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Improving Novice Teachers' Instructional Practice Using Technology Supported Video-based Reflection System: The Role of Novice Teachers' Beliefs

P Ardisa[1], Y T Wu[2] and H D Surjono[3]

[1,3] Yogyakarta State University, Indonesia.
[2] National Central University, Taiwan.

E-mail: ardisaprilia@gmail.com

Abstract. The use of technology supported video-based reflection has become an essential tool for teacher education. This present study seeks to investigate the effect of video-based reflection to the novice teacher conception of teaching belief and the nature of the novice teacher comments on i-Critical reflection on teaching system (iCRT) for improving their instructional practice. Particularly, this research employed qualitative method with a case study approach. By using purposive sampling, there are fifty-third years of chemistry education students who have registered for microteaching course were selected. A mixed-type data analysis approach used in this present study, the data collected is quantitative and qualitative data. The main findings indicated that novice teachers positively changed their conception of teaching belief. The results of data analysis were six major themes related to the nature of comments provided by novice teachers through the iCRT system; classroom management, teacher feedback, teacher Student Interaction, teaching assignment, teaching design, teaching skill.

1. Introduction

Improving the quality of education has close relation to the quality of a teacher. Teachers have the important role to help students in mastering the lesson even though way of thinking, ways of learning and the meaning of education, from the teachers as the focus of teaching learning process, into teachers as mere facilitators has changed through development in educational technology. Before becoming a teacher, teacher candidate (in this research called Novice teacher) comply with teacher education or known as teacher education program. Although novice teachers have participated in various educational programs, they still have many weaknesses; lack of perceive and interpret classroom situation, lack of both – selective attention and knowledge-based reasoning - aspect to noticing, cause less of experience, novices are less able to identify relevant learning situations, hard to anticipate the context and reason of instruction, novice teacher also hard to notice the effect of teaching action and alternative course of action (Kleinknecht & Schneider, 2013; Carter, Cushing, Sabers, Stain, & Berliner, 1988; Berliner, 2001). Due to many weaknesses of novice teacher, Kleinknecht & Schneider (2015) suggested that novice teacher need the different form of guidance and different treatment to enhance instructional practice (p. 46). Regarding to the role of teacher education,

reflection is a one way to conduct an investigation on how novice teacher teach as previously mentioned to enhance novice teacher instructional practice through interaction and experience (Schön, 1983; Kolb, 1984; Ferreira; Korkko, Kyro-Ammala, & Turumen, 2016; Krutka, Bergman, Flores, Mason, & Jack, 2014). Gaudin & Chalies (2015) mentioned that video viewing became a signifacant part of teacher education and professional development program to train novice teacher enchance their instructional practice (p. 42). Following the trend of teacher reflection in teacher education, a number of studies have to examine how novice teacher enhance their lack of instructional practice in previous literature. However, the studies on the use of technology supported video-based reflection, especially in Indonesia are very rare. Therefore, The main purpose of this research was to investigate the effect of technology supported video-based reflection to the novice teachers' instructional practice. Based on the background of the research, the research question was formulated as:

2.   Related Works/Literature Review

Labaree (2008) stated, "Teaching exited long before teacher education." (p.290). By observing the role of teachers in the field of education, their role is certainly very strategic in improving the quality of a school in accordance with national education. Femin-nemser (2001) stated that "The quality of schools of a country depends on the quality of teachers". This an evidence that the role of the teacher increasingly important to notice and the improvement the instructional practice of teachers on a periodically supposed be done both personally and institutionally. Hence, with the concerns, Zeichner & Liston (1987) as cited in Korkko, Kyro-Ammala, & Truman (2016) Reflection can be seen as a central component of a student teacher's professional development (p. 198).

Figure 1. Reflection Cycle by David Boud (1985)

Reflection is a form of learning from experiences, which is often used unintentionally by people but can be also used actively and on purpose. In line with that, there are three different components proposed by David Boud (1985); Reflective process, experience(s), Outcomes that the reflection process starts in the middle of the picture as a reflective process, the having an experience which we do analysis, and evaluate according to our prior knowledge and having the outcomes of our reflection as an idea and plan how to improve in the future.

Furthermore, teachers' beliefs are particularly important to be assess in the beginning of the research. Studies of teachers' beliefs may be a case in point. as cited in Fischl & Sagy (2005) their stated that

Pre-service teachers usually begin their training process with personal beliefs about teaching, images about good teachers, images about themselves as teachers and personal memories about their days as pupils in class (Bennett, 1991; Bullough, 1991; Calderhead & Robson, 1991) (p. 290). It has been proved by plenty of researchers that teachers' belief can affect their teacher education (Seymen, 2012; Alina-Oana & Mihaela, 2015; Lakin & Harrison, 2018). Lim, Cock, Lock and Brook (2009) have cited two sets of teachers' beliefs highlighted by Berry and Brady. Berry insists that teacher belief in traditional, teacher-centered teaching approach consider teaching the transfer of knowledge and information, thus teacher encouraging rote learning to student and their just reproduction of information. Brady on the other hand, affirms that proponents of a constructivist beliefs, student-centered teaching approach that teacher as a mere facilitator to guiding and facilitating students for an active construction and reconstruction their own knowledge, thus encouraging the development of competencies of students that may be used throughout their lives. Following the two sets of teacher beliefs, researcher adopted an instrument of the Conception for Teaching and Learning Questionnaire (CTLQ) for this present study that originally from Chan (2001).

Video becomes one of the most widely used tools in reflection. Gaudin and Charlies (2015) as the person who review on the use of video-based in teacher education and professional development stated that there are three benefits of using video-based on enhancement teacher education and professional development; (a) the use of video makes teacher easier to observe class events during the lesson than the traditional observation and it as an artifact of practice with function as an evidence to link between theoretical and practical in education, (b) technological developments, especially in teacher education have strongly supported the video display requirements for professional development in all aspects of digitalization, and (c) institutionally, watching videos is increasingly being used as a means to facilitate institutional reform (p. 42). In line with that, As stated in Kleinknecht and Schneider (2013), he emphasized that there are two main advantages in classroom video; first, video has the potential to capture in an authentic and relevant way (Spiro, Collins, & Ramchandran, 2007). Second, observers of videos have the opportunity to analyze situations from a distance. furthermore, the use of video has become an essential tool for working with preservice teacher to enhance their instructional practice through reflection (Finn, 2002; Sherin & Van Es, 2005). Several studies have reported that using video aids reflection on teaching and learning (e.g. Borko et al., 2008; Sherin, 2007; Sherin & van Es, 2009) and positively impacts teaching and student learning (Kersting, Givvin, Thompson, Santagata, & Stigler, 2012; Sherin & van Es, 2005). In fact, video recorded helps novice teacher to look forward for the events that they are not notice and reconstruct it from their experience in teaching.

3. Overview of iCRT Video-based Reflection System

This study employed web-based application for the novice teacher, named i-Critical Reflection on Teaching (iCRT) used by novice teachers and mentor as the expert teacher. This system was design to facilitated novice teacher to enhance with their instructional practice. Therefore, any features that made as much as possible, enables them to reflect on themselves. Furthermore, before using this system, each user needs to log in first to distinguish the user. iCRT system used by novice teachers has three main features, i.e., individual reflection, peer feedback and meta-reflection.

Figure 2. Login page

As a novice teacher, they got a lot more features than mentor and they need to upload their own teaching practice video with options (e.g., sharing option, type of education, video title, ID of embedded video and so on), especially for ID of embedded video, systems provide the way how to embedded the video from YouTube as the storage to system.
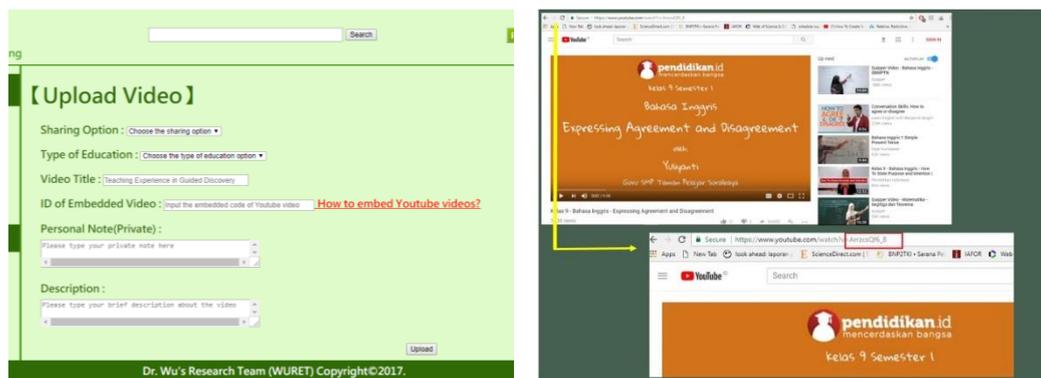

Figure 3. Feature of upload video and embedded video for novice teacher

Furthermore, for the three main features for novice teachers, there are different features when doing. How to do self-reflection and give a peer feedback is the same way, novice teacher need to mark and give a comments when they notice something regarding to the teaching practice video. These two features have several buttons (i.e., mark, save, delete and summary), slightly different with meta reflection (e.g., reflect).
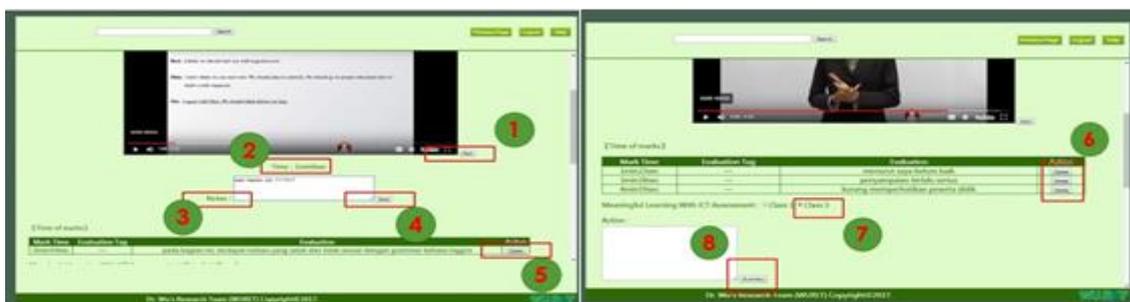
Figure 4. Self-reflection and peer comment feature

Figure 5. Meta-reflection feature

In meta reflection, novice teacher can see self-reflection comments, peer feedback and mentor feedback and they reflect on themselves based on multilevel reflection.

Meanwhile, iCRT system used by mentor has mentor feedback as the main feature. Mentor has a list of teachers who have done self-reflection then mentor can evaluate it for each novice teacher.

4. Material & Methodology

4.1 Data Collection
There are three stages in the data collection in this study; (a) Pre reflection, (b) Reflection stage and (c) Post reflection. At each stage, the researcher will be taken a different piece of data. For the beginning of the research, demographic questionnaire and pre-test about conception of teaching belief will be taken. After that, novice teacher will have a reflection class and in this stage, researcher will take self-reflection, peer feedback, mentor feedback and meta reflection comments through technology supported video-based reflection. Thus, the last stage will be post reflection where each student will have a posttest about conception of teaching belief and need to explain their experience during take part in the research. This paper limited in self-reflection data. The participants for this study are third year students of chemistry education who have registered for Microteaching course. There were fifty third year students of chemistry education who registered for Microteaching course that willing to join this research as the participants. This research conducted this research in Chemistry Department, Jambi University as one of public university in Jambi Province, Indonesia. To get access to do research sites, the researcher used official letter on getting permission from department. The research started at January 24th 2018 to March 2nd 2018. The research held every Wednesday and Friday for 2 x 50 minutes of every meeting.

4.2 Method
Qualitative method with case study approach is used. According to Gall, Borg and Gall (2003), "case study research is the in-depth study of instances of a phenomenon in its natural context and from the perspective of the participants involved in the phenomenon" (p.436). The type of case study uses in this research is intrinsic case study because the researcher takes the case based on his personal interest and curiosity as to understand the strategies of teaching public speaking in independent community. As stated by Stake (1995) that in intrinsic case study, the researcher has his own curiosity to study the case (p. 3). As stated by Stake (1995) that in intrinsic case study, the researcher has his own curiosity

to study the case (p. 3). It is in line with Hancock and Algozzine (2000), when the researcher wants to understand more a particular case, his work then called intrinsic case study (p. 32).

4.3 Data Analysis
A mixed-type data analysis approach used in this present study, thus the data analyzed data both quantitatively and qualitatively. First quantitative data analysis was descriptive statistic for subject of the research.

Table 1. Sample characteristic: means (and standard deviations)

Characteristic	Chemistry education
Age	20.2 (0.596)
Gender (female)	92%
Practical teaching experience (yes)	52%

The researcher used pretest and post-test score data to be processed in paired T-test analysis. To defined the effect of technology video-based reflection in novice teachers' conception of teaching belief. In addition, through all the comments from system also analyzed by statistical analyses. The researcher used Paired T-test to examined in which focus of novice teachers' comments on their teaching videos then used Independent Sample T-test to examined in which focus of novice teachers' comments on their teaching videos compared with accepted comments and mentor feedback. While to seek the significance difference between first and second round of treatment on self-reflection and comments giving to peer, which is done by chi-square analyses.

Furthermore, analyzing data in this case study research was started since the data were collected. As stated in Gall, Borg and Gall (2003) that in case study, researcher is required to analyze the data while data collection in progress. The data obtained from open-ended questionnaire and direct observations were analyzed descriptively while data gained from interview process were transcribed. Johnson and Christensen (2008) suggest that "coding is the process of marking segments of data (usually text data) with symbols, descriptive words, or category names" (p.534). After encoding data from participants (novice teachers and mentor), the researcher found several common themes shared by the participants. Then, the common themes were discussed descriptively. The researcher also discussed the data finding in the relation to previous research.

5. Result and Discussion

5.1 The effects of online video-based reflection in novice teachers' conception of teaching belief
Regarding the conceptions of teaching belief, overall, the findings in the quantitative part of the study reflect that the novice teachers strongly believed that the constructivist approach was the best teaching strategy, as the mean score of the constructivist conception of teaching was 3.92, which is between agree and strongly agree with Cronbach's Alpha score 0.817; they did not completely agree with the traditional conception of teaching (mean score = 2.86) with Cronbach's Alpha score 0.813. In addition, the novice teacher had significantly stronger espousal of the constructivist view than the traditional view, as indicated by the significant difference shown in the results of the paired sample T test. The

mean difference between the constructivist and traditional approaches is significant (t statistic = 5.30, df = 49, p < .01).

Furthermore, some novice teacher that has constructivist conception of teaching belief expressed their nature of comments that they preferred strategies related to the student-centered approach as a main focus and planning to changes their model of teaching.

Comment given by NV15, comment 52 – self reflection

My explanation was quite good, but it's not clear enough from the syntax of scientific learning because I lack on preparing the material so that makes students less to think critically.

Comment given by NV10, comment 10 – meta reflection

in the learning process occurs the interaction between students and teachers. It's the better the students are more active in teaching and learning process in accordance with the demands of the 2013 curriculum.

Interestingly, novice teacher that has traditional conception of teaching belief stated in their nature of comments in meta reflection as their critical reflection, novice teacher show that they notice the traditional conception of teaching belief when they teach their students.

Comment given by NV01, comment 01 – meta reflection

in this video, the way I teach is still centered on me as the teacher, so that students tend to be passive and the methods used do not attract students interest in learning and there are many students who are still busy with themselves.

In this study, the researcher examined the effect of technology-supported video-based reflection to their conception of teaching belief, whether novice teachers are more tend to change to constructivist or to traditional conception of teaching belief. To determine the trend, the researcher used paired t-test to seek for trends of changed based on pre and posttest conception of teaching belief questionnaire.

Table 2. Novice teachers' conception of teaching belief changed between constructivist and traditional belief from before and after treatment (n=50).

Conception of teaching belief	Constructivist (mean, SD)	Traditional (mean, SD)
Pre-test	3.92 (0.95)	2.86 (1.11)
Post test	4.29 (0.69)	2.30 (0.95)
T	5.30[**]	7.11[**]

Novice teachers show statistical differences in their scores through the two scales conception of teaching belief questionnaire of both before and after treatment by iCRT systems. The changed of novice teachers' belief using Conception for Teaching and Learning Questionnaire (CTLQ) been done by paired-sample t-test. There was significant difference in the score for pretest constructivist conception for teaching belief (M=3.92, SD=0.95) and posttest constructivist conception for teaching

belief (M=4.29, SD=0.69) conditions; t (49) = 5.30, p < 001. Not only in constructivist conception for teaching belief but also in traditional conception for teaching belief, there was significant difference in the score for pretest traditional conception for teaching belief (M=2.86, SD=1.11) and posttest traditional conception for teaching belief (M=2.30, SD=0.95) conditions; t (49) = 7.11, p < .001. These results shown that both constructivist and traditional conception for teaching belief does have positively changed novice teacher conception for teaching belief. Specifically, these results shown that multilevel reflection as a treatment does have an effect to more constructivist conception for teaching belief.

5.2 Novice teachers' comments on their teaching video
In this section, the researcher investigated the types of comments provide by novice teachers when they reflect on their own teaching video. Terms of comment refers to remarks, interpretation, observation, advice, views of novice teacher regarding to their own video. Furthermore, the researcher examined the novice teachers' amount and percentages of comments that they gave to their own teaching videos. This part is aims to seek on which themes they focus more on reflecting on themselves and decide whether there is any significance difference between first and second round of treatment on self-reflection.

The results on investigated the types of comments provided by novice teacher on self-reflection both first and second round were similar with slightly different portion from each theme. According to table 14, the total number of comments from the self-reflection in the first round of the novice teachers n= 182. The main focus of the nature of the novice teachers' comments is in the classroom management (51, 28%) were similar with slightly different portion with teaching design (43, 24%) and followed by teaching skills (41, 23%), teacher student interaction (33, 18%) and with a portion of the fewest comments but not much different between teacher feedback (9, 5%) and teaching assignment (5, 3%). We could have said that CM > TD >TS > TSI and followed by TF > TA.

Similarly, the total number of comments from the self-reflection in the second round of the novice teachers n= 229. The main focus of the nature of the novice teachers' comments is in the classroom management (68, 30%) were similar with slightly different portion with teaching skills (46, 20%) and followed by teaching design (44, 19%), teacher student interaction (37, 16%) and with a portion of the fewest comments but not much different between teacher feedback (23, 10%) and teaching assignment (11, 5%). We could have said that CM > TS >TD > TSI and followed by TF > TA.

Regarding to the results, there is no significance difference between first and second round of treatment on self-reflection, which is done by chi-square test; X2= 6.035. Most of the comments, their explaining the classroom situation both in teacher centered and students centered views. As stated by NV34, "when the teacher explains the overall conclusions of the presentation of each group, the teacher lacks of control the classroom control, some students are not pay attention to the teacher's explanation." (137, self reflection1). It is also supported by NV07 emphasize, "at the time when the teacher explained the material on the board, there are some students not paying attention to the teacher and some also sleeping in the class." (25, self reflection2). Those results consistently uttered by NV25 in her overall individual reflection that, "I try to pay attention to things in detail {doing self-reflection}. and I look for what is lacking in me, so that in the future I will not repeat the same mistake then I become more judgmental or maybe even find out where my faults than others." (75, overall individual reflection)

Table 3. The novice teachers' amount and percentages of comments that they gave to their own teaching videos

	Types of comments											
	CM		TF		TSI		TA		TD		TS	
	n	%	n	%	n	%	n	%	n	%	n	%
Round 1[a]	**51**	**28%**	9	5%	33	18%	5	3%	**43**	**24%**	41	23%
Round 2[b]	**68**	**30%**	23	10%	37	16%	11	5%	44	19%	**46**	**20%**
X^2	6.035 (n.s)											

Table 4. The novice teachers' comments on their teaching videos

	Types of comments													
	CM		TF		SI		TA		TD		TS		overall	
	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD
Round 1[a]	1.02	0.94	0.18	0.44	0.66	0.85	0.1	0.30	0.86	0.95	0.82	0.85	3.64	1.52
Round 2[b]	1.36	1.12	0.46	0.71	0.74	0.99	0.22	0.55	0.88	0.80	0.92	0.80	4.58	1.46
t	1.71		**2.71****		0.42		1.29		0.12		0.74		**3.40****	

CM = Classroom Management, TF = Teacher Feedback, TSI = Teacher Student Interaction, TA = Teaching Assignment, TD = Teaching Design, TS = Teaching Skill
n.s.: nonsignificant
around one (n = 182)
bround two (n = 229)

The second part on this section, the researcher examined the novice teachers' comments on their teaching videos by finding which themes have significant focus of comments given by novice teacher. According to table 15, the total number of comments from the self-reflection of the novice teachers n= 182 (mean= 3.64, SD = 1.52) in the first round and n= 229 (mean= 4.58, SD= 1.46) in the second round, with the result t = 3.40, $p < .001$ means there is significant difference between the total number of comments done by Paired T-test.

Even though there is a significant difference in total, but it showed only in teacher feedback theme n= 9 (mean= 0.18, SD= 0.44) in the first round and n= 23 (mean= 0.46, SD= 0.71) in the second round which has a percentage increase of 5% with t = 2.71, $p < .001$ has significance differences in single theme. Whereas others themes were similar with slightly different portion from each theme and some themes have decreased their portion, such as teaching design decreased 5% of their comment, although this theme continues to dominate in the provision comment.

Some novice teacher conscious in the first round of self-reflection, more comment they see that they did not give a feedback, like NV41 expressed, "Here's the advanced answer to the question from Hermaliza again. That's clearly I'm not trying to make other students become more active and I didn't

give a feedback." (165, self reflection1). Another commented from NV14, "I do not motivate students after answer questions." (53, self-reflection1). By contrast, in the second round the comments more positive, novice teacher can do the positive feedback and can see it, expressed by NV22 "The teacher gives reinforcement to the conclusions that have been conveyed by the students." (97, self-reflection2) and event they students did not good in learning, novice teacher still give a reinforcement to support them in learning. Uttered by NV43, "me as a teacher still support and give a positive feedback to a student who has not answered the question correctly." (176, self-reflection2), also support by NV18, "teachers have already reinforced students' wrong answers to keep motivated them and asked other students to come up with ideas or arguments." (77, self-reflection2).

Those all results defined as a good result, where teacher feedback means novice teacher giving more focus on how they gave reinforcement, motivation, clarification and advancement to their students. The same as found by Sherin & van Es (2005), that video based has positively impacts teaching and student learning. While Sherin & han (2004) emphasized that teachers observing their own teaching can probably empathize with situations depicted by and participate emotionally in the videotaped events. In this findings, novice teachers are more aware of what they should do to their students to keep students motivated to follow the lesson after doing something right or wrong during the lesson, so this showed that the teacher is more student-centered on the concept of teaching and learning belief.

6. Result and Discussion

6.1 Conclusions
The online technology reflection widely perceived as a teacher education friendly tools. In this era, this tool already implemented in education and has been ubiquitous in teaching learning process. Not only as a teacher education friendly tools but this tool also offering evidence, data base, as an artefact of novice teacher improvement in their instructional practice. The aims of this research was to explore and describe the factual findings of novice teacher instructional practice related to the reflection on teaching through technology supported video-based reflection. The findings indicated that technology supported video-based reflection effect novice teachers' belief to be more constructivist conception for teaching belief.

6.2 Suggestion
Based on the findings in this study, there are some aspects that can be developed by further researcher that interested in this topic, multilevel reflection. Future research could show more specifically how technology supported online video-based reflection improve novice teachers' instructional practice within their teaching practice course. Besides, the further researchers that want to conduct other research in the same scope to gain in depth information about the quality of the comments.

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