KnE Social Sciences
ISoLEC
International Seminar on Language, Education, and Culture
Volume 2019

Knowledge E
Engaging minds

Conference Paper

Teacher Training Scaffolding Type to Improve Teacher's Ability in Development of Guided Inquiry Practical Worksheet

Abdul Rosid[1], Yayan Sunarya[2], and Mulyati Arifin[2]

[1]Sekolah Pascasarjana, Universitas Pendidikan Indonesia
[2]Departemen Pendidikan Kimia FPMIPA UPI Bandung

Abstract

Generally teacher training is still ineffective, and there are still many weaknesses in its implementation. The main objective of teacher training is to improve the ability and skills in learning process, so as to prepare students for competition in the millennial century. In chemistry learning teachers must be able to stimulate all initiatives, creativity and scientific attitudes through guided inquiry-based laboratory activities. The purpose of this study was to measure the effectiveness of teacher training in improving the ability to develop guided inquiry lab worksheets to achieve students' understanding and literacy. The training involved 26 chemistry teachers who teach in Karawang West Java. The method applied in this study is multi-method, both quantitative and qualitative with multi-design. The results achieved in this study indicate that the teacher's response to training materials and training methods is very strong based on the results of the pretest and posttest. Increased ability of teachers in inquiry is classified as medium category. In general, the teacher's response to the training showed a very positive response especially to the topic of practical evaluation or evaluation. Some teachers demonstrated their ability to design guided inquiry-based lab worksheets mainly related to contextual phenomena, including the effect of vinegar acid concentration on baking soda decomposition reactions, and the effect of fertilizer concentrations on grain sprout growth

Teacher training is still a project that many considered as not effective and has a number of shortcomings. Learning should prepare students according to the demands of the 21st century. So that the learning process of chemistry should stimulate initiative, creativity, and scientific attitude through Guided-Inquiry based laboratory activity to improve student literacy ability. The objective of this research is to measure the effectiveness of teacher training in improving the production ability of Guided-inquiry Labs to achieve students' understanding and literacy. The training involved 26 chemistry teachers as trainees, a mixed method chosen to measure the quantitative side by pre-experimental design with a pretest-posttest design, one-group design and teacher feedback collection on training through questionnaires. The pretest and posttest results were calculated by measuring N-gain, and scoring teacher responses on a scale of 1-4. The results of questionnaire showed that the teachers responded with strong criteria and very strong, with an average of 83 (Very Strong). Increased ability of participants

Corresponding Author:
Abdul Rosid
abdulrosid.duchie@gmail.com

Received: 23 January 2019
Accepted: 26 February 2019
Published: 17 March 2019

Publishing services provided by Knowledge E

Selection and Peer-review under the responsibility of the International Seminar on Language, Education, and Culture Conference Committee.

is shown with N-gain obtained by each teacher. The average N-gain of trainees is 0.71 in the medium category. Aspects of analyzing the curriculum have the smallest N-gain value compare to the aspects of composing the referring questions and aspects of presenting the experimental data in the form of tables/graphs. In general, teachers' responses to training show very strong categories with the highest responses on the topic of practicum assessment. And the ability of teachers in designing guided-inquiry self-study worksheets has improved especially for aspects of curriculum analysis and presenting experimental data in the form of tables/graphs. The development of teachers' skills through measurable training that focused on improving teacher competence should be more frequent. The selection of materials that are urgently needed and used in the learning process should also be considered.

Keywords: guided inquiry, LKS, rate of reaction, student worksheet, scientific literacy, training, scaffolding

1. Introduction

A teacher must have pedagogic competence, personal competence, social competence and professional competence according to Government Regulation of the Republic of Indonesia Number 19 of 2005 on concerning National Education Standards. This competence must be fully owned by a teacher, but in reality the competence and quality of teachers is still not evenly distributed (Alhumami, 2016). This is because one of them is the unequal opportunity of teachers to improve their competence through training, whether organized by government institutions or other.

Kawuwung (2011) revealed the results of his research that the participation of teachers in training was still lacking, even though the participation of teachers in seminars and workshops could provide new understanding and knowledge for teachers in improving the quality of learning.

Teacher training that has been carried out through various education quality improvement projects has been ineffective. The training is carried out just to meet the demands of the project (Jalmo and Rustaman, 2010). Pulungan (2013) sees that there are two things that have caused the education and training to not be able to provide a major impact from improving teacher quality. First, education and training is not based on real problems in the classroom (unrealistic class problem). Second, the implementation of the education and training results is not yet complete. The results of the new training in the level of knowledge are not applied in classroom learning. This is due to the content of

the education and training material that is too theory-oriented so that it is not applicable or can be due to the absence of post-training monitoring.

The training aims to foster and enhance the skills of science and art, mental or skills needed to fulfill values in life. Through training, the aim is to improve teacher competencies, one of which is to improve the ability to develop practical guides. Supriatno (2013) revealed the weakness of teachers in designing laboratory activities, especially procedural and conceptual knowledge. The existence of these weaknesses resulted in the design of laboratory activities in the field applied to students without prior analysis to be *adapted, modified* or *reconstructed.*

Haryani, et al (2018) found that many teachers experienced difficulties in designing worksheets based on learning models as mandated by the curriculum. Scaffolding type training is a type of effective training program to improve participant competency in developing tests (Jalmo and Rustaman, 2010).

1.1. Aspects of teacher ability that can be developed

Wiyanto (2005) revealed that there are several aspects that can develop the ability of teachers to design practicum activities, namely (1) determine practical objectives, (2) determine the type of practicum, (3) determine the tools and materials, (4) determine the experimental series, (5) self-planning trial procedures, (6) preparing worksheets and (7) designing activity evaluations.

1.2. Definition of Scaffolding

Wood, Bruner and Ross who coined the term scaffolding in 1975 based on the concept of zone of proximal development (ZPD) from Vygotsky. Scaffolding is understood as a systematic sequence of requested content, material or tasks and teachers and supporters as optimizing learning, is also understood as a process by which learners are given support so they can apply their new skills and strategies independently (Dickson, Chard & Simmons, 1993 and Roshensine& Meister, 1992 in Larkin, 2002).

Zone of Proximal Development (ZPD) is an area between what learners can do independently (mastery level) and what can be achieved with the help of competent or peer (instructor level) (Ellis, Larkin and Worthington in Stuyf, 2002).

According to McKenzie in Stuyf (2002) there are six aspects of teaching scaffolding, namely (1) preparing clear directions and reducing learners' confusion, (2) clarifying goals, (3) maintaining learners in their work (4) clarifying goals and expectations and integrating assessment and feedback, (5) showing useful sources to reduce confusion in learners and (6) reduce uncertainty, surprise and disappointment.

1.3. Scaffolding training

The development carried out by Ellis & Larkin in Jalmo and Rustaman (2010) for the implementation of scaffolding strategies in teacher training through the steps the teacher does, the class does, groups do and individuals do.

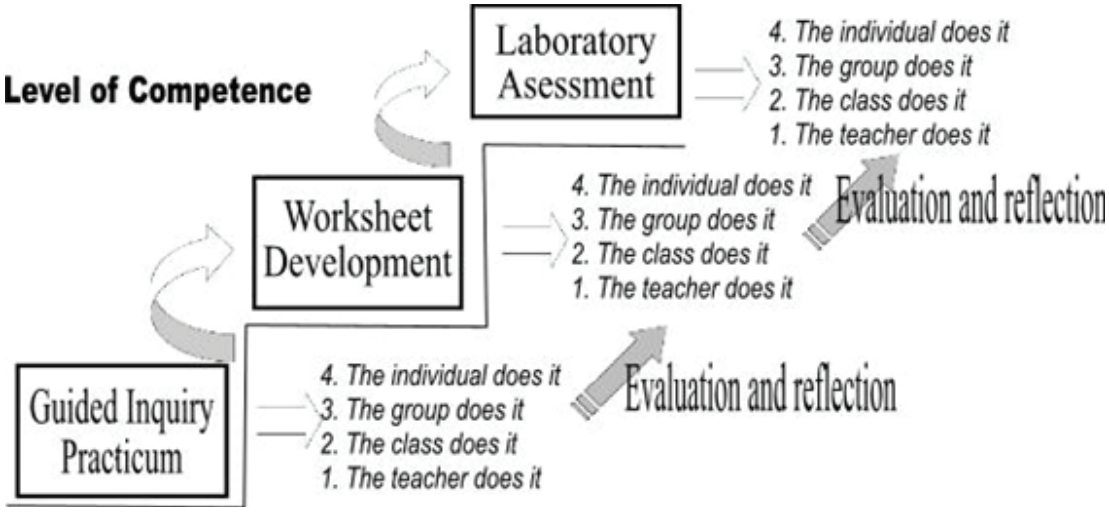

Figure 1: Stages of teacher training adopted by PPGS Jalmo and Rustaman.

Scaffolding type training stages according to Tri Jalmo and Rustaman consist of four steps, they are:

1. The first stage, the coach modeled problem solving steps (the teacher did), not with material explanation. In scaffolding learning, the position of the trainer as the MKO (the more knowledgeable other) is the person who has more competence than the participants. This MKO will develop participants to achieve their potential competencies. The trainer provides the right example of problem solving.
2. The second stage, which is the dummy class. At this stage the responsibility of the trainer is left to the class, the trainer only acts as a companion and collects the opinions of the participants / class. Class work results are evaluated and reflected to control the absorption (understanding) of participants. Work evaluation is intended to find out whether the work has met the specified standards or not. Reflection is needed to correct and correct its deficiencies.
3. The third stage, that is the group does, assignments are given to small groups. Problem solving is done by intensive interaction and communication between group members. Groups that have difficulty can ask for coach assistance. Group work results are evaluated and reflected.
4. The fourth stage is that individuals do. Each participant is given an assignment / problem to be done / solved individually. In this final step the participants are

required to be more independent to demonstrate the completion of their tasks. The ability of participants to complete the task at this stage illustrates the competency of participants has increased from before.

This study aims to develop effective training for teachers in improving the ability to create guided inquiry lab worksheets. With the formulation of the problem in this study is ”How is the effectiveness of teacher training in the development of guided inquiry practicum worksheets?”.

Literally training is defined as ”giving lessons and practice”, ”making it develop in the desired direction”. Many meanings about training, as expressed by Sudjana (2007), Buckley and Caple (in Darmawan, 2016), Khomsatun (2013), Cascio (in Dekawati, 2011), Joyce and Showers (in Sparks and Horsley, 1989), Kamil (2012) So that training can be interpreted as an effort to improve a certain competence in a scientific subject within a certain period.

The Ministry of National Education (2007) states that student worksheets (*LKS*) are sheets that contain tasks that student must do and contain instructions, steps that must be taken to complete the task in the form of theory and practice. According to Trianto (2010[18]) Student worksheet is a student guide that is used to conduct investigative or problem solving activities. Student worksheets can be in the form of guidelines for developing cognitive aspects as well as guidance for developing all aspects of learning in the form of an experimental guide or demonstration. Because worksheets are guidelines for educators in carrying out learning activities and assignments to students, the compiled student worksheet must meet didactic requirements, construction requirements and technical requirements. Darmodjo and Kaligis (1992, pp. 41-46).

2. Method

The subjects of this study were chemistry teachers who were members of the Profesional Learning Community in Karawang Regency, totaling 26 people as training participants conducted in scaffolding. Mixed methods are chosen because there is a need to study more in the qualitative and quantitative aspects. Because this study aims to get effective training, this study uses a case study design. According to Sukmadinata (2015) case study design is a research that is directed to collect data, take meaning, gain an understanding of the case, by only exploring one phenomenon and ignoring other phenomena. To measure the quantitative side using the pre-experimental method (pre-experimental design), (Sugiyono, 2014).

In addition, the researchers intervened throughout the study with the One-group pretest-posttest Design that is a study designed by involving one group given pretest

(O1), treatment (X) and posttest (O2) (McMillan, JH, & Schumacher, S, 1984) and questionnaire distribution to see teacher responses to training.Pretest and posttest results were calculated by measuring N-gain from Hake (1998), and scoring the teacher's response to the training of Riduwan (2016). The qualitative side is by characterizing the training worksheet.

3. Findings and Discussions

In general, this study involved a number of chemistry teachers to be given training in scaffolding to improve the ability of teachers in the development of practicum guidelines. As a prerequisite for training, the teachers were asked to collect worksheets / practicum guides that are commonly used for certain materials that would be characterized, at the beginning of the training were given the pretest and at the end of the training were given post-test and questionnaire to measure the success of the training.

In Figure 2 below, the flow of training activities is carried out through three stages, namely pre-training, training and post-training. In the pre-training, the participants submitted the practicum worksheets that they used to use in the learning process. At the time of the training, the participants received the material by scaffolding with certain stages (the teacher did the class to do the do-individual group) until the training ended. And finally, after the training participants were asked to submit guided inquiry worksheets products for certain materials, conducted questionnaires about training and were given posttest.

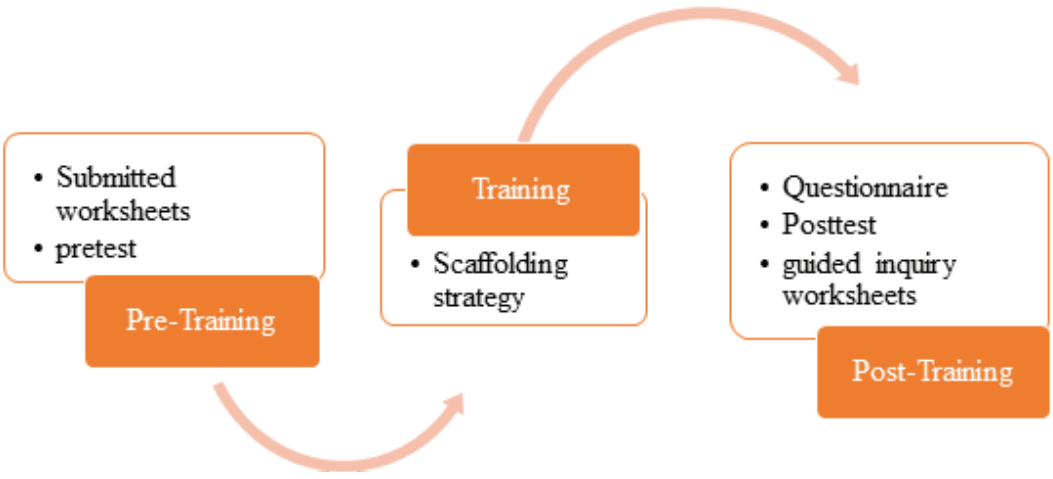

Figure 2: Teacher Training Design.

Before the training, the participants were asked to collect the practical worksheet used on the concept of reaction rate. Presented in table 1 below.

Haryani, et.al (2018) found the fact that many teachers had difficulty in designing practical worksheet as mandated by the 2013 curriculum. In addition, Adnyana, et.al

Table 1: Sources and Characteristics of Participants' Worksheet.

Worksheet Source		Worksheet Characteristic	
Creator	**Percent**	**Types**	**Percent**
Independent	35	Confirmation	88%
Others	65	Guided Inquiry	8%
-	-	Authentic Inquiry	4%
SCORE	**100**		**100**

(2017) reported that Teachers rarely make their own practical worksheet, practical worksheet already in the book. Practical worksheets a good learning media and needs to be made in accordance with the characteristics of students, materials and facilities available.

The number of practical worksheet is confirmation used by teachers of prospective trainees in accordance with what is disclosed Rahmawati et.al (In Arifin et.al) during this practicum conducted in schools is still a verification that only proves the concept or principle that has been studied. Dwiyanti et.al (2015) consideration of teachers using a verification practical worksheet in the form of a cookbook (recipe book) is easy to use by students despite having some weaknesses such as overly guiding students when students carry out lab work in the laboratory. After the training, the participants designed a practicum guide with guided inquiry characteristics and included a contextual phenomenon of the effect of vinegar concentration if reacted with baking soda and drafting a practical guide to the effect of fertilizer concentration on grain sprout growth.

Table 2: Teacher responses to training.

No	Topic	Average	Category
1	Training materials	79	Strong
2	Training activities	80	Strong
3	Practical draft	81	Very Strong
4	Practicum assessment	88	Very Strong
5	Follow-up training	85	Very Strong

As shown in table 2, the material that received the best response was the practical evaluation design material. A strong response from the trainees is a valuable asset for the success of the training. As revealed by Sudrajat, et al (2015) someone who has strong beliefs and motivations will have confidence in the work or other challenges in his life.

Analysis of the pretest and posttest scores of teachers' understanding in designing guided inquiry lab worksheets has increased. The increase is shown by the N-gain obtained by the trainees. The average N-gain of training participants is 0.71 with the medium category. Distribution of trainee N-gain is shown in table 3 below.

Table 3: N-gain distribution based on categories.

Unit	Category		
	High	Medium	Low
Score	13	11	2
Percentage	50%	42%	8%

From the table above, there are two participants who have a low N-gain with a fairly high pretest and posttest scores. N-gain only gives a picture of changes or increases in the results of the intervention, the greater the N-gain, the more positive changes obtained by the trainees.The smaller the N-gain, does not show the inability of participants in participating in the training. Overall, the training has a strong enough impact on the teacher's ability to design practical guide material for reaction rates. Gumilar (2016) states that the ability of teachers to design inquiry-based practicums has increased after participating in training in the type of scaffolding.

Based on the picture below, the aspect of analyzing the curriculum has the smallest N-gain value while the aspect of compiling the steering questions and aspects of presenting experimental data in the form of tables / graphs. Arifin (2007[29]) revealed that curriculum analysis is the first thing a teacher must do in designing a practicum or learning process. In the activity of analyzing the curriculum, a teacher must analyze the needs in accordance with the curriculum while the aspect of presenting data in table form increases because at the time of training was given training in making graphics / tables using Microsoft Excel program.

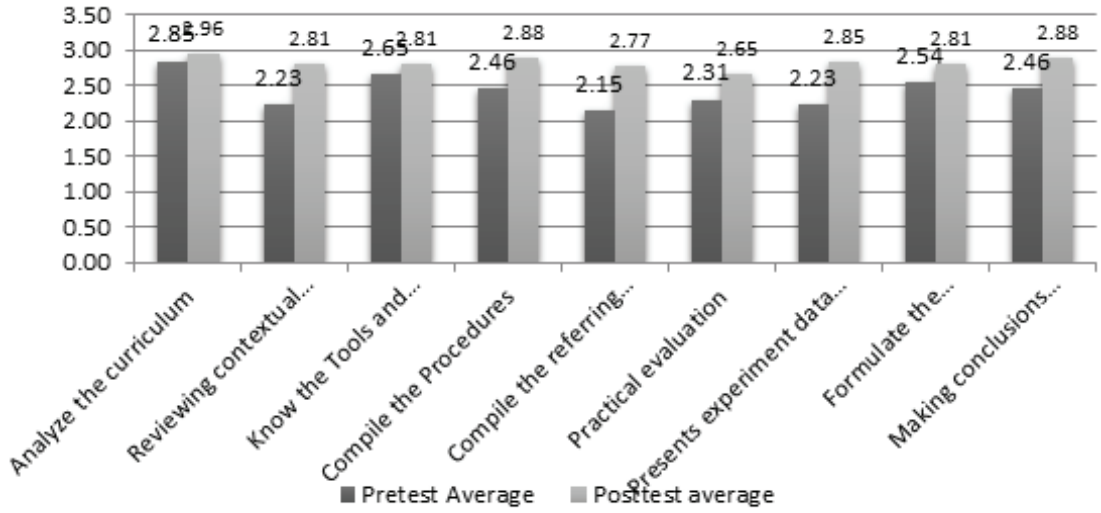

Figure 3: Histogram comparison of mean scores of pretest and post-test understanding of designing guided inquiry based practice per indicator.

4. Conclusion and Suggestion

4.1. Conclusion

The results achieved in this study indicate that the teacher's response to training materials and training methods is very strong based on the results of the pretest and posttest. Of the five aspects of training that were given responses, three of them gave very strong responses, with an average response score of 82.6. The ability of teachers to improve is categorized as medium with an N-gain value of 0.71. In general, the teacher's response to the training showed a very positive response especially to the topic of practical evaluation or evaluation. Some teachers demonstrated their ability to design guided inquiry-based lab worksheets mainly related to contextual phenomena, including the effect of vinegar acid concentration on baking soda decomposition reactions, and the effect of fertilizer concentrations on grain sprout growth.

The development of the teacher's ability through measurable training and focusing on improving teacher competencies must be done frequently, the selection of materials that are needed and used in the learning process must also be considered.

4.2. Suggestion

Based on the results of research and efforts to develop the ability of chemistry teachers in designing guided inquiry based practice, found some suggestions as follows

1. For the stakeholders, we recommend the following:

   (a) Provide reinforcement to Profesional Learning Community (PLC = MGMP) as an effort to improve pedagogic competence of teachers through training.

   (b) The more routine activities undertaken by the PLC to follow up on the results of this research so that teachers are accustomed to designing and developing their own practice guides.

2. From the results of the research conducted clearly visible, more specific training to further improve the ability of teachers in the learning process needs to continue to be done. From the study illustrated the enthusiasm of teachers to learn how to design a practice evaluation this needs to be addressed by the PLC or teachers themselves to improve their competence.

References

[1] Adnyana, P. B., Citrawathi, D. M., & Santiasa, I. M. (2017). *Pelatihan pembuatan LKS Inkuiri berbasis pertanyaan untuk materi biologi bagi guru-guru IPA SMP Kota Singaraja.* Singaraja: FMIPA Universitas Pendidikan Ganesha.

[2] Alhumami, A. (2016, Agustus 13). *Nasional*. Retrieved Februari 22, 2017, from Kompas.com: http://nasional.kompas.com/read/2016/08/13/16371671/pelatihan.guru.harus.rutin. dan.merata

[3] Arifin, M. (2007). *Pengembangan Kurikulum dan Pembelajaran Kimia*. Jakarta: Universitas Terbuka.

[4] Arifin, U. F., Hadisaputro, S., & Susilaningsih, E. (2015). Pengembangan lembar kerja praktikum siswa terintegrasi guided inquiry untuk keterampilan proses sains. *Chemistry in Education* , 54-60.

[5] Darmawan, D. (2016). *Efektivitas pelatihan kecakapan vokasional dalam meningkatkan kompetensi kerja (studi deskriptif pada peserta life skill di PKBM Wilayah DKI Jakarta).Disertasi.* Bandung: Sekolah Pasca Sarjana UPI.

[6] Darmodjo, H., & Kaligis, J. R. (1992). *Pendidikan IPA II.* Jakarta: Depdikbud.

[7] Dekawati, I. (2011). Manajenem Pengembangan Guru. *Cakrawala Pendidikan. Th XXX No 2* , 203-215.

[8] Depdiknas. (2007). *Pedoman memilih menyusun bahan ajar dan teks mata pelajaran.* Jakarta: CV. Mini Jaya Abadi.

[9] Dwiyanti, G., Suryatna, A., Wiguna, R. A., & Alifiani, F. (2015). Optimasi prosedur percobaan dan penyiapan lembar kerja siswa sebagai perangkat pembelajaran identifikasi unsur karbon dan hidrogen dengan model inkuiri terbimbing. *Seminar Nasional Kimia dan Pendidikan Kimia VII* (pp. 1-10). Surakarta: UNS.

[10] Gumilar, A. I. (2016). *Pengembangan kemampuan guru kimia dalam merancang praktikum berbasis inkuiri melalui pelatihan guru tupe scaffolding untuk meningkatkan kreativitas siswa.* Tesis. Tidak diterbitkan: Sekolah Pasca Sarjana. UPI.

[11] Hake, R. R. (1999). Retrieved Agustus 17, 2017, from URL: http://www.physics.indiana.edu/~sdi/AnalyzingChange-Gain.pdf.

[12] Haryani, S., Wardani, S., & Prasetya, A. T. (2018). Analisis Kemampuan Penyusunan Lembar Kerja Siswa Berbasis Problem Based Learning dan Project Based Learning. *Jurnal Inovasi Pendidikan Kimia. Vol 12, No. 1, 2018* , 2086-2096.

[13] Jalmo, T., & Rustaman. (2010). Pengembangan program pelatihan peningkatan kualitas guru IPA SMP. *Forum Pendidikan volume 30* , 78-89.

[14] Kamil, M. (2012). *Model Pendidikan dan Pelatihan.* Bandung: Alfabeta.

[15] Kawuwung, F. (2011). Profil Guru, Pemahaman Kooperatif NHT dan Kemampuan Berpikir Tingkat Tinggi di SMP Kabupaten Minahasa Utara. *El-Hayah. Vol. 1* , 157-166.

[16] Khomsatun, S. (2013). *Efektiftas workshop achievement motivation training (AMT) dan peer teaching terhadap peningkatan kompetensi pengelolaan pembelajaran. Tesis.* Program Pascasarjana STAIN Salatiga.

[17] Larkin, M. (2002). Using Scaffolded Instruction To Optimize Learning. ERIC Digest.

[18] Mc.Millan, J. H., & Schumacher, S. (1997). *Research in Education: a Conceptual Introduction.* New York: Longman.

[19] Pulungan, I. (2013). *Analisis kompetensi guru pascadiklat guru matapelajaran kimia tingkat madrasah aliyah se Sumatera Utara.* Medan: BDK Medan.

[20] Riduwan. (2016). *Dasar-dasar statistika.Cetakan ke-14.* Bandung: Alfabeta.

[21] Sparks, D., & Horsley, S. L. (1989). Five models of staff development. *Journal of Staff Development* , p. 1-28.

[22] Stuyf, R. R. (2002). *Scaffolding as a Teaching Strategy.* Retrieved September 17, 2017

[23] Sudjana, D. (2007). *Sistem dan Manajemen Pelatihan.* Bandung: Falah.

[24] Sugiyono. (2014). *Metode penelitian kuantitatif, kualitatif dan R&D.* Bandung: Alfabeta.

[25] Sukmadinata, N. S. (2015). *Metode Penelitian Pendidikan.* Bandung: Remaja Rosda Karya.

[26] Supriatno, B. (2013). *Pengembangan program perkuliahan pengembangan praktikum biologi sekolah berbasis ANCORB untuk mengembangkan kemampuan merancang dan mengembangkan desain kegiatan laboratorium. Disertasi.* Bandung: UPI.

[27] Trianto, M. (2012). *Mendesain Model Pembelajaran Inovatif-Progresif (Konsep, Landasan dan Implementasinya pada Kurikulum Tingkat Satuan Pendidikan KTSP).* Jakarta: Kencana.

[28] Wiyanto. (2005). *Pengembangan Kemampuan Merancang dan Melakukan Kegiatan Laboratorium Fisika Berbasis Inkuiri Bagi Mahasiswa Calon Guru.* Disertasi Doktor SPs UPI Bandung: Tidak diterbitkan.