

A Preliminary Case Study of Promoting Teacher Professional Development via Post-Lesson Debriefing with the Support of Sokrates Cloud Services

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Abstract: During the process of teacher professional development, debriefing serves as a critical element, which not only helps teachers reflect on their own teaching practice but also helps all peer teachers promote their professional development. A successful debriefing session requires teachers to recollect their experience of a taught lesson. The more details are recollect, the more issues will be identified, which, in turn, may enhance the effects of debriefing. In this vein, the authors develop a system, Sokrates Video Player (Sokradeo), which incorporates the abilities of automatic data collection and analysis, enhanced video player, and analytic dashboards to help teachers reconstruct their experience and identify critical issues of their teaching. A preliminary study was conducted to evaluate the effects of using Sokradeo to support post-lesson debriefing. Although the results indicated that Sokradeo might enhance the efficiency of debriefing and helped novice teachers master the use of smart classroom tools within a relatively short time, the study was not a well-controlled experiment due to the fact that the school schedule did not allow such an experiment. Hence, rigorous studies should be further conducted to investigate how Sokradeo contributes to the process of post-lesson debriefing.

Keywords: teacher professional development, Sokrates, Sokradeo, debriefing, AI engine

1. Introduction

Debriefing, a postexperience analytic process (Lederman, 1984; 1992) originated from army (Gardner, 2013), plays an imperative role in the process of professional development in various fields. Due to its simplicity and effectiveness in improving performance (Tannenbaum & Cerasoli, 2013), the debriefing technique was then applied to other career fields, such as nursing and healthcare (Dreifuerst, 2015), human resource management (Reyes, Tannenbaum, & Salas, 2018), and software development (Collier, DeMarco, & Fearey, 1996).

In addition to the above-mentioned fields, debriefing is also regarded as an effective technique for improving teachers' teaching capabilities. Such a technique provides teachers with opportunities to gain a deep insight of their teaching practice, which, in turn, may not only help teachers enhance their teaching and research skills but also facilitate students' learning thanks to the improvement of teachers' instructional plans and implementations (Hail, Hurst, & Camp, 2011). In schools, (post-lesson) debriefing is usually regarded as a method of inquiry aiming at helping inquirers explore and look into the critical issues that are not easy to be identified by the inquirers themselves via disclosing personal experiences to peers (Lincoln & Guba, 1985).

A debriefing session consists of seven elements: (1) the debriefer (guide), (2) the participants to be debriefed, (3) participants' experience, (4) the impact of participants' experience, (5) the recollection of participants' experience, (6) reporting mechanisms, and (7) time for debriefing (Lederman, 1991). More specifically, there would be a debriefer who coordinates the entire debriefing session within a specific duration. The debriefer facilitates the process of experience sharing and manages the foci of the experience to be debriefed. For a post-lesson debriefing session, the participants to be debriefed are the teachers who have taught a planned lesson. A debriefing session starts with experience sharing. The

participants are requested to recount their personal experience of the planned lesson. The debriefer may ask some questions to facilitate the debriefing process. In addition to the debriefer–participant conversation, the debriefer would also invite peer teachers to express their opinions about the strengths and the weaknesses of the participant’s lesson. Peer teachers are also encouraged to interact with the participants after the participants finish their experience sharing (Lewis, 2002). Such interaction among peers may not only help the participants recall more details but also provide the participant with different perspectives for self-reflection (Hail, Hurst, & Camp, 2011).

Table 1

The Three Phases of Debriefing Framework

Phase 1	Review and reflection	The participants share their experience, including facts, feeling, and personal opinions towards specific events. Peers are encouraged to interact with participants to help them elicit more detail and identify the pros and cons of their teaching.
Phase 2	Understanding and analysis	The identified pros and cons are discussed to explore the underlying causes. The debriefer may raise questions to stimulate the participants and peer teachers to think deeply and broadly and link up with their past experiences so that they may gain a deeper understanding about the topics being discussed and explore the impact of their experience by which the participants’ performance on future tasks might be influenced.
Phase 3	Summary and generalization	This phase reviews what has learned from the experience and discusses how to apply the learned lesson in the future.

Past studies from different disciplines involve various forms of debriefing, which implies there is no a standard format for debriefing (Spillett, 2003). Even so, there are three phases (Table 1) which forms the main debriefing framework (Gardner, 2013; Lederman, 1992; Rudolph, Simon, Raemer, & Eppich, 2008). In this framework, experience sharing constitutes the first step of debriefing. The latter steps rely on the participants’ experience as the source for discussion. In other words, the quality of recollected experience may decide the result of a debriefing session – success or failure. Hence, it is critical to help participants recollect their experience. Traditionally, the debriefer may prepare some tools, such as a survey or questionnaire, to facilitate the recollection of participants’ experience, (Gardner, 2013). Although these tools may help participants recall more details, they still rely on participants’ memory. Alternatively, we started to consider if there is a tool which provides objective and detailed information to facilitate debriefing. Actually, there is a tool which may fulfill the requirements: videos.

Flanagan (2008) suggested that videos may be served as a tool for facilitating experience recollection. Past studies indicated that teachers behaved differently on recalling their teaching experience if they were provided with the video of their teaching. Without the support of videos, the recalled experience mainly focused on classroom management and personal performance. However, teachers would put greater emphasis on reviewing how they deliver their instruction and students’ responses when they were provided with the video clips of their lecturing (Rosaen, Lundeberg, Cooper, Fritzen, & Terpstra, 2008). Although videos provide detailed information, teachers may have to interrupt debriefing and spend time on seeking and playing the videos, which may become another problem.

2. The Design of Sokradeo: A Tool for Facilitating the Process of Debriefing

To address the above issues, an interactive teaching analytic system, the Sokrates Video Player (Sokradeo) (Fig. 2), was developed. Sokradeo is an interactive player which integrates videotaped lectures, smart tags, analytic dashboards, and a comment collector. These features are designed to reconstruct the whole lecture and foster the recollection of teachers’ teaching experience during the process of debriefing. The following subsections describe the design details of the Sokradeo.

2.1 The Design Principles of Sokradeo

Three principles are applied to develop the system; the system should be (1) automatic, (2) intelligent, and (3) interactive. First, it is a labor-intensive task to record all the events occurred in classrooms with traditional methods (e.g. Gall & Acheson, 1980; Flanders, 1966). Thanks to the advancement of technology, we are now able to operate various devices to record and process necessary data of a lesson automatically and simultaneously. Second, the data should be processed intelligently. The raw data is processed with AI algorithms tuned by human experts. These algorithms imitate how human experts evaluate teachers' performance and then visualize the results with analytical dashboards. Third and the last, instead of merely serving as a one-way information deliverer, the system should provide users with an interactive interface so that users may get additional information through interacting with the system. As shown in Figure 1, the interface of Sokradeo is composed of four different panels; they are (1) a video player, (2) smart tags of teaching behavior, (3) smart tags of comments, and (4) analytic dashboards.

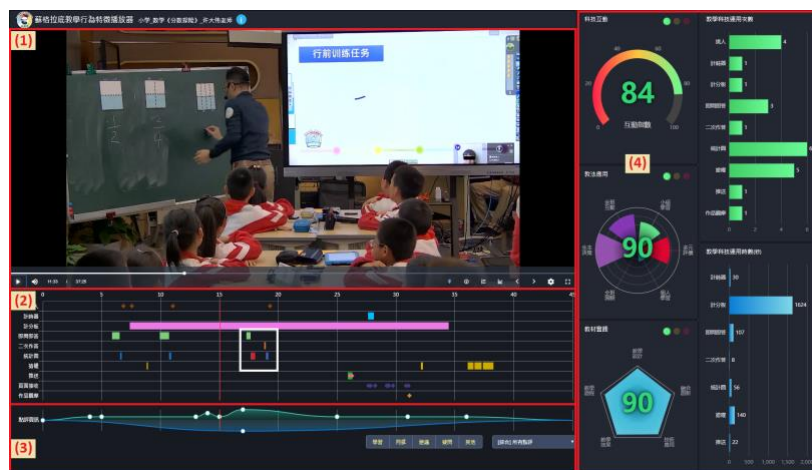


Figure 1. The Sokrates Video Player.

2.2 Video Player with Smart Tags of Teaching Behavior

The left three panels can be operated jointly to provide users with an extended controlling interface for playing lecture videos. The smart tags in panel 2 are generated automatically after the Sokrates Cloud Services analyzed teachers' teaching behavior data. This panel serves as a navigator guiding users what interaction tools the teacher executed at a specific time. These "smart tags" can be used to interact with the video directly. Users can click on the smart tags to trigger the video jump to the corresponding time point. For example, if a teacher wants to share the experience of carrying out a pedagogical pattern (the framed area in panel 2 of Figure 1), the teacher can click on the smart tags in the frame and describe her/his experience with the support of corresponding video.

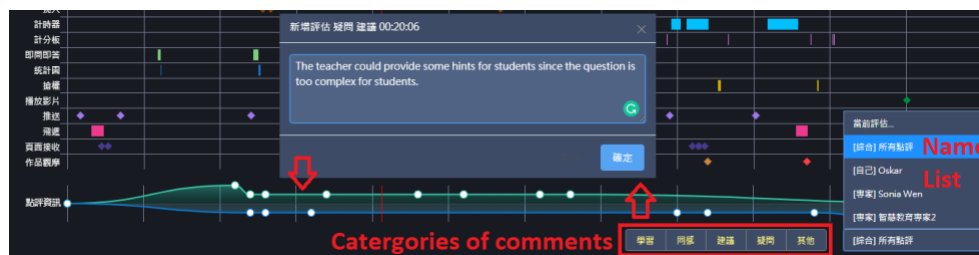


Figure 2. The comment collector.

2.3 Comment Collector

In addition to the automatically generated smart tags, users can manually add annotations to a video. These annotations then become the other type of smart tags (smart tags of comments) that interact with

videos. Experts and peer teachers who are invited to evaluate a taught lesson can leave public comments. Other users can add private comments for personal reference. For example, teachers who taught a planned lesson can add some annotations to the video so that they could use the annotations to remind themselves what to share during a debriefing session. Figure 2 illustrates the interface of the comment collector of Sokradeo.

2.4 Analytic Dashboards

The panel 4 shown in Figure 1 demonstrates the analytic dashboards which summarize how teachers delivered their lectures in smart classroom environment. These dashboards with the orders from top to bottom, left to right are (1) technological interaction index, (2) pedagogical application index, (3) content implementation index, (4) the frequencies of interactive technologies, and (5) the accumulated time on using interactive technologies. Unlike the other four automatically generated dashboards, the third dashboard, content implementation index, is designed to complement the other two automatically rated indices since the Sokrates AI engine still has its own limitations. Hence, we implemented this index rated by human experts to evaluate how teachers prepare, implement, and deliver their lectures.

3. A Preliminary Study of Using the Sokradeo

In order to evaluate the effects of using Sokradeo to support debriefing sessions and find out the shortcomings of system design, a preliminary study was conducted in 2018 in an elementary school. The study lasted for three months (from September to November). There are totally 83 teachers, of which 39 teachers have never taught in a smart classroom before participating this study while the other 44 teachers have one to three years' experience of using a smart classroom, participated in this preliminary study (N = 83). The details of this evaluation are presented in the following subsections.

3.1 Method

Teachers' technological interaction and pedagogical application indices (T index & P index) of their lessons are used as the indicators to observe the change of teachers' performance on their teaching. T-tests are applied to compare the performance between teachers with no and at least one year's experience on teaching in a smart classroom. Due to the fact that this preliminary study is conducted in a regular semester, a rigorous experiment was not able to be conducted since we could not alter school's schedule as well as interfere how teachers carried out their teaching plans. Hence, a qualitative report from the teacher participants, which explained how teachers utilized Sokradeo to conduct post-lesson debriefing to promote teacher professional development was adopted to serve as a supplemental material to discuss the possible advantages of debriefing with the support of Sokradeo.

3.2 Quantitative Results

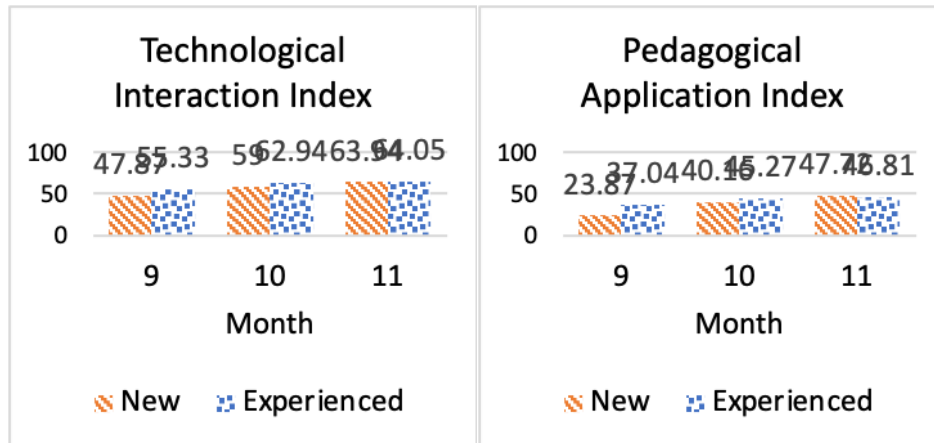


Figure 3. The Mean Scores of the Technological Interaction of Pedagogical Application Indices.

Teachers' performance on the two indices is shown in Figure 3. All teachers gained improvement on both indices from September to November. In addition, the teachers without any experience in teaching in smart classrooms seemed to perform almost equally on the two indices when comparing to their experienced peers in the third month.

In order to confirm whether the observation is correct, *t*-tests are applied to compare the differences of the T index and P index between the novice and experienced teachers. The results of independent-samples *t*-tests are shown in Table 2. The results indicate that there are significant differences in both indices in September and October between the novice and experienced teachers with $ps < .001$ while no significant differences are found in the two indices in November between the novice and experienced teachers ($ps > .05$).

Table 2

The Result of T-tests between Teachers with Different Levels of Experience on using Smart Classrooms

Experience	N	September, 2018		October, 2018		November, 2018		
		M	P index	T index	P index	T index	P index	
0	39	M	47.87	23.87	59.00	40.16	63.94	47.72
		SD	19.25	27.17	19.47	24.79	18.32	24.93
≥ 1 year	44	M	60.45	46.07	66.27	49.61	64.18	45.73
		SD	19.24	27.78	17.17	22.05	19.00	24.89
		t	7.98***	9.84***	6.14***	6.24***	0.10	0.64

* $p < .05$; ** $p < .01$; *** $p < .001$

3.3 Qualitative Response from Teachers

Three of the teacher participants who coordinated the teacher professional development group created a report to describe how they conducted debrief sessions in their school with the support of Sokradeo. Before this study, teachers in this school had already collected thousands of videotaped lectures. Among these videos, several videos or video clips with model examples were identified and saved as example lists. When this study started, those model clips are used as an additional resource for enhancing the effects of debriefing. Teachers conducted debriefing sessions regularly with the use of Sokradeo. The teachers indicated that there was usually only one case could be debriefed during a traditional debriefing session. However, they might able to debrief at least two or three cases thanks to the features of Sokradeo that help teachers locate critical episodes quickly and precisely.

4. Discussion

The quantitative results indicate the novice teachers might have grasped the skills of teaching in smart classrooms within two months. More specifically, the T index demonstrates the level of a teacher's

familiarity with lecturing in smart classrooms while the P index represents the level of a teacher's knowledge of applying the smart classroom tools to carry out various pedagogical model in his/her lesson. In fact, it may take longer time to master the pedagogical skills since teachers might spend time on mastering the skill of using smart classroom tools first. However, the novice teachers performed almost equally to their experienced peers in both aspect after two months. This may be due to the effect of debriefing since debriefing may help teachers not only master the use of tools but also a gain deeper understanding on integrating the tools into the lesson design optimally (Groth, 2011). The qualitative responses from teachers might explained why the novice teachers could demonstrate comparable levels of performance to the experienced teachers in both technological and pedagogical aspects in two months since the efficiency of debriefing was improved.

5. Conclusion

Past studies provided a lot of evidence of using debriefing to promote personal performance in various domain of professions, including teaching. Lesson study is one of the common methods adopted by teachers to promote their professional development, and debriefing constitutes the final step of lesson study, which help teachers reflect on if their teaching fulfilled their plans. More importantly, the results of debriefing create the foundation, which may induce the next lesson study cycle (Groth, 2011).

This study developed a system, Sokradeo, of which an important application is supporting the process of debriefing. Since the teachers being debriefed have to reconstruct their experience of a taught lesson, Sokradeo provides a feature to help teachers locate critical episodes efficiently. A preliminary study was conducted to examine the effects of using Sokradeo to support the process of debriefing to promote teacher professional development. The results indicated that novice teachers achieved similar levels of performance when comparing to their experienced peers after two months. Such a result might be contributed by the integration of debriefing and Sokradeo. Since a controlled experiment was not able to be conducted, the true effect of Sokradeo could not be confirmed yet. We only got a message which implied the Sokradeo might improve the efficiency of debriefing from teachers' response. Hence, a controlled experiment should be conducted to verify the effects of Sokradeo on supporting post-lesson debriefing. A rigorous qualitative study should also be conducted to find out the deep meaning of how teachers interact with Sokradeo to improve their professional development.

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