# EVALUATING THE IMPACT OF VIDEO-BASED TRAINING STRATEGIES ON TEACHERS' PERCEIVED PEDAGOGICAL KNOWLEDGE AND SELF-EFFICACY

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## Abstract

The digital videos have gradually affirmed until becoming one of the most used tools in teacher education. However, their single use cannot guarantee by itself a deep comprehension of classroom events. Their effectiveness can depend on the training strategies that are put into action. Teacher trainers can use two training video-based strategies. The first one presents the pedagogical principles, followed by an example of the videotaped practice. Following a direct instruction learning model, the authors define this strategy *rule-example*. In the second strategy, it shows the video; afterward, it asks teachers to note teaching facts sharing their notes collaboratively to elaborate ideas about what have been observed. Following a knowledge construction learning model, the authors define this strategy *example-rule*. The paper shows the findings of an experiment that merged digital videos with teacher training strategies. The research involved 84 future teachers randomly assigned to two experimental conditions. In both conditions, the subjects watched two clips in which two teachers interact with students following a triarchic model of feedback: (a) task-oriented feedback, (b) motivational-oriented feedback, (c) student-oriented feedback. In the first treatment, the participants observed the clips in the context of knowledge construction approach. In contrast, in the second treatment, the participants viewed the clips in the context of a direct instruction strategy. The study had three objectives: (a) understanding the participants' perception of video-taped teachers' feedback; (b) comparing the participants' perception of video-taped teachers' feedback for direct instruction and knowledge construction strategies; (c) comparing the participants' self-efficacy to provide feedback for direct instruction and knowledge construction training strategies. For the first research project, the findings confirm partially the three facets model of feedback. The analysis produces a two factors solution based on the following components: *learning-oriented feedback*, *motivational-oriented feedback*. For the second research objective, only for *learning-oriented feedback* scores associated to CLIP I, we observe a significant and large difference between treatments. Concerning the third objective, the result show that knowledge construction approach seems to produce a higher level of self-efficacy in providing feedback to students, once teachers come back in the classroom.

Keywords: Digital video, Teacher Education, Training strategies, Formative Feedback, Evidence-based education, Random Control Trial.

## 1 INTRODUCTION

The videos of teaching actions have become one of the most used tools both in academic courses and in teacher training. Their use has been gradually affirmed, until becoming one of the most used instruments in teacher education ([1]; [2]). This fact suggests an accurate consideration and research programs with the aim of understanding if and how videos can help teachers increasing their professional knowledge ([3]; [4]).

In the videos are contained several educational and teaching events. Some of them play a critical role in student learning, some others not. The identification of a noteworthy event consists in the teacher's ability in paying attention to aspects that are crucial in the student's learning process ([5]). In this case, videos work as first stimulus of knowledge activation ([6]).

But, on which elements should we focus? The meta-analysis, elaborated by Seidel and Shavelson ([7]) and by Hattie ([8], [9]) on the effects of a range of educational, cognitive and motivational factors, offer a first knowledge base (Tab. 1). Why do we consider this range of factors? Most of them can be subject of video-observation, consequently they can be elements of professional knowledge. The hypothesis is that a good professional vision implies the ability to think about teaching drawing on their own pedagogical knowledge ([10]). If professional vision is nurtured by the knowledge of what works in teaching and learning ([8], [9]), the integration of these with content knowledge and experience video-

taped may form a system of professional cognitions, which shade light on those elements that have a critical role in students' learning.

In this study we focused the attention on supporting teachers to understand "how to provide a better feedback to students". We treated this factor as an element of pedagogical knowledge. Teachers need to know how to formulate responses through feedbacks, giving corrective indications, offering insights on "how" and "why" a result was achieved ([9]). We defined these actions as *task-oriented feedback*. Another kind of feedback consists in praises, positive reinforcements, social recognitions ([11]). With these actions, teachers motivate student to learn. We outlined them as motivational feedbacks. Finally, teachers need to know that the feedback is more effective if is "just in time", "just for me", "just for where I am" in the learning process ([9] p. 122). We named these elements as student-oriented feedbacks.

*Table 1. Lists of high effect size factors in teaching and learning processes.*

| ***Seidel and Shavelson meta-analysis*** | ***Hattie meta-analysis*** |
|---|---|
| 1. Goal setting | 1. How to develop a high expectation for each student |
| 2. Orientation of learning towards a goal | 2. How to provide better feedback to students |
| 3. Activation of student thinking through challenges tasks | 3. Reciprocal teaching |
| 4. Support student through constructive feedback | 4. Teacher-student relationship |
| 5. Supportive learning climate by taking students' needs seriously | 5. How to better teach metacognitive strategies |
| | 6. Teaching study skills |

The *task-oriented feedback* has a better effect on student learning if compared with praises and positive reinforcements. In the studies that evaluate the effect of *task-oriented feedback*, the mean value of Effect Size (ES) is 0.67. Conversely, the mean value for praises and reinforcement is 0.48 ([12]). Briefly, the effect on learning is greater if the feedback provides instructions to improve the task performance; in contrast, it is observed a lower level effects when teachers communicate praises or positive reinforcement. The rule of thumb is probably to mix the three typologies of feedback by mostly focusing on task-oriented feedback.

Any teacher education activities - addressed both to pre-service and in-service teachers - should be focused on how to help teachers shaping their learning ([4]). Following this line of reasoning, the simple vision of a video is not enough in order to generate an accurate comprehension of the teaching/learning processes. The effectiveness of such resources depends on the training strategies that are put into action. Referring to a classification proposed by Seidel and colleagues ([13], p. 58), two overall teacher education training strategies can be highlighted. The first strategy presents the pedagogical principle to pursue, followed by an example of application through a video. The authors define this strategy *rule-example*. The overall scope is learning to apply a system of pedagogical knowledge. The *rule-example* strategy can be defined as a strategy of direct instruction (DI). The second one firstly shows the video. Afterwards, it asks teachers to note teaching facts, facilitating the learning of new pedagogical knowledge that help to do better in classroom. The authors define this strategy *example-rule*. This second strategy refers to a knowledge construction (KC) approach, in which it is stated that learning is meaningful when is the outcome of a process of guided discovery ([14]). The paper proposes the results of an experiment in which we compared the effects of these two video-based training strategies.

## 2 METHODOLOGY

The study involved $N = 84$ future teachers (84,5% female), engaged in an academic course for attaining a national qualification in special education. They had a mean age of 38.44 ($SD = 6.98$), 61,9% worked in middle school, 34,5% in high school, 2,3% in primary school.

The teachers were randomly assigned to two experimental conditions: 43 in DI treatment, 41 in KC treatment. One group worked to the videos with a KC approach, the other one worked with DI approach ([15]). The teachers watched two CLIPS in which two teachers were providing feedbacks to students (Fig. 1). Concerning CLIP I, participants observed a teacher during an interaction with the whole class

involved in a writing assignment. In the classroom was integrated one special educational need student. Regarding CLIP II, the subjects visioned a teacher during an interaction with a small group of students involved in a series of math assignments. All students were involved in a special education program.

CLIP I: Teacher interacts with whole classroom during a writing assignment

CLIP II: Teacher interacts with a small group during a series of math assignments

*Figure 1. Video of two teacher who provide feedback.*

In each experimental condition we designed five training activities. The first condition is based on discovery and sharing with peers activities. In KC activities, the group started watching videos, afterward it began to understand the theory and details of the feedback through a guided discovery learning process (production and sharing notes). The second condition is based on activities of understanding and applying pedagogical knowledge about the feedback. In DI activities, the trainer starts presenting the theory and the details of the feedback through brief lecture, afterward the subjects tried to understand the theory and details of the feedback through individual and small group exercises. At the end of this patterns, the subjects observed the videos. Table 2 shows the methods used to lead the two treatments.

*Table 2. Two video-based experimental conditions: KC vs DI approach.*

| ***Treatment 1*** ***Knowledge construction*** | | ***Treatment 2*** ***Direct instruction*** | |
|---|---|---|---|
| Starting at 2:00 P.M. *Each group together for a general presentation* | | | |
| ***Timing*** | ***KC activities*** | ***DI activities*** | ***Timing*** |
| 15’ | First vision of CLIP I/II and production of individual notes. | Brief lesson on “how to provide a better feedback to students”. | 30’ |
| 60’ | Sharing notes in small groups. | Comprehension test: 10 questions answered in small group. | 25’ |
| 60’ | Sharing notes in whole class. | An instructional design task in three phases: individual, pair, small group. | 45’ |
| Break 3:30 P.M. | | Break 3:45 P.M. | |
| 15’ | Second vision of CLIP I/II. | Examples: presentation of two teaching cases. | 60’ |
| 45’ | Data collection. | Vision of CLIP I/II and data collection. | 60’ |
| Ending at 6:00 P.M. | | | |

Two different researchers lead each condition. At the end of each training we collected data on teachers’ background variables, on three facets of feedback, on teachers’ self-efficacy. The questionnaire was organized in 3 sections: (a) 9 items with 4-point Likert scale (“*disagree*” vs “*agree*”) proposed twice - for CLIP I and CLIP II – addressed to capture the perception of video-taped teacher’s feedback; (b) 1 item with 6-point Likert scale (“*much unconfident*” vs “*much confident*”) addressed to capture the subjects’ self-efficacy to provide feedback after the participation to the treatments (“*how much feel me skilled to*

*communicate feedback to the students*"); (c) background variables (Age, Sex, Degrees, School order, etc.).

# 3 RESULTS

## 3.1 Perception of video-taped teacher's feedback

### *3.1.1 CLIP I - Teacher interacts with the whole classroom during a writing assignment*

The 9 items - designed to capture the perception of video-taped feedback on behalf of all subjects involved in the experiment – were subjected to principal component analysis (PCA). The factor analysis revealed a two factors solution with 8 items. Table 3 shows the hierarchical order of processed items. The two factors explain 52% of total variance, with Component 1 contributing 35,46% and Component 2 contributing 16.70%. There is a weak correlation between the two components (r = .24). We named the first factor *learning oriented feedback* (LoF), while we called the seconde *motivational oriented feedback* (MoF). This solution doesn't confirm the 3 facets theoretical model of feedback trained during the two treatments.

*Table 3. Perception of video-taped feedback: Factor loadings (CLIP I).*

| *Item* | *Learning-oriented feedback* | *Motivational-oriented feedback* |
|---|---|---|
| T encourages reflection on "how" to work | 0,808 | |
| T encourages reflection on "how" to improve | 0,744 | |
| S receive a "just in time" feedback | 0,722 | |
| S receive a "where to next" feedback | 0,666 | |
| S receive a "just for me" feedback | 0,652 | |
| T praises the student's work | | 0,758 |
| T says, "Well done", "Good", "Perfect", "Right" | | 0,753 |
| T focuses student's attention on positive answers | | 0,60 |
| T = Teacher S = Student | | |

### *3.1.2 CLIP II - Teacher interacts with a small group during a series of math assignments*

The second factor analysis confirmed the outcome of previous one but with a different hierarchical order in factor loadings (Tab. 4). The two factors explain 54% of total variance, with LoF contributing 33.43% and MoF contributing 20.80%. There isn't any correlation between the two factors (r = .089).

*Table 4. Perception of video-taped feedback: Factor loadings (CLIP II).*

| *Item* | *Learning-oriented feedback* | *Motivational-oriented feedback* |
|---|---|---|
| T encourage reflection on "how" to work | 0,803 | |
| S receives a "where to next" feedback | 0,767 | |
| T encourages reflection on "how" to improve | 0,718 | |
| S receive a "just for me" feedback | 0,57 | |
| S receive a "just in time" feedback | 0,522 | |
| T says, "Well done", "Good", "Perfect", "Right" | | 0,865 |
| T praises the student's work | | 0,784 |
| T focuses student's attention on positive answers | | 0,618 |
| T = Teacher S = Student | | |

## 3.2 Effects of treatments on perception of video-taped teacher's feedback

In the third analysis an independent-sample t-test was conducted to compare perception of LoF and MoF scores, in CLIP I and II, for DI treatment and KC treatment. In CLIP I, regarding the LoF, there is a significant difference in scores, for DI (M=3.27, SD=0.58) and KC (M=2.68, SD=0,64), t=4.47(81), with a p below 0,05. The magnitude of the difference in the means (= -0,59, CI: 0,33 to 0,87) is large (Cohen's d = 0,968). It means 96.8% of variance is explained by treatment (Fig. 2). Concerning the MoF, there is no significant difference in score for DI and KC experimental condition (Tab. 5).

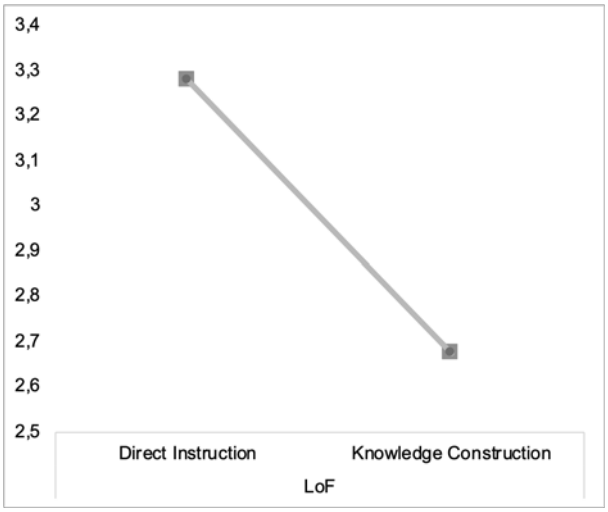


*Figure 2. CLIP I: Perception of LoF for the two experimental treatment.*

*Table 5. CLIP I - Independent-sample t-test: Perception of feedback X Treatments*

| *Type of feedback* | *Treatment* | *N* | *M* | *SD* | *t* | *df* | *Sig.** |
|---|---|---|---|---|---|---|---|
| Learning-oriented feedback | *Direct Instruction* | 43 | 3,27 | 0,58 | 4,47 | 81 | 0,000 |
| | *Knowledge Construction* | 40 | 2,68 | 0,64 | | | |
| Motivational-oriented feedback | *Direct Instruction* | 41 | 2,11 | 0,61 | 0,56 | 80 | 0,579 |
| | *Knowledge Construction* | 41 | 2,02 | 0,71 | | | |
| * 2 tailed | | | | | | | |

For the CLIP II, a Mann-Whitney U Test was conducted to compare perception of LoF and MoF scores, for the two treatments. The choice of non-parametric test is due to no-normal curve distribution of scores. For this reason, we compared not the means but the median. For the CLIP II, there is no significant difference in scores for DI and KC, regarding LoF and MoF (Tab. 6).

*Table 6. CLIP II - Mann-Whitney U Test: Perception of feedback X Treatments.*

| *Type of feedback* | *Treatment* | *N* | *MD* | *U* | *z* | *Sig.** |
|---|---|---|---|---|---|---|
| Learning-oriented feedback | *Direct Instruction* | 43 | 4,0 | 848,00 | 0,095 | 0,92 |
| | *Knowledge Construction* | 39 | 3,8 | | | |
| Motivational-oriented feedback | *Direct Instruction* | 43 | 4,0 | 1005,00 | 1,50 | 0,138 |
| | *Knowledge Construction* | 41 | 4,0 | | | |
| * 2 tailed | | | | | | |

## 3.3 Effects of treatments on teachers' self-efficacy

An independent-sample t-test was conducted to compare self-efficacy scores for DI treatment and KC treatment. There is a significant difference, in self-efficacy scores for KC (M=0,91, SD) and DI (M=-0,80,

SD=3.17), with t=-2.88(71), and a *p* below 0,05 (Tab. 7). The magnitude of the difference in the means (= -1,70, CI: -2,89 to -0,52) is moderate (Cohen's d = 0,626). It means 62,6% of variance is explained by the treatment. In Figure 3, the value with the minus sign before identifies a low level of perceived self-efficacy to provide feedback, whereas the values with positive sign before identifies a high level of self-efficacy. Probably, at the end of KC training, participants feel more confident in providing a better feedback to students once they return in the classroom.

*Table 7. Independent-sample t-test: Teachers' Self-efficacy X Treatments.*

| | Treatment | N | M | SD | t | df | Sig.* |
|---|---|---|---|---|---|---|---|
| Teachers' self-efficacy to provide feedback after the participation to the treatments | *Direct Instruction* | 42 | -0,80 | 3,17 | -2,88 | 71 | 0,005 |
| | *Knowledge Construction* | 37 | 0,91 | 2,03 | | | |

* 2 tailed

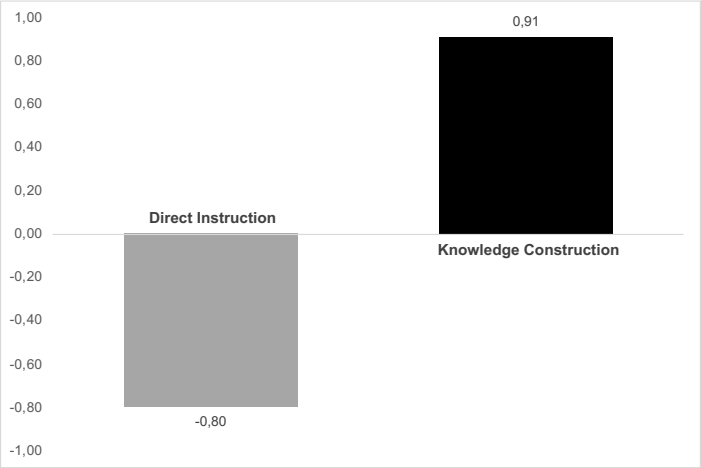


*Figure 3. Impact of treatments on teachers' self-efficacy.*

## 4 CONCLUSIONS

Some issues and future directions arise from the study. Regarding the first research objective, the factorial analysis produced a two factors solution based on the following components: learning-oriented feedback, motivational-oriented feedback. The factor analysis partially confirms the three facets model of feedback, showing a difference in the hierarchical order of items for CLIP I and II. Probably the order depends on the content of the video observed. In the CLIP II, subjects perceived a teacher with a high level of ability in providing to students both LoF and MoF. Whereas the CLIP I conveys a better balance to provide feedback to students. Concerning the second research objective, only for LoF scores associated to CLIP I, it observes a significant and large difference between treatments. For CLIP II the two experimental conditions did not produce any significant difference. Regarding the participants' self-efficacy to provide feedback, the findings suggest that the KC approach seems to produce a higher level of self-efficacy in providing better feedback to students once teachers come back in the classroom.

This study claims that videos' effectiveness depends on the training strategies ([13]). With the scope to give more soundness to this hypothesis, the idea is to design an experimental study with four randomized assigned groups [16], enrolling not less than 200 pre-service teachers, 40 subjects for each experimental condition. Participants will watch only one clip in which a teacher provides feedback during an interaction with the class. One group of subjects will work with a KC training strategy approach; the second one will work with a DI training strategy; the third one will use a digital platform (i.e., VIALOGUES) for noticing teaching events in the videos; the control group will observe only the video without any noticing activities or specific training strategies. At the end of each experimental conditions, all groups will answer to a questionnaire through which collecting data on teachers' background variable, on different facets of feedback, on perceived personal change after participation to the experimental treatment, on self-efficacy ("how much feel me skilled to communicate feedback to the students"). The scope is to test (a) if the groups differentiate the responses at the treatments about feedback, perceived

personal change, and self-efficacy; (b) if there is an interaction between the treatments and the background variables in the same dependent variables.

## ACKNOWLEDGEMENTS

This research was supported by the LUMSA University of Rome (Deliberation UCRI – 02.21.19). I would like to thank all teachers who participated in this study. I also thank Prof. Giuseppe Tacconi, University of Verona. I'm deeply grateful for his collaboration, suggestions and encouragement. In January 2020 he passed away. I dedicate the paper to his memory.

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