

The differences of chemical learning outcomes using students work sheet and question cards with NHT type of cooperative models in salt hydrolysis

Gelis Juliandini^{1,2*}, Zainuddin Muchtar²

¹Chemistry Teacher of SMP Islam Terpadu Lubuk Cemara, Perbaungan, Indonesia

²Department of Chemistry, Universitas Negeri Medan, Medan 20221, Indonesia

Abstract:

This study aimed to determine the differences in chemistry learning results by Numbered Heads Together (NHT) type of cooperative model. This model used student worksheet media compared to question card media on salt hydrolysis. The results shown that there were differences in the learning outcomes in SMA N 1 Perbaungan 2016/2017. The analysis data shown for the gain value in the first experiment class reached 73.19% and the second experiment class 67.57%. The data processing obtained the average value of pre-test and post-test in the first experiment class (33.78) and (82.42) respectively. In the second experiment class achieved the average value of pretest (33.48) and posttest (78.48). The difference in increasing learning outcomes achieved 5.62%.

Keywords:

learning outcomes; learning media; numbered heads together; salt hydrolysis

Introduction

Chemistry is one of the natural science lessons which is essentially knowledge based on facts, ideas and products of research by experts, so that the development of chemistry is directed at scientific products, scientific methods and scientific attitudes that students have and ultimately lead to increased results student achievement. Chemistry is common in everyday life, but not a few students consider chemistry to be a less interesting science. This is because chemistry is closely related to abstract ideas or concepts that require scientific reasoning, so learning chemistry is a mental activity that requires a high level of learning (Qurniawati & Saputro, 2013; Sariwati et al. 2015; Sari et al. 2017).

Student worksheet can be used as an alternative source of learning, and an instructional media that can be used by teachers in teaching activities. The development of student worksheet should be considered in learning principles. Learning principles are: easy to understand the difficulties; repetition would be reinforce student understanding, high motivation to learn is one of

many success factors of learning, achieving was like climbing stairs, step by step, but will eventually reach a certain height, the results will encourage students to continue to reach their goals (Asri et al. 2017; Susanti et al. 2017).

Question cards are a kind of game in learning using question card media which are presented based on card numbers and distributed to all students in groups. The question card serves to randomly share the problems that the teacher has previously explained to be discussed in groups or can also be used to share questions with each group or individual where each question has certain points that can be obtained by the group if it successfully answers (Wijayati et al. 2008; Febri et al. 2016; Manalu et al. 2017; Silaban & Dewi, 2012; Silaban, 2013).

Based on the background of the problem above, researchers are interested in conducting research by applying the two learning media to see a comparison of student learning outcomes.

Materials and Methods

The population in this study were all students of class XI IPA in SMA N 1 Perbaungan 2016/ 2017. Academic sample consisted of 2 classes taken by purposive sampling technique. The research

* Corresponding author.

gelisjuliandini192@yahoo.com

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design used was "pretest-posttest control group design" which can be seen in Table 1.

Table 1
The data pretest and posttest control group design

Group	Pre-test	Treatment	Post-test
Experiment 1	Y ₁	X ₂	Y ₂
Experiment 2	Y ₁	X ₂	Y ₂

Description: Y₁: preliminary test; Y₂: final test; X₁: teaching using media student worksheets with models cooperative type numbered head together (NHT); X₂: teaching using question card media with the model cooperativenumbered head together (NHT) type.

In this study the research instrument used was a test instrument to measure cognitive learning outcomes (pretest and posttest). The research instruments were tests of 40 multiple choice questions with 5 options. Before conducting an evaluation, the tests will be standardized using standard procedures for standardizing tests, questions in the evaluation test will be validity, reliability, differentiation and level of difficulty using statistics, then the number of questions used is a number of valid questions.

The independent variable in this study is teaching using Student Worksheet media and question card media with the learning model Numbered Heads Together type cooperative, while the dependent variable is students' cognitive learning outcomes.

Data obtained in the form of student learning outcomes data. To collect learning outcomes data, use an objective test research instrument with five answer choices. The required data is analyzed using a two-party test using the Independent Sample T-Test which is calculated by SPSS-21 for Windows. Therefore, it is necessary to fulfill the analysis prerequisite test, namely the normality test is used to determine whether the data is normally distributed or not. The normality of the data was tested with the SPSS 21 for Windows program using the Kolmogorov-Smirnov Normality test. While the homogeneity test to find out whether the data is homogeneous or not, the homogeneity test is used (test the similarity of two variances) using the Levene SPSS 21 Test.

Results

Description of research results

Based on the results of validation test, difficulty level test, different power test and reliability test instrument test, then from 40 questions as many as 20 questions fulfilled the requirements to be used in this study. Based on the results of the

research conducted, data obtained are presented in Table 2. Based on the average score table of the learning outcomes above, a graph can be presented below. The posttest average score in the higher experiment 1 class is compared with the posttest average score in the experiment 2 class.

Table 2
Research data

Group	Score Average Learning Outcomes	
	Pre-Test	Post-Test
Experiment 1	33.78	82.42
Experiment 2	33.48	78.48

Normality test

The results of Test for Posttest and Gain Normality of Experiment Classes are normally distributed, with Sig. > α . which can be seen in Table 3.

Table 3
Result normality test

Group	Data	Sig.	A
Experiment 1	Post-test	0.140	0.05
	Gain	0.431	0.05
Experiment 2	Post-test	0.60	0.05
	Gain	0.083	0.05

Homogeneity test

The results of Test for Posttest and Gain homogeneity of Experimental Classes which can be seen in Table 4 data of both samples are homogeneous, with Sig. > α .

Table 4
Result homogeneity test

Test of Homogeneity of Variances				
Studentt work sheet and question card				
Data	Levene Statistic	df1	df2	Sig.
Post-Test	.214	2	27	.808
Gain	2.503	6	20	.060

Hypothesis testing

This study shows the results of hypothesis analysis which can be seen in Table 5 with a two-party test using the Independent Sample T-Test which calculations with SPSS 21 for windows. Based on Table 5, it can be seen that the results of data analysis using the two-party hypothesis test using the Independent Sample T-test with a significance level of $\alpha = 0.05$ and a 95% confidence level in the SPSS 21 for windows

program , the sig value is obtained. 0.002. This shows the Sig. α (0,002 <math><0,05</math>) which means that there are differences in chemistry learning outcomes with the model Numbered Heads Together (NHT) type cooperative using student work sheet media and question cards on the subject of salt hydrolysis.

Table 5.
Independent sample t-test using spss-21 for windows

Learning outcomes using student	Df	Sig.	A
Experiment 1	64	0.002	0.05
Experiment 2	63.818	0.002	0.05

Learning success is characterized by an increase in student learning outcomes. Calculation of the percentage increase in student learning outcomes is done by the gain formula (Fig 1). Based on Fig 1, the average percentage of improvement in learning outcomes in experimental class I was 73.19% and the average learning success of students in the experimental class II was 67.57%. Then the difference in the increase in learning outcomes (gain) between the experimental class I and Experiment II is equal to 5.62%.

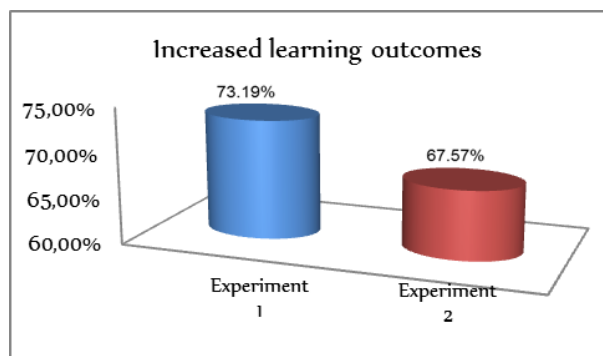


Fig 1. Increased learning outcomes.

Discussion

Student worksheet is a printed material in the form of sheets of paper contains materials, a summary, and instructions to implementation of learning tasks that must be done by students referring to basic competence to be achieved (Dudeliyani et al. 2014; Karmila et al. 2017).

The application of learning model NHT type of cooperative accompanied by student work sheet media made student learning outcomes increase 73.19%. Student work sheet media become more understanding and more active in working on questions about hydrolysis of salt easily. It

happens because student work sheet media are designed attractively for students to study salt hydrolysis. This is in line with Wahyuningsih research, et al. (2014) that there is an increase in student learning outcomes by applying the learning model NHT type of cooperative accompanied by student work sheet media.

The application of learning model is the NHT type of cooperative accompanied by question card media making student learning outcomes increase 67.57%. Both question cards and answer cards look more concise and practical, so students need to read more in order to find answers right. This is in line with Amiroh's et al research. (2015) that there is an increase in student learning outcomes by applying the learning model NHT type of cooperative accompanied by question card media writing.

One learning model that supports improving student learning model outcomes is the NHT type of cooperative. research Sa'diah et al. (2017) showed that the learning model NHT type of cooperative on salt hydrolysis material significantly improved student achievement in chemistry lessons.

Several studies have shown the effectiveness of the media for student work sheet width to improve learning outcomes. The results of research Subarkah et al. (2018) entitled inquiry based worksheet on the utilization of pectin from lemon peel waste as corrosion inhibitors to support student understanding in electrochemistry concept showed an increase in student learning outcomes by 79.16%.

So, it can be seen that there are differences in the learning outcomes of chemistry using LKS media and question cards with the model NHT type cooperative on the topic of salt hydrolysis. Judging from the results of the improvement in student learning, NHT and student work sheet media has a good effect to improve the student learning. The level of curiosity of student to answer the questions of NHT and student work sheet were higher than the question cards.

Conclusion

Based on the results of the research conducted, it is concluded learning that NHT type cooperative assisted by student work sheet media provides better learning outcomes than learning NHT cooperative assisted by question card media on the subject of salt hydrolysis. The difference in learning outcomes between the two experimental classes was seen based on the difference in the increase in learning outcomes (gain value)

between the experimental classes which was equal to 5.62%.

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References

- Amiroh, Y., Yamtinah, S., & Utomo, S.B. (2015). Penerapan pembelajaran numbered heads together (nht) disertai media kartu soal untuk meningkatkan aktivitas dan prestasi belajar pada materi pokok stoikiometri kelas x mia 3 semester genap sma negeri 7 surakarta tahun pelajaran 2014/2015. *Jurnal Pendidikan Kimia*, 4(4), 193-199.
- Asri, D. Z. L., Dian, N., & Bertha, Y. (2017). The development of student worksheet with contextual teaching and learning oriented on thermochemical matter to train student critical thinking skill. *Unesa Journal of Chemical Education*, 6(1), 66-73.
- Dudeliyany, J.A., Mahardika, I.K. & Maryani. (2014). Penerapan model pembelajaran berbasis masalah (pmb) disertai lks berbasis multirepresentasi pada pembelajaran ipa-fisika di smp. *Jurnal Pendidikan Fisika*, 3(3), 254-259.
- Febri, S., Syahrial, A., & Muhammad, T. (2016). Perbedaan hasil belajar fisika melalui model pembelajaran kooperatif tipe numbered heads together (nhts) berbantuan kartu soal dengan model pembelajaran direct instruction di sman 7 mataram tahun ajaran 2015/2016. *Jurnal Pendidikan Fisika dan Teknologi*, 2(4), 147-153.
- Karmila, N., Ketut, M., & Agus, A. G. (2017). Increased of VVPR through quantum teaching model with student worksheet based on multiple representation. *Pancaran Pendidikan FKIP Universitas Jember*, 6(3), 54-60.
- Manalu, H.C., Hutabarat, W. & Silaban, S. (2017). The development of cooperative learning model type teams games tournament (tgt) integrated on scientific approach. *ICIESC*, 6-11
- Qurniawati, A., & Saputro, A. N. C. (2013). Efektivitas metode pembelajaran kooperatif tipe numbered head together (nht) dengan media kartu pintar dan kartu soal terhadap prestasi belajar siswa pada materi pokok hidrokarbon kelas x semester genap sma negeri 8 surakarta. *Jurnal Pendidikan Kimia*, 2(3), 166-174.
- Sariwati, L. N. A., Utami, B., & Masykuri, M. (2015). Upaya meningkatkan kemampuan berpikir kritis dan prestasi belajar siswa dengan model problem solving dilengkapi media kartu pintar pada materi hukum dasar kimia kelas x mia 3 semester ii sma al islam 1 surakarta tahun pelajaran 2014/2015. *Jurnal Pendidikan Kimia*, 4(4), 123-131.
- Sari, Y. A., Bahar, A., & Rohiat, S. (2017). Studi perbandingan pembelajaran kooperatif menggunakan media kartu pintar dan kartu kemudi pintar. *Alotrop*, 1(1), 44-48.
- Sa'diah, H., Kusasi, M., & Hamid, A. (2017). Meningkatkan aktivitas dan hasil belajar menggunakan kolaborasi model discovery learning dan number head together (nht) pada materi hidrolisis garam di sma negeri 12 banjarasin. *Journal of Chemistry and Education*, 1(1), 52-57.
- Silaban, S., & Dewi, R.S. (2012). Efektivitas media petakonsept terhadap peningkatan prestasi dan motivasi mahasiswa prodi biologi dalam pengajaran biokimia dalam kehidupan sehari-hari pada mata kuliah kimia umum-2. *Jurnal Pendidikan Kimia*, 5, 5-9.
- Silaban, S. (2013). Efektivitas media petakonsept dalam pengajaran biokimia dasar terhadap peningkatan prestasi belajar mahasiswa. *Jurnal Pendidikan Kimia*, 5, 4-7.
- Susanti, F., Ayub, S., & Taufik, M. (2017). Perbedaan hasil belajar fisika melalui model pembelajaran kooperatif tipe numbered heads together (nht) berbantuan kartu soal dengan model pembelajaran direct instruction di sman 7 mataram tahun ajaran 2015/2016. *Jurnal Pendidikan Fisika dan Teknologi*, 2(4), 147-153.
- Subarkah, C.Z., Chusni, M. M., Gusniar, O.W., & Sundari, C.D.D. (2018). Inquiry-based worksheet on the utilization of pectin from lemon peel waste as corrosion inhibitors to support student understanding in electrochemistry concept. *International Journal of Pure and Applied Mathematics*, 118(24), 1-15.
- Wahyuningsih, F., Saputro, S., & Mulyani, S. (2014). Pengembangan LKS berbasis inkuiri terbimbing pada materi pokok hidrolisis garam untuk sma/ma. *Paedagogia*, 17(1), 94-103.
- Wijayati, N., Kusumawati, I., & Kushandayani, T. (2008). Penggunaan model pembelajaran numbered heads together untuk meningkatkan hasil belajar kimia. *Jurnal Inovasi Pendidikan Kimia*, 2(2), 281-286.