JOURNAL OF E-LEARNING AND KNOWLEDGE SOCIETY
Vol. 21, No. 1 (2025), pp. 74-84

Video-based learning activities in teacher education: effects on self-efficacy and perception of feedback for learning

Maurizio Gentile[a,1], Gabriella Agrusti[a], Caterina Fiorilli[a], Valerio Ghezzi[b], Giulia Toti[a]

[a]*LUMSA University, Dept. of Human Sciences – Rome (Italy)*

[b]*Sapienza University, Dept. of Psychology – Rome (Italy)*

(submitted: 26/11/2024; accepted: 8/4/2025; published: 9/5/2025)

Abstract

Transferring pedagogical knowledge from university courses to school is a complex challenge for many teachers. For this reason, teacher education experts began to recommend integrating practice during university learning activities. Classroom videos could be one of the resources in supporting this critical process. The research involved 84 future teachers randomly assigned to two experimental conditions. In both conditions, the subjects watched two clips in which two teachers interacted with students following a triarchic feedback model: task-oriented feedback, motivational-oriented feedback, and student-oriented feedback. In the first treatment, the participants observed the clips in the context of the knowledge construction (KC) approach. By contrast, in the second treatment, the participants viewed the clips in the context of a direct instruction (DI) strategy. The study had two objectives: understanding the participants' perception of video-taped teachers' feedback; and testing the effects of treatments on the participants' self-efficacy to provide feedback. For the first research goal, the findings partially confirm the three-facet model of feedback. The analysis produces a two-factor solution based on the following components: learning-oriented feedback, and motivational-oriented feedback. Concerning the second research goal, the results show that KC approach seems to produce a higher level of self-efficacy in providing feedback to students. This treatment has a direct impact on the self-efficacy score, with evidence that no teacher and contextual factors directly influence the score or moderate the effects of the approach on the dependent variable. This finding is consistent with studies that address how university courses may positively promote teacher self-efficacy.

KEYWORDS: Video-Based Learning Activities, Feedback For Learning, Self-Efficacy, Knowledge Construction, Direct Instruction.

DOI
https://doi.org/10.20368/1971-8829/1136175

CITE AS
Gentile, M., Agrusti, G., Fiorilli, C., Ghezzi, V., & Toti, G. (2025). Video-based learning activities in pre-service teacher education: effects on self-efficacy and perception of feedback for learning. *Journal of e-Learning and Knowledge Society*, *21*(1), 74-84. https://doi.org/10.20368/1971-8829/1136175

1. Introduction

Academic courses for teacher education struggle to build a close connection between pedagogical knowledge acquired in university courses and real teaching in the classroom (Seidel, Blomberg & Recnkl, 2013). The transfer of new pedagogical ideas from university activities to the workplace can be a complex challenge for many teachers. For this reason, teacher education experts began to recommend integrating practice during university learning activities (Darling-Hammond & Bransford, 2005). However, the application of pedagogical knowledge does not necessarily imply a direct exposition to a real classroom setting (Seidel, Blomberg & Recnkl, 2013). Teachers can have an experience of vicarious learning (Bandura, 1986) to facilitate the comprehension and transfer of pedagogical knowledge into the classroom. Classroom videos could be one of the resources in supporting this important professional learning process (Santagata & Yeh, 2014).

[1] corresponding author - email: m.gentile@lumsa.it – address: P.zza delle Vaschette, 101, 00193, Rome (IT)

Video-taped teaching actions became popular in academic courses and in professional development activities. Their use has been gradually affirmed, until becoming one of the most used instruments in improving the quality of teaching (Calandra & Rich, 2015; Gaudin & Chaliès, 2016). This fact suggests an accurate consideration and research programs with the aim of understanding if and how videos can help teachers increase their professional knowledge (Bakkenes, Vermunt & Wubbels, 2010; Lieberman & Pointer Mace, 2008). For example, pre-service teachers struggle to understand the complexity of teaching events, so to perceive themselves as unable to apply the pedagogical theories studied in academic courses (Seidel & Stürmer, 2014). Educating teachers on the ability to analyze video can promote high-quality professional knowledge. Consequently, one of the priorities of university courses for teachers should be building an integrated system of pedagogical and practical knowledge along with the self-confidence to apply it in the classroom.

Video-taped teaching actions can contain several educational and didactic events. Some of them play a critical role in student learning, and some do not. The identification of a noteworthy event consists of the teacher's ability to pay attention to aspects that are crucial in the learning process of students (Seidel & Stürmer, 2014). In this case, videos work as the first stimulus of knowledge activation (Kersting, 2008). However, on which pedagogical key elements should we focus? The meta-analyses by Seidel and Shavelson (2007) and by Hattie (2009, 2012, 2023) on the effects of a range of educational, cognitive, and motivational factors, offer a first knowledge base. For example, Seidel and Shavelson (2007) indicate the following factors that can have a significant impact on learning:

- goal setting and orientation of learning towards goals;
- activation of student thinking through challenging tasks;
- supporting students through constructive feedback;
- supportive learning climate by taking students' needs seriously.

In line with this, Hattie's meta-analyses (2009; 2012; 2023) shed light on dimensions such as:

- learning intentions;
- feedback targeted to students and teachers;
- teaching methods and strategies to support students' surface and deep learning;
- whole school and outside contextual factors;
- curriculum, technologies and classroom variables;
- classroom variables and students' individual differences;
- teacher attributes and teacher education.

Most factors within each dimension can be an object of video observation, consequently they can be elements of pedagogical knowledge to include future teacher education.

In the present study, we focused on how to provide better feedback to students. Firstly, we collected two videos showing two teachers providing feedback in two different instructional contexts. Second, we developed two video-based learning activities to promote the teachers' understanding of different facets of feedback. Finally, we tested the effects of the video-based learning activities on participants. The study had two objectives:

- understanding the participants' perception of video-taped teachers' feedback;
- testing the effects of two learning activities on participants' self-efficacy to provide feedback.

2. Assessment and feedback for learning

In the last 30 years, the concept of assessment has changed, and the discussion has focused on the distinction between *formative assessment*, *assessment for learning*, and *summative* or *assessment of learning* (ARG, 1999; 2002). The first term characterizes an assessment aiming to improve teaching and learning processes. On the contrary, with *summative assessment* teachers formally judge students after an instructional period (at the end of a unit, a term, a whole year, or a cycle of studies), commonly using final performance tests. Concerning *assessment for learning*, Klenowski (2009) refined the definition by highlighting the following elements:

- teachers and pupils are the critical actors in the assessment process;
- assessment is a daily process that engages teachers and students to seek information and reflect on it;
- dialogs, demonstrations and observations support and enhance learning.

Earl and colleagues (2003, 2013; Dann, 2014; Earl & Katz, 2008) have extended the concept of *assessment for learning* by emphasizing the active involvement of pupils. Based on this premise, the authors proposed an evolution and a third perspective: *assessment as learning*. Students are the actual assessors of their learning and this connection between assessment and learning can promote the development of metacognition and self-regulated learning (Clark, 2012).

We argue that feedback aimed at students is a practice to implement the assessment *for* and *as learning*, and we consider it as a key component directly connected to teacher assessment competence (Hattie, 2023; Mitchell & Sutherland, 2020). We proposed to assume a three facets model of feedback.

1. Task-oriented feedback. Teachers formulate responses, gives corrective indications, offers insights on "how" and "why" a result was achieved (Hattie, 2012). The main goal of this type of feedback is to regulate the students' learning processes.
2. Motivational feedback. Another kind of feedback consists of praise, positive reinforcements, social

recognition (Heitink et al. 2016). The main goal of this second kind is to motivate students to learn.

3. Student-oriented feedback. Feedback may be more effective and valuable for students if it is "just in time," "just for me," or "just for where I am" in the learning process (Hattie, 2012, p. 122). The primary purpose of this last feedback is to personalize the ways of reaching achievements.

Hattie and Temperley (2007) compare the impact of *task-oriented feedback* and *motivational feedback* on student learning. In all comparisons, the *task-oriented feedback* has a better effect on student learning if compared with praises and positive reinforcements. In studies that evaluate the effect of task-oriented feedback, the mean value of ES is 0.67. Conversely, the mean value for praises and reinforcements is 0.48. However, according to Hattie's meta-analysis (2009, 2012) both values fall in the zone of desired effects. We are not telling teachers to stop praising students. We suggest mixing the three types of feedback, by mostly focusing on task-oriented ones. Briefly, the effect on learning is greater when the goal of feedback is to provide instructions to improve the performance of a task; in contrast, it is observed lower-level effects are observed when teachers communicate praises or positive reinforcement.

3. Teacher self-efficacy

According to Bandura's theory (1977), self-efficacy (SE) refers to how people judge "their capabilities to organize and execute courses of actions required to attain designed types of performances" (ivi, p. 391). Later, Bandura (1994), pointed out that "self-efficacy beliefs determine how people feel, think, motivate themselves, and behave" (ivi, p. 71) providing additional emotional and motivational dimensions to the SE construct. Overall, a strong belief in self-efficacy is typically positively associated with high performance and general well-being (Ngui & Lay, 2020; Pajares, 1997). Therefore, people with a high SE show engagement in their tasks by maintaining a persistent effort and motivation to increase knowledge and skills. Furthermore, SE is associated with positive strategies to cope with new challenges and learning opportunities across a range of tasks and behaviors (Schunk, 1995). By contrast, low SE is associated with maladaptive coping strategies, for example, avoidant behaviors, doubt about one's skills, low effortful control, and low-level goals (Bandura, 1994). As a result, people with low SE are more likely to achieve minimal or poor performances (Kelley et al., 2020).

Regarding teacher self-efficacy (TSE), scholars define it as a feeling of confidence and a sense of effectiveness in subject-specific teaching strategies and/or classroom management (Kelley et al., 2020; Hajovsky et al., 2020; Perera & John, 2020; Skaalvik & Skaalvik, 2019). It is expected that the higher TSE, the better teachers are motivated to use knowledge in their practices. Moreover, when future teachers have a high SE, they are more motivated to transfer new pedagogical knowledge into their practice (Kelley et al., 2020; Gegenfurtner, 2011).

4. Video-based learning activities

The simple vision of a video is not enough to generate an accurate comprehension of the teaching and learning processes. The effectiveness of video depends on the learning strategies that are put into action (Seidel & Stürmer, 2014). Tucholka and Gold (2025) examine the application of videos in teacher education. They discuss the "order of conceptual input" and whether it is preferable to present theoretical concepts initially or to evaluate the videos first. They suggest that theoretical information prior to video analysis enhances the capacity to assess the events video-taped in the clips. Major and Watson (2018) highlight the efficacy of video of classroom practices, indicating that colleagues' observations and discussions can enhance the effectiveness of videos in improving teaching methods. They further point out that passive video viewing does not ensure learning; it is essential to integrate effective pedagogical strategies and offer high-quality professional support.

Referring to pedagogical strategies, Seidel and colleagues (2013) proposed two overall approaches, both oriented to the use of videos in teacher education.

1. *Direct instruction* (DI). The first strategy presents a pedagogical principle, followed by an example shown through videos. The underlying scheme is "from rule to application". Participants receive fundamentals of pedagogical knowledges, then, they are asked to watch a video and to take notes, to think about what was noted, recalling the pedagogical knowledge earlier received (Seidel, Blomberg & Renkl, 2013). The focuses of observation are expert teachers, videotaped during the performance of successful activities: exemplary lessons, with a total or near-total absence of critical incidents and with positive reactions from the students. In this case, the stimulated reasoning would sound like this: "It is good to do so, if you want to achieve suitable educational outcomes". It is mostly practiced in pre-service teacher education, to teach pedagogical knowledge, or the use of educational principles and effective teaching strategies.
2. *Knowledge construction* (KC). In this second strategy, teacher educators show an example of practice in one or more videos, teachers observe the video and write down notes about teaching facts to prepare the next pedagogical reflections and reasonings. Before the vision of the video, instructors do not provide any knowledge about principles, teaching strategies and research evidence (Seidel, Blomberg & Renkl, 2013). The

strategy implements the pattern "from application to rule". The schema is thought to help teachers to tackle specific issues that could arise during classes and students' activities. For this reason, the KC strategy is mostly practiced in professional development activities, in which there is the need to learn something that will be later applied in the classrooms (Kleinknecht & Schneider, 2013; Tacconi & Mejia Gomez, 2012) and working collaboratively with colleagues to share reflections and reasonings about authentic classroom situations (Greeno, 1989; Resnick, 1991).

Regardless of the nature of teacher education (university courses versus professional development initiatives), teacher educators can combine KC and DI approaches and propose hybrid solutions to both categories of teachers. It can propose learning activities in university courses based on the KC strategy; by contrast, it can carry out activities in professional development based on the DI strategy.

5. Method

The present study involved a group of Italian teachers enrolled in one-year academic courses to attain a national qualification in special education. We focused our attention on supporting them in understanding "how to provide better feedback to students". One sub-group worked on the videos with the KC approach, the other worked with the DI approach (Blomberg et al., 2014). The purpose of the study was to compare the effects of the two video-based learning strategies on teacher self-efficacy and perception of feedback for learning. Specifically, the aim was to answer three research questions (RQs):

RQ1. How do the teachers perceive the video-taped teacher's feedback? Is the participant's perception coherent with the theoretical feedback model (task-oriented, motivation-oriented, student-oriented)?

RQ2. How does self-efficacy for proving feedback change in relationship to experimental treatments (KC versus DI)?

RQ3. Is the relationship between treatments and self-efficacy moderated by relevant teacher (gender, age, total years of teaching) and contextual (grade level, high-density school locations, total number of students per school) factors considered critical elements for future professional commitment and development (European Commission/EACEA/Eurydice, 2015)?

5.1 Participants

The study involved 84 Italian teachers (84.5% female), attending a one-year academic course for accomplishing a national qualification in special education. They had a mean age of 38.44 (SD = 6.98), 61.9% worked in middle school, 345% in high school, and 2,3% in primary school. Their average teaching experience in years was 6.55 years (SD = 4.07). Finally, 53.8% of the overall teacher sample worked in a school located in a town with less than 15,000 citizens (the respective counterparts worked in places with more than 15,000 citizens), and the average number of students per school was 344 (SD = 324).

5.2 Procedure and measures

The teachers were randomly assigned to two experimental conditions: 43 in DI treatment, and 41 in KC treatment. One group worked with the KC approach; the other one worked with DI approach (Blomberg et al., 2014). The teachers watched two CLIPS in which two teachers, previously trained in the implementation of the three facets model of feedback, were providing feedback to students (Figure 1). Concerning CLIP-I, participants observed a teacher during an interaction with the whole class of students involved in a writing assignment. One student with special educational needs was integrated into the classroom. Regarding CLIP-II, the subjects viewed 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 1 - A teacher during an interaction with whole class involved in a writing assignment - 2 min.

CLIP II - A teacher during an interaction with a small group of students involved in a series of math assignments - 7 min.

Figure 1 - Two teachers committed to provide feedback in two different classroom settings.

In each experimental condition we designed five tasks. The first condition is based on the KC approach:

teachers were sharing their notes with colleagues. The emphasis was on social cognition and collaboration. In the KC learning activity, 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 tasks of understanding and applying pedagogical knowledge about the feedback. In DI learning activity, the instructor started presenting the theory and the details of the feedback through a brief lecture, afterward the subjects tried to understand the theory and details of the feedback through lecture, individual and small group exercises, analysis of examples. At the end of this path, the subjects observed the videos. Table 1 shows the two treatments.

Table 1 - Experimental treatments: KC approach versus DI approach.

Treatment 1 KC learning activity		**Treatment 2** DI learning activity	
Starting at 2:00 P.M. Each group together for a general presentation			
Timing	**KC tasks**	**DI tasks**	**Timing**
15’	First vision of CLIP I/II and production of individual notes.	Brief lesson on “how to provide 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.			

At the end of each learning activity, we collected data through a questionnaire organized in 3 sections:

1. nine 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;
2. one item with 6-point Likert scale (“much unconfident” vs “much confident”) addressed to capture the subjects’ self-efficacy to provide feedback after participation in the treatments (“How confident I feel that I have the ability to communicate feedback to students”) (Caprara, 2001);
3. teacher and contextual variables (gender, age, total years of teaching, grade level taught, location where the teacher teaches, total number of students in school) (European Commission/EACEA/ Eurydice, 2015).

Two different researchers lead each condition. No significant differences were detected in teacher and contextual variables between the two groups.

6. Results

6.1 Perception of video-taped teacher’s feedback

With the purpose to capture the participants’ perception of video-taped teacher’s feedback, two factor analyses were carried out for CLIP I (Teacher interacts with the whole classroom during a writing assignment) and CLIP II (Teacher interacts with a small group during a series of math assignments). The 9 items - designed to capture the participant’s perception of video-taped feedback were subjected to principal component analysis (PCA).

A broad spectrum of guidelines exists for the subject-to-item ratio, often advocating for a minimum of 3 to 20 subjects per item. Nonetheless, actual evidence corroborating these particular ratios is scarce (Mundfrom et al., 2005; Rouquette & Falissard, 2011). Nunnally (1978) recommends a ratio of 10 to 1, meaning ten subjects for each item to be factor analyzed. Others propose that five cases per item are sufficient in most instances (Tabachnick & Fidell, 2007), and if there are a few distinct factors, a smaller sample size is adequate (Tabachnick & Fidell, 2013). Although recommendations differ, an increased ratio and bigger sample size typically result in improved outcomes. The interplay between sample size and item quantity is substantial, but our particular experimental settings have implied setting a subject-to-item ratio of 9 to 1.

The procedure revealed a two factors solution with 8 items. Table 2 shows the hierarchical order of processed items. The two factors explain 52% of the 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 second motivational-oriented feedback (MoF).

The second factor analysis confirmed the outcome of previous one but with a different hierarchical order in factor loadings (Table 3). The two factors explain 54% of total variance, with LoF contributing 33.43% and MoF contributing 20.80%. There is no correlation between the two factors (r = .089).

6.2 Effects of treatments on self-efficacy scores

Since some subjects reported missing data on the outcome variable, the final sample comprised 37 subjects in the KC condition and 41 subjects in the DI condition. Preliminary analyses showed that missing values occurred completely at random, and they were completely unrelated to teacher and context variables.

An independent-sample t-test was conducted to compare self-efficacy scores (*level of confidence in the ability to provide feedback to students*) for DI treatment and KC treatment. There is a significant difference, in self-efficacy for KC (M = 0.91, SD = 2.03) and DI (M=-0.80, SD = 3.17), with t = -2.88(71), and a $p < 0.05$ (Table 4).

The magnitude of the difference in the means (= -1.70, CI: -2.89 to -0.52) is moderate (Cohen's d = 0.626). In Figure 2, 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.

Table 2 - Perception of video-taped feedback: Factor loadings (CLIP I).

Item	LoF	MoF
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 = Students LoF = Learning oriented feedback MoF = Motivational oriented feedback		

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

Item	LoF	MoF
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 = Students LoF = Learning oriented feedback MoF = Motivational oriented feedback		

Table 4 - Independent-sample t-test: SE * Treatments.

	Treatment	N	M	SD	t	df	Sig.*
SE	DI	42	-0.80	3.17	-2.88	71	0.005
	KC	37	0.91	2.03			
* 2 tailed SE = Self-efficacy score DI = Direct Instruction KC = Knowledge Construction							

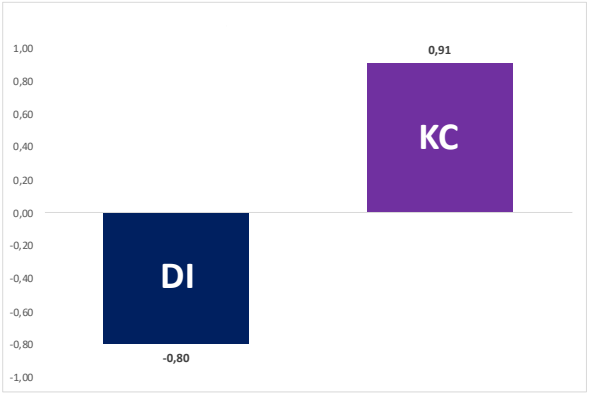

Figure 2 - Impact of treatments on self-efficacy score.
DI = Direct Instruction KC = Knowledge Construction

6.3 Testing direct and moderated effects on self-efficacy scores

To strengthen the results associated with RQ2, we tested if the relationship between treatments and self-efficacy was affected by factors such as gender, age, total years of teaching and context, grade level, high-density school locations, and total number of students per school. Figure 3 presents the relationship model between experimental treatments (KC versus DI), teacher and context variables, and self-efficacy score.

In other words, we considered, on one side, the probability that teachers and contextual factors could explain KC's positive influence on self-efficacy and, on the other hand, the possibility of these variables' direct influence on self-efficacy score.

A full factorial MANCOVA model was initially carried out to test the conceptual model against the data. The dependent variable was the score on the single item reflecting TSE in providing feedback, the fixed factors were the treatment grouping variable, gender, grade level (primary, middle, high school), and school location (school located in places with less or more than 15,000 citizens). All principal, two-way and three-way interaction effects considered in the model were statistically non-significant ($p > .10$).

Building on this prior evidence, we formulated a set of alternative informative hypotheses (Hoijtink, 2011) regarding the difference in the self-efficacy score between KC and DI conditions. Differently from the null hypothesis significance testing (NHST approach, see Nickerson, 2000), results from competitive informative hypothesis testing may directly support the hypothesis most compatible with the observed data compared to its competitors. Below, we describe the four alternative informative hypotheses formulated for the present study.

H_u: μTreatementDI, μTreatementKC (1)

H_1: TreatementDI = TreatementKC (2)

H_2: TreatementDI > TreatementKC (3)

H_3: TreatementKC > TreatementDI (4)

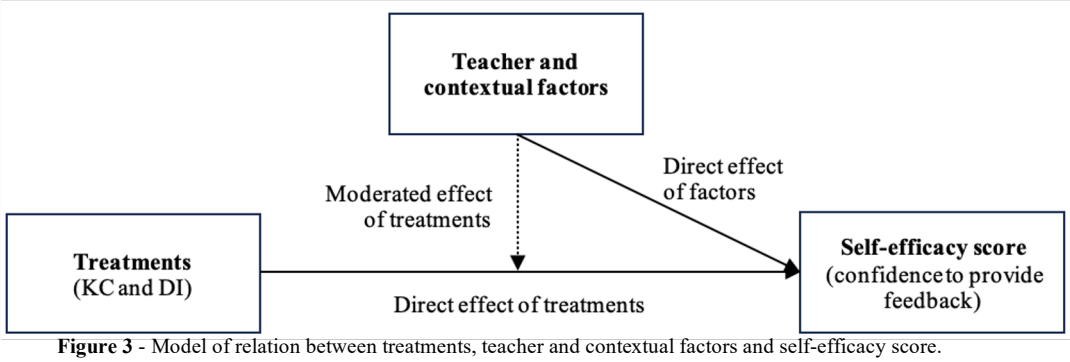

Figure 3 - Model of relation between treatments, teacher and contextual factors and self-efficacy score.

H_u (also known as the unconstrained hypothesis) does not impose constraints on the means of self-efficacy score between the two groups. It is not a specific hypothesis of interest here: rather, it represents the most general hypothesis in which all other competitive hypotheses are nested. H_1 represents the null hypothesis tested within the NHST approach: no mean differences between DI and KC are expected on the dependent variable. H_2 and H_3 posit, respectively, that self-efficacy score is higher in the DI (or KC) condition compared to the other.

We tested and compared these hypotheses within the analytic framework of Bayesian ANCOVA, controlling for the effects of, for example, teacher experience (expressed in years). Although preliminary results highlighted a non-significant effect of this covariate on the dependent variable, its inclusion in this model is theoretically sound, since it may represent a proxy of one of the most important sources of TSE which is critical to control for (see *mastery experience*, Pfitzner-Eden, 2016). Furthermore, Bayesian approaches facilitate the integration of previous information, which can substantially affect the necessary sample size. Informative antecedents may result in reduced sample sizes, whereas non-informative priors could necessitate larger samples to attain equivalent precision (Santis, 2007; Zheng et al., 2020; Sahu & Smith, 2006).

Bayesian ANCOVA with informative hypothesis testing was performed using the *bain module* of the JASP v. 0.16.3. software (JASP Team, 2022). Table 5 displays results from this analysis. The unconstrained Bayes Factor (BF.u) provides the quantity of support of a given hypothesis over H_u. As can be noted, H_3 received two times more support from the data than H_u. With respect to its alternative hypothesis (H_2), H_3 fits the data four hundred times better than the observed data. Finally, the posterior model probabilities (based on equal model probabilities) suggest that H_3 received 62.9% support from the data among the other considered hypotheses (including H_u), and 91.8% support from the data when H_u is excluded. Thus, we can conclude that, on average, in the KC treatment teachers reported higher scores (adjusted M=4.84, SD=.80) than what observed for the DI condition (adjusted M=4.17, SD=1.25), after controlling for teacher and contextual variables.

Table 5 - Results for the tested informative hypotheses.

Hypothesis	BF.u	BF.c	PMPa	PMPb
H1	.172	.172	.079	.054
H2	.005	.002	.002	.002
H3	1.995	400.235	.918	.629
Hu	-	-	-	.315

Note - BF.u and BF.c denote the Bayes factors of the hypothesis in the row versus the unconstrained hypothesis and complement, respectively. Posterior model probabilities (a: excluding the unconstrained hypothesis, b: including the unconstrained hypothesis) are based on equal prior model probabilities.

6. Discussion and conclusions

One of the fundamental premises of the study is that videos' effectiveness depends on the learning strategies (Seidel et al., 2013). Their efficacy is contingent upon the learning methodologies employed: it is not the video itself that is effective, but rather its integration inside a learning approach (Kang & van Es, 2019). Furthermore, studies suggest that a video alone is insufficient for effective learning; it must be incorporated into a well-organized training program. The impacts of videos are contingent upon the implementation of instructional strategies, including pre/post-video observation activities, expert facilitation, discussion with colleagues (Seago et al., 2018).

Regarding the first research objective, the factor analysis produced a two factors solution based on two components: LoF and MoF. This solution doesn't confirm the three facets theoretical model of feedback proposed during the two treatments. Furthermore, the factor structure shows a difference in the hierarchical order of items for CLIP I and II. This order, probably, depends on the content of the video observed. In the CLIP II, subjects perceived the teacher much more oriented to students, whereas the CLIP I seems to convey a better balance between feedback given to the classroom and feedback oriented to specific student.

The distinction between LoF and MoF is coherent with studies that depict feedback as a multifaceted process in which the teacher may have different goals: (a) helps students understand and improve their learning by

providing practical guidance (regulative function); (b) supports students' motivation to maintain cognitive engagement (motivational function). This view integrates the two main goals of feedback: regulation of learning to promote the activation of cognitive and metacognitive skills and motivation to learn in terms of emotional and affective support.

Gentile (2019) compared five couples of studies in which researchers calculated the ES of feedback and praises on student learning (Hattie & Temperley, 2007). In all comparisons, the LoF has a better effect on student learning than praise and positive reinforcement. In studies that evaluate the effect of LoF, the mean value of ES is 0.67. Conversely, the mean value for praises and reinforcement is 0.48. However, according to Hattie's meta-analysis (2009, 2012), both values fall in the zone of desired effects. The meta-analysis proposed by Wisniewski et al. (2020) emphasizes that high-information feedback is the most effective and proves that MoF is the least effective type of feedback. In brief, we are not suggesting that teachers should avoid praising students. We suggest mixing the two types of feedback, mainly focusing on LoF.

Concerning the second research objective, the findings suggest that participants feel more confident in providing feedback after participating in learning activities based on KC. Furthermore, the treatment has a direct impact on the self-efficacy score, with evidence that no teacher and contextual factors directly influence the score or moderate the effects of treatment on the dependent variable. These findings are coherent with studies addressing how pre-service teachers' education may positively promote TSE (Clark & Newberry, 2019; El-Abd & Chaaban, 2021; Yada et al., 2020). Effectively, starting from a general optimism in an earlier career, teachers tend to become less confident with their teaching capacities due to negative experiences with students and colleagues. This is a relevant point considering that Bandura (1997) argued that efficacy beliefs tend to be resistant once established on the basis of experience (Matoti et al., 2011). In this regard, teacher education may play a relevant role in promoting new teaching strategies and recognizing their effectiveness in enhancing students' learning achievement.

We interpret the present findings as pilot knowledge, propaedeutic for further replications. One limitation of this pilot is the absence of a third group, which could improve the evidence of the causality in our substantive conclusions. With the aim of providing more soundness to this perspective, the purpose is to design a new trial with three randomly assigned groups. The groups will observe the clips within a KC and DI learning activity, while the control group will observe the video without following specific learning tasks (e.g., individual notes, collaborative work, design tasks, etc.). The goal is to verify if the groups differentiate their responses depending on learning activities and if there are direct or interaction effects on the dependent variable score after controlling for teacher and contextual variables. Furhermore, the new study should also improve the measurement of self-efficacy, which in the present research was limited to a single item. By adopting Bandura's instructions (Bandura, 2006), we can continue to assess the TSE following a task-specific domain approach and ask them to rate how confident they feel in providing feedback as a specific assessment practice.

Acknowledgements

This research was supported by LUMSA University (Deliberation UCRI-02.21.19). We would like to express our gratitude to all the teachers who participated in the study, as well as to the Department of Human Studies at the University of Verona, which played a crucial role by hosting the experiment within one of its courses. Our sincere thanks go to Daniela Castellani and Sebastiano Cuffari, the teachers featured in the clips. We deeply appreciated their commitment and involvement in the project.

References

ARG. (1999). *Assessment for learning: Beyond the black box.* Cambridge: University of Cambridge School of Education.

ARG. (2002). *Assessment for learning: 10 principles.* https://doi.org/10.1007/978-3-319- 02600-8_12.

Bakkenes I., Vermunt J.D. & Wubbels T. (2010). Teacher learning in the context of educational innovation: Learning activities and learning outcomes of experienced teachers. *Learning and Instruction*, 20, pp. 533-548.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1994). Self-Efficacy. In V. S. Ramachaudran (Ed.), Encyclopedia of Human Behavior (Vol. 4, pp. 71-81). New York: Academic Press.

Bandura, A. (1997). The anatomy of stages of change. *American journal of health promotion: AJHP*, *12*(1), 8-10.

Bandura, A. (2006). Guide for constructing self-efficacy scales. *Self-efficacy beliefs of adolescents*, *5*(1), 307-337.

Bandura, A., & Walters, R. H. (1977). *Social learning theory* (Vol. 1). Prentice Hall: Englewood cliffs.

Blomberg, G., Gamoran Sherin, M., Renkl, A., Glogger, I., & Seidel, T. (2014). Understanding video as a tool for teacher education: investigating

instructional strategies to promote reflection. *Instructional Science*, 42, pp. 443-463.

Calandra, B., & Rich, P. J. (Eds.). (2015). *Digital video for teacher education: Research and practice*. NY: Routledge.

Caprara, G.V. (2001). *La valutazione dell'autoefficacia. Costrutti e strumenti.* Trento: Erickson.

Clark, I. (2012). Formative Assessment: Assessment Is for Self-regulated Learning. Educational *Psychology Review*, 24(2), 205-249. https://doi.org/10.1007/s10648-011-9191-6

Clark, S., & Newberry, M. (2019). Are we building preservice teacher self-efficacy? A large-scale study examining teacher education experiences. *Asia-Pacific Journal of Teacher Education*, *47*(1), 32-47.

Dann, R. (2014). Assessment as learning: Blurring the boundaries of Assessment and learning for theory, policy and practice. *Assessment in Education: Principles, Policy and Practice*, 21(2), 149–166. https://doi.org/10.1080/0969594X.2014.898128.

Darling-Hammond, L., & Bransford, J. D. (2005). Preparing teachers for a changing world: What teachers should learn and be able to do. San Franscisco, CA: Jossey-Bass.

Earl, L. (2003). *Assessment as learning: Using classroom assessment to maximize student learning*. Thousand oaks, CA: Corwin.

Earl, L. M. (2013). *Assessment as learning: Using classroom assessment to maximize student learning*. Corwin Press.

Earl, L., & Katz, S. (2008). Getting to the core of learning: Using Assessment for self- monitoring and self-regulation. In S. Swaffield (Ed.), *Unlocking assessment: Understanding for reflection and application* (pp. 90–104). Abingdon, England; New York: Routledge.

El-Abd, M., & Chaaban, Y. (2021). The role of vicarious experiences in the development of pre-service teachers' classroom management self-efficacy beliefs. *International Journal of Early Years Education*, *29*(3), 282-297.

European Commission/EACEA/Eurydice (2015). *The Teaching Profession in Europe: Practices, Perceptions, and Policies. Eurydice Report*. Luxembourg: Publications Office of the European Union.

Gaudin, C. & Chaliès, S. (2015). Video viewing in teacher education and professional development: A literature review. *Educational Research Review,* 16, pp 41-67.

Gegenfurtner, A. (2011). Motivation and transfer in professional training: A meta-analysis of the moderating effects of knowledge type, instruction, and assessment conditions. *Educational research review*, *6*(3), 153-168.

Gentile M. (2019). Digital videos and teacher education: a research training framework. In BESEDA, J, ROHLÍKOVÁ, L., DUFFEK, V. (Eds) *DisCo2019: Unlocking the Gate to Education around the Globe. 14th conference reader*, (pp. 6-24). Prague, CZE: Centre for Higher Education Studies.

Greeno, J. G. (1989). Situations, mental models and generative knowledge. In D. Klahr & K. Kotovsky (Eds.), *Complex information processing: The impact of Herbert A. Simon* (pp. 285–318). Hillsdale, NJ: Erlbaum.

Hajovsky, D. B., Chesnut, S. R., & Jensen, K. M. (2020). The role of teachers' self-efficacy beliefs in the development of teacher-student relationships. *Journal of school psychology*, *82*, 141-158.

Hattie, J. (2023). Visible learning: The sequel: A synthesis of over 2,100 meta-analyses relating to achievement. Routledge.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, *77*(1), 81–112.

Hattie, J.A.C., (2009). *Visible Learning. A synthesis of over 800 meta-analyses relating to achievement.* New York, NY: Routledge.

Hattie, J.A.C., (2012). *Visible learning for teachers. Maximizing impact on learning*. New York, NY: Routledge.

Heitink, M.C., Van der Kleij, F.M., Veldkamp, B.P., Schildkamp, K., & Kippers, W.B. (2016). A systematic review of prerequisites for implementing assessment for learning in classroom practice. *Educational Research Review*, 17, 50-62.

Hoijtink, H. (2011). Informative hypotheses: Theory and practice for behavioral and social scientists. CRC Press.

JASP Team (2022). JASP (Version 0.16.3)[Computer software].

Kang, H., & van Es, E. A. (2018). Articulating Design Principles for Productive Use of Video in Preservice Education. *Journal of Teacher Education,* 70(3), 237-250. https://doi.org/10.1177/0022487118778549.

Kelley, T. R., Knowles, J. G., Holland, J. D., & Han, J. (2020). Increasing high school teachers self-efficacy for integrated STEM instruction through a collaborative community of practice. *International Journal of STEM Education*, 7(1), 1-13.

Kersting, N. (2008). Using video clips of mathematics classroom instruction as item prompts to measure

teachers' knowledge of teaching mathematics. *Educational and Psychological Measurement*, 68(5), pp. 845–861.

Kleinknecht, M., & Schneider, J. (2013). What do teachers think and feel when analyzing videos of themselves and other teachers teaching? *Teaching and Teacher Education,* 33(1), pp. 13-23.

Klenowski, V. (2009). Assessment for learning revisited: An Asia-Pacific perspective. *Assessment in Education: Principles, Policy and Practice, 16*(3), 263–268.

Lieberman, A., & Pointer Mace, D.H. (2008). Teacher learning: the key to Educational reform. *Journal of Teacher Education*, 59(3), pp. 226-234.

Major, L., & Watson, S. (2018). Using video to support in-service teacher professional development: The state of the field, limitations and possibilities. *Technology, Pedagogy and Education*, 27(1), 49–68. https://doi.org/10.1080/1475939X.2017.1361469.

Matoti, S. N., Odora, R. J., & Junqueira, K. E. (2011). A comparative study of pre-service teachers' self-efficacy beliefs before and after work-integrated learning. *South African Journal of Higher Education*, *25*(6), 1140-1154.

Mitchell, D., & Sutherland, D. (2020). What Really Works in Special and Inclusive Education: Using Evidence-Based Teaching Strategies? London: Routledge. https://doi.org/10.4324/9780429401923.

Mundfrom, D., Shaw, D., & Ke, T. (2005). Minimum Sample Size Recommendations for Conducting Factor Analyses. International Journal of Testing, 5, 159 - 168. https://doi.org/10.1207/s15327574ijt0502_4

Ngui, G. K., & Lay, Y. F. (2020). The Effect of Emotional Intelligence, Self-Efficacy, Subjective Well-Being and Resilience on Student Teachers' Perceived Practicum Stress: A Malaysian Case Study. *European Journal of Educational Research*, *9*(1), 277-291.

Nickerson, R. S. (2000). Null hypothesis significance testing: a review of an old and continuing controversy. Psychological methods, 5(2), 241-301.

Nunnally, J.O. (1978). *Pychometric theory.* New York: McGraw-Hill.

Pajares, F. (1997). Current directions in self-efficacy research. *Advances in motivation and achievement*, *10*(149), 1-49.

Perera, H. N., & John, J. E. (2020). Teachers' self-efficacy beliefs for teaching math: Relations with teacher and student outcomes. *Contemporary Educational Psychology*, *61*, 101842.

Pfitzner-Eden, F. (2016). Why do I feel more confident? Bandura's sources predict preservice teachers' latent changes in teacher self-efficacy. *Frontiers in Psychology*, 7, 1486.

Resnik, L. B. (1991). Shared cognition: Thinking a social practice. In L. B. Resnik, J. M. Levine, & S. D. Teasley (Eds.), *Perspectives on socially shared cognition* (pp. 1–20). Washington, DC: American Psychological Association.

Rouquette, A., & Falissard, B. (2011). Sample size requirements for the internal validation of psychiatric scales. International Journal of Methods in Psychiatric Research, 20. https://doi.org/10.1002/mpr.352.

Santis, F. (2007). Using historical data for Bayesian sample size determination. *Quality Engineering,* 53, 25-30. https://doi.org/10.1111/J.1467-985X.2006.00438.X.

Santagata, R., & Yeh, C. (2014). Learning to teach mathematics and to analyze teaching effectiveness: evidence from a video- and practice-based approach. Journal of Mathematics Teacher Education, 17(6), 491–514.

Sahu, S., & Smith, T. (2006). A Bayesian method of sample size determination with practical applications. *Journal of the Royal Statistical Society:* Series A (Statistics in Society), 169. https://doi.org/10.1111/j.1467-985X.2006.00408.x.

Schunk, D. H. (1995). Self-efficacy and education and instruction. *Self-efficacy, adaptation, and adjustment*, 281-303.

Seago, N., Koellner, K., & Jacobs, J. (2018). Video in the Middle: Purposeful Design of Video-Based Mathematics Professional Development. *Contemporary Issues in Technology and Teacher Education* 18(1), 29-49.

Seidel, T., & Shavelson, R. J. (2007). Teaching effectiveness research in the past decade: the role of theory and research design in disentangling meta-analysis results. *Review of Educational Research*, 77(4), 454-499.

Seidel, T., & Stürmer, K. (2014). Modeling and measuring the structure of professional vision in preservice teachers. *American Educational Research Journal*, 51(4), 739-771.

Seidel, T., & Stürmer, K. (2014). Modeling and measuring the structure of professional vision in preservice teachers. *American Educational Research Journal*, 51(4), 739-771.

Seidel, T., Blomberg, G., & Renkl, A. (2013). Instructional strategies for using video in teacher education. *Teaching and Teacher Education*, 34, 56-65.

Sherin, M. G., & Russ, R. S. (2015). Making sense of teacher noticing via video. In B. Calandra, & P.

Rich (Eds.), *Digital video for teacher education: Research and practice* (pp. 3-20). New York: Routledge.

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, 57(1), 1-22.

Skaalvik, E. M., & Skaalvik, S. (2019). Teacher self-efficacy and collective teacher efficacy: relations with perceived job resources and job demands, feeling of belonging, and teacher engagement. *Creative Education*, *10*(07), 1400.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5nd ed.). Boston: Pearson Education.

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6nd ed.). Boston: Pearson Education.

Tacconi, G., & Mejia Gomez, G. (2012). Osservazione in classe e videoriprese come strumenti per lo sviluppo professionale dei docenti e la ricerca didattica. Note di metodo su un'esperienza in corso nella Provincia di Bolzano. *Form@re - Open Journal per la Formazione in Rete*, 12(79), 22-33.

Tucholka, I., & Gol, B. (2025). Analysing classroom videos in teacher education. How different instructional settings promote student teachers' professional vision of classroom management, *Learning and Instruction*, 97, 102084. https://doi.org/10.1016/j.learninstruc.2025.102084.

van Es, E. A., & Sherin, M. G. (2002). Learning to notice: scaffolding new teachers' interpretations of classroom interactions. *Journal of Technology and Teacher Education*, 10(4), pp. 571-596.

Wisniewski, B., Zierer, K., & Hattie, J. (2020). The power of feedback revisited: A meta-analysis of educational feedback research. *Frontiers in psychology*, *10*, 487662. https://doi.org/10.3389/fpsyg.2019.03087.

Yada, A., Björn, P. M., Savolainen, P., Kyttälä, M., Aro, M., & Savolainen, H. (2021). Pre-service teachers' self-efficacy in implementing inclusive practices and resilience in Finland. *Teaching and Teacher Education*, *105*, 103398.

Zheng, H., Jaki, T., & Wason, J. (2020). Bayesian sample size determination using commensurate priors to leverage preexperimental data. *Biometrics,* 79, 669 - 683. https://doi.org/10.1111/biom.13649.