The Use PQ4R Strategy in Chemistry Learning Process to Improve Student's Knowledge and Motivation

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Abstract - Research on the implementation of the strategy Preview, Question, Read, Reflect, Recite, and Review (PQ4R) was carried out in the course of Inorganic Chemistry 2, semester 5, Chemistry Education Study Program, FKIP-Unri. Teaching material in the form of PQ4R-based Student Worksheets (LKM) was designed, self-validation and then a limited test was conducted to students. The PQ4R research idea arose after the reflection of the implementation of active learning in English Chemistry (Asmadi, 2015) is time consuming. too much time needed to carry out every stage of learning activities, while students are expected to read a lot of textbooks for self-development / literacy. MFIs with the PQ4R strategy are felt to be quite simple and easy to apply in class for inorganic chemistry 2 courses on bonding material. The results of the syllabus study, Chemical Bond material is an important material that needs to be equipped for prospective chemistry teachers because this material is very broad in scope, so teachers / prospective teachers need to master the material well through PQ4R learning activities. The research method used is one Group Pretest-Postest Design. The results showed an increase in the value of student learning outcomes, and there was an influence of adequate learning motivation

Keywords: PQ4R strategy , LKM (student worksheets -English Chemistry, Chemical Bond, one Group Pretest-Postest

1. Introduction

Analysis of the Chemistry English course shows that the chemistry material delivered in English, as well as special and distinctive vocabulary / chemistry terminals or standard chemical terms in English aims to achieve the General Competence and the Competence of Supporters of Education (college student). To achieve these competencies, adoption / use of models / learning strategies is needed so that students gain learning experiences (learning experiences, Tyler :))

In line with the challenges of entering the 21st century, where global competition includes the realm of education, especially learning in Higher Education faces very complex challenges in preparing the quality of human resources (HR: Human Development Index that is able to compete in the global era. Appropriate efforts to prepare quality HR are through meaningful and quality learning in accordance with the competencies to be achieved, as well as competition in the era of globalization (illah shailllah) .- Menrisstedikti, for that well-designed chemistry learning is expected to be able to support

the development of students' potential, so that those concerned are able to face and solve the life problems they face (Trianto, 2014). For this reason, it is necessary to prepare teaching materials (based on constructivism learning, one of which is the preparation of MFIs based on PQ4R strategies. Preparation of Chemistry Professional teacher candidates, presenting teaching materials (Student Worksheets) that are packaged through the learning process, conditions students to construct concepts / knowledge independently (Elva Febriyanti and Fatria Dewi Afrida, 2017).

Based on the background, the problem requires a learning strategy that can help students understand the material more easily and through a fun process. Application of the use of teaching materials based on PQ4R strategy (Preview, Question, Read, Reflect, Recite and Review) becomes one of the alternative solutions to solve problems regarding the difficulty of understanding / understanding chemical concepts. The purpose of the PQ4R strategy is to provide a platform for students to construct reasoning through lecturer guidance in which there are stages that can support the entry of information into students' long-term memory storage.

Related research conducted by Arini Dwi Larasatining Retnowati (2015) with the title Development of PQ4R-Based Biology Worksheets in Improving Metacognition and Learning Outcomes (Sub-Subject of the Human Nervous System. The same thing as the results of Resti Alfarisa research (2017) with the title influence PQ4R learning strategies on understanding concept concepts students on monera material at MAN 1 Palembang, it turns out that the PQ4R learning strategy can improve students' understanding of learning concepts.

Based on the results of the research presented above, the researchers and the team were inspired to adopt the PQ4R strategy for the study of bonding material carried out in Inorganic chemistry courses2. The research objective is the application of the PQ4R strategy to chemistry / learning subjects whose teaching materials / MFIs speak English and analyze the influence of the PQ4R strategy on student learning outcomes and student motivation. the development of students' potential, so that those concerned are able to face and solve the life problems they face (Trianto, 2014). For this reason, it is necessary to prepare teaching materials based on constructivism learning, one of which is the preparation of MFIs based on PQ4R strategies.

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Based on information research presented above, We as a team is inspired to adopt the PQ4R strategy in learning process, especially for **Chemical Bonding** material that carried out in Inorganic chemistry courses2. The research objective is the application of the PQ4R strategy for chemistry learning subjects which teaching materials (students worksheets=LKM) in English and analyze the effect of the PQ4R strategy on student learning results and student motivation.

The PQ4R (based on Logdans Ann.2019) starategy applied in class as follows:

Preview:

Perhaps students look through the pages of the reading passage and asked read the headings of the chapter and any sections dividing the chapter. Read the first and last paragraph of each section. View the illustrations in each section. Read the captions under the pictures and take a few minutes to look at charts, graphs or maps. This will help students synthesize the information.

Question:

Students make some questions through information they learned in the preview. Ask yourself questions about it. Think about what you already know about the ideas you saw during your preview. To raised question –it may use 5W + 1H (what, who, where, when, why, and How)

Read

Students have to Read the passage actively. If there are ideas that seem important, make a note of them on paper. If the book belongs to you, consider making notes in the margins and highlight important parts in the book. If you just can't imagine writing in your book, use sticky notes or make your notes on paper.

Reflect

Take time to reflec (ask yourself) on what you have read. How are the passages or chapters inter-related? How does the information fit into the details you have already learned? What new information did you learn? Did the passage include the information you expected it to cover? Was there information that surprised you? Were the questions that you have leraned?

Recite

Think about the material. Discuss it with your peer or write down the main points you learned. Generally, writing information down by hand will improve the memory of the material. If writing is a problem for you, consider brief notes or discuss the material with other students. It is important to summarize the material in writing using your own words. Explain it aloud to someone else or recite your notes aloud to yourself. Consider using a graphic or visual organizer to increase your understanding of how concepts in the reading relate to each oth

Review

Consider the main points of the material. Were your questions answered? If not, what information are you unsure about? Do you feel that the writer's points are fully understood?

Preparation of Chemistry Professional teacher candidates, presenting Chemistry teaching materials (LKM) that are packaged in such a way that the learning process conditions students to construct concepts / knowledge independently (Elva Febriyanti and Fatria Dewi Afrida, 2017).

Based on the background / the problems of the m aka needed a learning strategies that can help students understand the material easily and through a process ore fun. Applicability utilization strategies based teaching materials PQ4R (Preview, Question, Read, Reflect, Recite and Review) be an alternative solution to solve a problem early on the difficulty to understand / comprehend the concept of chemistry . The purpose of the PQ4R strategy is to provide a platform for students to construct their reasoning through the guidance of lecturers / teachers in which there are stages that can support the entry of information into students' long-term memory storage.

Research related to   carried out by Arini Dwi Larasatining Retnowati (2015) with   title "Development LKS Biology Based PQ4R in Improving Metacognition and Results of Study (Sub Highlights Discussion Human System Nervous. It matching the results of research Resti Alfarisa (2017) with the title of influence strategies of learning PQ4R to understanding the concept of students

on the material monera in MAN 1 Palembang, it turns out the strategy of learning PQ4R can improve the understanding of the concept of study participants learners .

Based hasi-results of the research that has been disampakan above , researchers and a team of inspired adopt staretegi PQ4R on learning the material bonds that dilaksanakn in the eyes of college chemistry Anorganik2. J ad i This research aims to design MFI PQ4R strategy and analyze the impact of MFIs on learning outcomes and learning motivation mahasiswa.

2. Methodology

Design of LKM (Student Worksheets) is designed and developed by PQ4R-based LM teaching materials designed by Plomp (2013) design model. Then LKM conducted internal validation. Then the next stage was carried out trials to students.

Design of PQ4R strategy used in class through one Group Pretest-Post Test Design (Sumardi SuryaBrata, 2014)

T1	X	T2
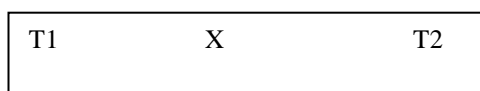
T1: Before treatment , and T2: After Treatment. X: Treatment: use the PQ4R strategy

Based on the table above it is known that the value of the correlation (r) the value of basic chemistry and learning outcomes is equal to -0.113 which means based on the correlation table value (r) Hinkle etc , (1998) the basic chemical value of students there is a weak relationship with student learning outcomes

3. Result and Discussion

3.1   Table 1 shows score/grade of students for General Chemistry, Inorganic Chemistry, etc

Table 1. Value of Toefl , Basic Chemistry, Inorganic Chemistry 1, Motivation and Learning Outcomes

No Responden	Nilai Toefl	Nilai Kimia Dasar	Nilai Kimia Anorganik 1	Skor Motivasi Belajar	Hasil Belajar
1	450	A	B-	69,57	57,1
2	455	A-	B	81,74	90,5
3	440	B-	B-	71,3	61,9
4	450	C+	C+	80	95,2
5	440	B	B-	70,43	76,19
6	450	B	B-	71,3	47,61
7	435	B	C+	71,3	47,61
8	450	B	C+	73,04	95,23
9	350	B-	C	71,3	85,71
10	435	B	C	60	62
11	450	B	C	72,17	85,71
12	410	B	C+	64,34	80,95

13	453	B	C+	67,82	90
14	438	C+	B-	83,47	80,95
15	450	B+	B	71,3	100
16	435	B+	C+	67,82	90,47
17	450	B+	C	66,95	80,95
18	453	B+	B+	79,13	43
19	450	B-	C+	75,65	61,9
20	430	B+	A	66,08	76,19
21	420	C	B+	73,04	90,4
22	415	A	C	63,47	80,95
23	440	C+	C+	70,43	71,4
24	350	C+	B-	65,21	95,23
25	450	A	B	57,39	76,19
26	450	A-	B+	71,3	76
27	453	A	B-	69,56	52,38
28	440	B+	C+	77,39	52,38
29	453	A-	B-	71,3	85,71
30	453	B+	C+	70,43	42,85
31	430	B	B-	70,43	57,14
32	453	A	B-	71,3	90,47
33	433	C+	C	66,08	90,47
34	450	A	B+	73,04	85,71
35	453	A	B	69,56	90,47

Table 2. Relationship of General Chemistry Score and Learning Results

		General Chem Score	Learning outcomes
General Chem. Score	Pearson	1	- 113
	Sig. (2-tailed)		, 518
	N	35	35
Learning Result	Pearson	- 113	1
	Sig. (2-tailed)	, 518	
	N	35	35

Based on the Table 2 above, it is stated that the value of the correlation (r) the value of General/basic chemistry and learning outcomes is equal to -0.113 which means based on the correlation table value (r) Hinkle etc , (1998) the General Chemistry value of students there is a weak relationship with student learning outcomes .

Table 3. Relationship Score Inorganic Chemistry and Learning Test

		Inorganic Chem.Score	Learning outcomes (test)
Inorganic Chem	Pearson	1	-, 029
	Sig. (2-tailed)		, 869
	N	35	35
Learning outcomes	Pearson	-, 029	1
	Sig. (2-tailed)	, 869	
	N	35	35

Based on the table above is known that the value of the correlation (r) the value of chemistry inorganic and outcomes of learning that is at -0.029 which means based on the table values of correlation (r) Hinkle etc , (1998) the value of chemistry inorganic students there is a relationship that is weak with the result of learning of students .

Table 4. Relationship between the TOFLE Score and Learning Outcomes

		ToFLE Score	Learning outcomes
TOFLE	Pearson	1	-, 209
	Sig. (2-tailed)		, 228
	N	35	35
Learning outcomes	Pearson	-, 209	1
	Sig. (2-tailed)	, 228	
	N	35	35

Based on the table above is known that the value of the correlation (r) the value of chemistry toefl and results of study that is of -0.209 which means based on the table values of correlation (r) Hinkle etc , (1998) the value of chemistry inorganic students there is a relationship that is weak with the result of learning of students .

Table 5. Relationship of Learning Motivation and Learning Outcomes

		Learning Motivation	Learning outcomes
Learning Motivation	Pearson	1	-, 045
	Sig. (2-tailed)		, 797
	N	35	35
Learning outcomes	Pearson	-, 045	1
	Sig. (2-tailed)	, 797	
	N	35	35

Based on the table above is known that the value of the correlation (r) motivation to learn and the results of study that is of -0.045 which means based on the table values of correlation (r) Hinkle etc , (1998) the value of chemistry inorganic students there is a relationship that is weak with the result of learning of students .

Based on the results tables 4.2, 4.3, 4.4 and 4.5 is obtained that the result of learning of students can be influenced by the motivation to learn the knowledge initially on the material that will be studied and understanding in speaking English .

4. Conclusion

Please conclude your work incorporating your most important finding as well as future works.

Tidak terllihat hasil signifikan pengaruh pengetahuan konsep awal mahasiswa yang sudah diperoleh di matakuliah Kimia Dasar maupun pada matakuliah Kimia Anorganik 1 terhadap hasil belajar (pre-test). Semestinya semua Mahasiswa bisa memperoleh nilai bagus karena konsep ikatan kimia sudah dipelajarai di kimia dasar, juga di kimia Anoganik1 (kecuali materi ikatan logam yang tidak terdapat didalam silabus yang luput dipelajari). Analisis sementara, penyebab sebagian mahasiswa tidak

memperoleh nilai bagus pada pre-test leih disebabkan karena ketidak biasa (uncommmon) penyampaian materi Ikatan Kimia dalam bahasa Inggris serta ketidak pahaman terminalogi/istilah konsep dasar ikatan kimia dalam bahasa Inggris. Padahal sebelum mengerjakan soa tes/pretest, kata-kkata penting /terminalogi istilah –sudah disampaikan dalam bahasa indonesia..Juga sebelum mengerjakan pre-test, mahasiswa diperbolehkan bertanya menyangkut text soal pre test yang belum dipahami atau ragu.

Strategi PQ4R cukup prospektif
This research PQ4R staratgy used is a starting point and this strategy would be widely implemented for future chemistry science learnng. The PQ4R strategy be able to improve students literacy, especially science literacy because a huge of chemstry print material and non-print /ebook delivers in english as one of PBB formal language

There is no significant result of the effect of the students' initial concept knowledge that has been obtained in the Basic Chemistry course or in the Inorganic Chemistry 1 course on the learning outcomes (pre-test). All students should be able to get good grades because the concept of chemical bonds has been studied in basic chemistry, also in Anoganic chemistry1 (except metal bonding material that is not contained in the syllabus that is missed being studied). Temporary analysis, the reason some students did not get good grades in the pre-test was due to the uncommon delivery of the Chemical Bond material in English and the lack of understanding of the terminalology / term of the basic concepts of chemical bonds in English. Even before doing the test / pretest, important words / terminalology terms - have been delivered in Indonesian ... Also before doing the pre-test, students are allowed to ask questions about the text of pre-test questions that have not been understood or doubted.

The PQ4R strategy is quite prospective
This research PQ4R staratgy used is a starting point and this strategy would be widely implemented for future chemistry science learning. The PQ4R strategy can be able to improve students' literacy, especially science literacy because a huge of chemistry in printed and non-printed materials / ebooks deliver in English as one of the United Nations formal languages

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