstration. With the demonstration provided, students can determine whether their predictions are correct or not.

In the core activity, the teacher assigns tasks to the students in the form of worksheets. The Sharing task emphasizes the basic material that students need to learn. After that, students are given a Jumping task that has a higher level of difficulty than the sharing task (Damayanti, 2017). The sharing tasks provided consist of four types of tasks, namely determining reaction rate, determining the order of reaction for each reactant (HCl and $Na_2S_2O_3$, determining the rate law of the reaction, and calculating the rate constant of the reaction.

In the first sharing task, students were asked to determine the reaction rate for each substance involved in the reaction between sodium thiosulfate ($Na_2S_2O_3$) and hydrochloric acid (HCl). The predicted response from the students is that they can state that the rate of concentration of the reactants decreases and the rate of concentration of the products increases, indicated by negative and positive values.

In second sharing task, students are asked to determine the reaction order for each reactant (HCl and $Na_2S_2O_3$). The predicted response from students is that they can determine the reaction order for each reactant, where the reaction order for HCl is zero and the reaction order for $Na_2S_2O_3$ is one. The teacher's anticipation of the students' responses is by asking them to use the rate law equation and compare the experimental data while keeping one concentration constant.

In the third sharing task, students are asked to determine the rate constant of the reaction. It is expected that students will be able to determine the rate constant using the rate law equation. The teacher's anticipation of student responses is to guide students to use the rate law and the rate of one of the known data.

In the fourth sharing task, students were asked to determine the rate law. The predicted response of the students is that they can write down their reactions and connect the reaction order obtained with the rate law equation. The anticipated response from the teacher is to guide the students to use the general rate law equation and relate it to the reaction order they have obtained. For more clarity, the core activities can be seen at Table 2.

The final activity is a learning activity that includes a jumping task, which is creative and challenging, facilitating students to utilize, apply, and deepen the concepts they have acquired in previous activities. In determining a suitable task for jumping, the level of difficulty can vary according to the students' circumstances (Maasaki, 2012). In this case, students are expected to apply the concepts they have learned in previous activities to the jumping task, allowing them to deepen their understanding of the law of reaction rates. With the jumping tasks, students become more trained to tackle questions that require analysis in their answers (Damayanti, 2017).

The jumping task given in this didactical design is to determine how the reaction rate of hydrochloric acid (HCl) and nitrogen monoxide gas ($Na_2S_2O_3$) changes when the pressure is increased from 1 atm to 2 atm. The prediction of student responses is that they are expected to determine the reaction rate by relating pressure and concentration, specifically that pressure is proportional to concentration. When the pressure is increased to 2 atm, the concentration becomes 4 M, allowing students to identify the initial and final concentrations of each reactant and connect them with the rate law provided in the question.

The teacher's anticipation of student responses involves guiding students to the information in the question regarding the symbol $\propto$, which indicates that pressure is directly proportional to concentration. Then the students were asked to compare the first law of rate with the second.

In the sharing task and jumping task activity, there is collaboration among students both within the same group and between groups, as they worked together to complete the sharing task. This aligns with Nurlaeli's research (2017), which states that in sharing tasks and jumping tasks, discussions occur not only among students but also between groups. Among students, there is a relationship of mutual learning, a relationship of mutual respect for differing opinions, and receiving gentle responses when asking for help (Sato, 2012).

Based on the implementation of didactical design, predict the responses that may arise from students and the anticipations made by the teacher in accordance with what has been planned in the didactical design, so that this can enhance the quality of learning and align with the learning objectives. This is in line with research conducted by Khaerudin (2023).

Table 2
Prediction of Student Responses and Teacher Anticipation in Core Activities

Student Activity	Student Response Prediction	Teacher Anticipation
The following is the reaction between hydrochloric acid(HCl) sodium thiosulfate ($Na_2S_2O_3$), with the following reaction equation $Na_2S_2O_3(aq) + 2HCl(aq) \rightarrow 2NaCl(aq) + H_2O(l) + SO_2(g) + S(s)$ What is the rate of change in concentration per unit time, for each substance involved in the reaction?	The reactant concentration rate decreases and the product concentration rate increases per unit time. The reactant concentration rate decreases per unit time are $Na_2S_2O_3$ and HCl. The concentration rates of products increasing each unit time are NaCl, H_2O, SO_2, and S Rate = $-\frac{1}{1}\frac{\Delta [Na_2S_2O_3]}{\Delta t} = -\frac{1}{2}\frac{\Delta [HCl]}{\Delta t} = +\frac{1}{2}\frac{\Delta [N}{\Delta t}$ 1 Δt 1 Δt 1 $\frac{\Delta [S]}{\Delta t}$	The teacher directs the students to observe the given general equation, as follows: $pA + qB \rightarrow rC + sD$ Rate = $-\frac{1}{p}\frac{\Delta [A]}{\Delta t} = -\frac{1}{q}\frac{\Delta [B]}{\Delta t} = +\frac{1}{r}\frac{\Delta [C]}{\Delta t} = +\frac{1}{s}\frac{\Delta [D]}{\Delta t}$ The teacher reminds the students again related to the symbols contained in expressing the rate of change in concentration, such as the [ ] symbol, Δ symbol, negative and positive values.
Based on the data from the reaction of hydrochloric acid (HCl) with sodium thiosulfate ($Na_2S_2O_3$), determine the reaction order for each reagent (HCl and $Na_2S_2O_3$)!	The reaction order of $Na_2S_2O_3$ is one and the reaction order of HCl is zero	The teacher directs the students to use the rate law equation and compare the experimental data when one concentration is held constant.
Determine the law of reaction rate!	Students can write what the reaction is and relate the reaction order obtained to the rate law equation, as follows: Rate = $k\,[Na_2S_2O_3]^1\,[HCl]^0$ Rate = $k[Na_2S_2O_3]^1$	The teacher directs students to use the general rate law equation, for example the general reaction equation is $pA + qB \rightarrow rC + sD$ Then the rate law is, Rate = $k\,[A]^m[B]^n$ and relate it to the reaction order of each reactant.
Determine the reaction rate constant!	Students can determine the rate constant using the rate law equation, as follows: $k = \frac{Rate}{[HCl]^m[Na_2S_2O_3]^n}$	The teacher directs students to use the law of rate and the rate of one of the known data from the problem.

Conclusion

The didactical design based on sharing and jumping tasks on the topic of reaction rate is developed through by considering predictions of student responses, teacher anticipations, and tasks that can facilitate various student characteristics. Sharing task is used to facilitate slow learner while jumping task is used to facilitate fast learner. In the sharing task, there was collaboration among students both within groups and between groups, as they worked together to complete the sharing task. Jumping task is not only

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beneficial for students with high academic ability, but also provides benefits for students with low academic ability. The author suggests that this didactical design be implemented in future chemistry learning.

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References

Asari, S. 2017. Sharing And Jumping Task In Collaborative Teaching And Learning Process. *DIDAKTIKA: Jurnal Pemikiran Pendidikan,* 23(2), 184

Cahyani, M. D., Hendayana, S., Komalia, K., & Risbiono, M. 2017. 2Sharing and Jumping Task Learning Design of Empirical and Molecular Formula Concept. *Proceeding International Conference on Lesson Study (ICLS)* yang diselenggarakan oleh Universitas Muhammadiyah Malang. (180-185).

Cesaria, A., & Herman, T. (2019). Learning Obstacle In Geometry. *Journal of Engineering Science and Technology*, *14*(3), 1271–1280. https://jestec.taylors.edu.my/Vol%2014%20issue%203%20June%202019/14_3_12.pdf

Damayanti, N. K. A., Suarsana, I. M., & Suryawan, I. P. P. 2017. Peningkatan Kemampuan Literasi Matematika Siswa Melalui Penerapan Collaborative Learning Model. *Wahana Matematika dan Sains: Jurnal Matematika, Sains, dan Pembelajarannya*, *11*(1), 33-42.

Fauziyah, N., Ma'rifah, U., Asari, S., & Maknun, C. L. (2021). Lesson Study for Learning Community to Support Creative Teachers in Designing Quality Learning: Lesson Study Practices on Bawean Island, Gresik Regency Author. *KONTRIBUSIA*, *4*(2), 443–449.

Fuadiah, N. F. 2017. Hypothetical Learnimg Trajectory Pada Pembelajaran Bilangan Negative Berdasarkan Teori Didaktis Di Sekolah Menengah. *Junal Musharafa,* 6(1), 13-24.

Jayatri, V. R., Hendayana, S., Rosbiono, M., & Komalia. 2017. Design of Collaborative Learning in Sharing Task and Jumping Task on The Topic of Electrolyte and Non-Electrolyte solution. *Proceeding International Conference on Lesson Study (ICLS) yang diselenggarakan oleh Universitas Muhammadiyah Malang.* (319-328).

Khaerudin, R.B., Supriatna, A., Hendayana, S., & Herwantono. 2023. Desain Didaktis Konsep Reaksi Reduksi Oksidasi. *Orbital: Jurnal Pendidikan Kimia*. 7(1), 25-40.

Maasaki, S. 2012. *Dialog dan kolaborasi di Sekolah Menengah Pertama : Praktek "Learning Community".* Jakarta: PELITA.

Nurlaeli, L., Hendayana, S., Komalia, K., & Rosbiono, M. (2018). Sharing Task and Jumping Task Lesson Design in Law of Definite Proportions Concept. *Research Report*.

Sukri, S., Prabawanto, S., & Usdiyana, D. (2023). Analyzing Students' Learning Obstacles on Distance Material in Three Dimensional. *Journal of Research in Science Education*, *9*(4), 1672–1678. https://doi.org/10.29303/jppipa.v9i4.2774

Sulistiawati, S., Suryadi, D., & Fatimah, S. (2015). Desain Didaktis Penalaran Matematis untuk Mengatasi Kesulitan Belajar Siswa SMP pada Luas dan Volume Limas. *Kreano, Jurnal Matematika Kreatif-Inovatif*, *6*(2), 135–146. https://doi.org/10.15294/kreano.v6i2.4833

Suryadi, D. 2010. *Menciptakan Proses Belajar Aktif: Kajian dari Sudut Pandang Teori Belajar dan Teori Didaktik.* Bandung: Tidak Diterbitkan.

Suryadi, D. 2013. Didactical Design Research (DDR) dalam Pengembangan Pembelajaran Matematika. *Prosiding Seminar Nasional Matematika dan Pendidikan Matematika yang diselenggarakan oleh STKIP Siliwangi Bandung.* (3-12).

Suryadi, D., & Suratno, T. 2014. Kemandirian Pendidik: Kisah Pendidik Reflektif dan Profesional Pembelajaran. *Sekolah Pascasarjana UPI, Bandung*.

Susetyarini, E., & Miharja, F. J. (2017). The Implementation of Lesson Study-Learning Community for Prospective Biology Teachers. *International Journal of Advance Research (IJAR)*, *5*(10), 1228–1235.

Unaenah, E., Suryadi, D., & Turmudi, T. (2024). Epistemological Learning Obstacles on Fractions in Elementary School. *Jurnal Elemen*, *10*(1), 1–12. https://doi.org/10.29408/jel.v10i1.18306

Zahroh, N. S., Lidinillah, M. A. D., & Rokhayati, A. (2016). Desain Didaktis Konsep Luas Daerah Persegi dan Persegi Panjang Kelas III Sekolah Dasar. *PEDADIDAKTIKA: Jurnal Ilmiah Pendidikan Guru Sekolah Dasar*, *3*(2), 281–291. https://ejournal.upi.edu/index.php/pedadidaktika/article/view/5159/3622

Zendrato, J. (2016). Tingkat Penerapan Rencana Pelaksanaan Pembelajaran dalam Pelaksanaan Pembelajaran di Kelas Suatu Studi Kasus di SMA Dian Harapan Jakarta. *Scholaria: Jurnal Pendidikan Dan Kebudayaan*, *6*(2), 58–73. https://doi.org/https://doi.org/10.24246/j.scholaria.2016.v6.i2.p58-73.