

# USE OF VIDEO-BASED RESOURCES IN THE PREPARATION OF ELEMENTARY SCHOOL TEACHERS IN CHILE

*In this paper we will discuss our findings from a pilot experience regarding the use of video-based resources in math related courses in pre-service elementary school teacher training programs in 13 universities of Chile. The study addresses issues such as the perception of teacher educators and pre-service teachers regarding the use of the material, as well as the benefits of the activities for students' learning. The resources were the product of a partnership between in-service teachers and a team of researchers and professionals affiliated to a research center.*

## INTRODUCTION

There is great concern about the quality of the preparation to teach math of pre-service teachers. Different measures have been proposed to address this issue. Some of these proposals include: deepening the mathematical content knowledge of future teachers, involving future teachers in activities that emphasize the communication of mathematical ideas, and focusing teacher preparation in the development of teaching practices that are fundamental to support student learning (Ball et al., 2008; Ball & Forzani, 2011; Greenberg & Walsh, 2008; Marrongelle et al., 2013).

This concern about the quality of pre-service teacher training is shared in Chile. Current programs do not provide opportunities to develop the knowledge and skills necessary for teaching (Manzi et al., 2011). In the case of mathematics, this lack of opportunities is corroborated by the performance of Chilean future teachers in the tests developed in the TEDS-M study measuring knowledge of mathematical content and mathematic pedagogical content (Tatto et al., 2012). The performance of more than 60% of future Chilean teachers in the mathematical knowledge test is low, which translates to difficulties when working with whole numbers and fractions, relating different concepts and developing mathematical arguments (Blömeke & Kaiser, 2014).

Among the initiatives to improve teacher preparation in Chile, we can find the development of National Standards for pre-service teachers, and a national diagnostic evaluation applied to pre-service teachers in their final year. Moreover, the recently enacted Teaching Career Act incorporates new requirements for the institutions that prepare teachers, such as: regulation of admission requirements, periodic evaluation of the quality of educational processes and stricter accreditation protocols. Under this new scenario, institutions are more inclined to include different approaches and models in their educational process.

In this report we present the results of a pilot involving the use of video-based resources in pre-service elementary school teacher programs in 13 Chilean universities, including the instructional purpose given to the resources and the subjective perception of their usefulness by teacher educators and students. The pilot was carried out within the framework of an R+D project (2014-2016), with the goal of producing video-based instructional resources for pre-service teachers. We will discuss how the procured results were used in the final design.

## **Video-based resources**

The resources consisted in activities centered on the analysis of video segments. The videos covered math lessons from 1st to 6th grade, from a variety of school (private, public, semi-private) located in counties with different SES. The preparation of the lessons involved extensive work with in-service teachers including: a workshop and coaching strategies focused on the promotion of interactions in the classroom, video feedback and collaborative lesson planning.

To produce the material, a team composed of researchers, psychologists and math teachers, analyzed each videotaped lesson, and dissected it into 3-8 segments showing specific teaching practices. Part of this team were K-3 Certified CLASS observers (Pianta et al., 2008) and/or had experience with the MQI classroom observation protocol (Hill et al. 2008). Others had experience as instructors of courses for pre-service or in-service elementary school teachers. For each segment, one or more learning activities were developed by the team, aimed at facilitating the analysis of the video through three perspectives: mathematic richness, student participation in reasoning and the construction of meaning, and learning promotion. Most of the activities in the book were designed for collective discussion.

## **FRAMEWORK**

Important investigations have sought to characterize *mathematical knowledge for teaching* (Ma, 1999; Ball et al., 2008; Krauss et al. 2008). In research conducted by Baumert et al. (2010) it is stated that training programs that solely provide opportunities for future teachers to develop a limited knowledge of school-level mathematics have negative effects on the acquisition of pedagogical mathematical knowledge, subsequently affecting instruction quality and student learning. Thus, to train competent teachers is necessary for math courses to provide opportunities to develop a deep mathematical knowledge in a way that is connected to teaching.

Ball & Forzani (2011) propose to establish a common core of fundamental and professional knowledge as well as skills that should be present in any teacher training program focusing in the development of instructional practice. In the same direction, several studies promote teaching practice as the core of pre-service teacher training. For instance, Boyd et al. (2009) present studies on the effects of teachers' preparation on teachers' value added to student test performance. They concluded that preparation directly linked to practice appears to benefit teachers in their 1st year.

The development of teacher training programs surrounding teaching practice requires that future teachers have the opportunity to learn, observe and analyze these practices. For this purpose, the incorporation of classroom videos appears to be a useful instructional resource.

## **The use of videos for teaching training**

In the last 15 years the use of videos for the training of teachers has taken a prominent role. In particular, they allow teachers to be exposed to a wider variety of contexts and teaching practices than typical on-site practices (Star & Strickland, 2008). As stated in Bloomberg et al. (2013), pre-service teachers perceive video as a vivid second hand experience that captures the complexity of classroom situations and analyzing teaching via video is motivational and compelling for pre-service teachers.

There are many instructional purposes for the use of videos: to acquire specific teaching techniques (Lemov, 2009), to develop the ability to notice what is important or noteworthy about a classroom situation (Star & Strickland, 2008; Sherin & van Es, 2005; Llinares & Valls, 2009), to foster productive discussions regarding mathematics teaching and learning (Borko et al., 2008), to help students to develop their cognitive skills (Llinares & Valls, 2009), and to develop reflective knowledge of teaching and learning (Blomberg et al., 2013; Rich & Hannafin, 2009).

## **DATA SOURCES**

The pilots involved the use of video-based resources in 36 math related courses in elementary school teacher pre-service training programs, belonging to 13 Chilean universities, during the 2015 school year. These courses were taught by 22 teacher educators to a total of 825 pre-service teachers. The courses lasted one semester and were focused in: math content (7), didactics of mathematics (12), math content and didactics (11). The rest corresponded to practicum or math elective courses (7).

The university sample was non-random, but heterogeneous, considering: location (2 northern, 8 central, 3 southern regions), private (9) or public (4), and degree of selectivity measured by the scores in the national standardized test used for university admissions, (high (4), medium (4), low (5)). All programs had at least 4 math courses (content or methodology). The participating teacher educators were instructors for one or more math courses in the selected programs. Their participation was voluntary.

## **METHODOLOGY**

The teacher educators involved in the pilot participated in a 25-hour workshop focused on video observation, design of learning activities based on videos, and discussion of the material to be used. During the workshop, the teacher educators planned and modelled the implementation of a video-based activity. The workshop was held before the start of the 2015 school year. The teacher educators participating in the pilot agreed to use in class at least 4 of the proposed video-based activities and to fill out a questionnaire for each one, reporting its instructional purpose, and rating the perceived benefits in student learning and motivation, and an overall assessment based on a 5-point Likert scale. The questionnaire was uploaded to a moodle platform during the same week of implementation. At the end of the pilot, there was also a focus group with 6 teacher educators from 5 universities, with the purpose to inquire about the usability, pertinence and benefits of the material as a teaching resource in the course being taught. The focus was analyzed using iterative and thematic qualitative analysis techniques.

At the end of the course, participating students filled out a questionnaire to rate the relevance and utility of the resources, and overall satisfaction, using 3 and 5-point Likert scales. The students could also provide general comments and suggestions. Answering the questionnaire was voluntary.

For the pilot, each student received a textbook containing all video based activities, but the videos were only available to teacher educators through a moodle platform. An example of activity is shown in Fig. 1.

## RESULTS

We received 106 questionnaires answered by teacher educators, who on average reported implementing 3 activities in each course. The instructional use declared for the activities is shown in Table 1. We observed that, in general, they used the activities for two distinct purposes.

Regarding the perceived benefits of the activities for student learning, in 77% of the questionnaires teacher educators reported that “the videos enhance student comprehension of mathematical content”; 83% agree that “the resources provide opportunities to analyze real school situations”; and 93% reported that “the students are more motivated than usual, and participate more actively in class”. Also, most of the teacher educators added their own questions to the proposed activities.

In the focus group, teacher educators manifested that the material “gives the opportunity to connect coursework with real school situations”, that “the planning of the video based activities was time consuming” and that “the time required for classroom discussion of the activity was longer than expected”. They also reported that “it was a challenge for the students to focus on one specific aspect while discussing videos”, and that “all videos should last no longer than 8 minutes, unless an intermediate activity is incorporated”.

We received 249 student questionnaires. According to the information obtained, the subjective perception of the students regarding the use of the material was also positive. They declared that when the video based activities are used, the class is as productive (43%) or more productive (47%) than non-video ones. They also reported that, in a range of 1 to 5, where 5 is the most positive response, through the material they can “analyze teaching practices” (Mean=4,03), “learn mathematical content” (Mean=3,59), “learn mathematical pedagogical knowledge” (Mean=4,03), and they also reported “being more motivated and [that they] participate more than usual in classes where video based activities are used” (Mean=3,58). Most of the suggestions given by the students in the questionnaires relate to the teaching methodology used by the instructor, and they proposed that debating and discussing should be prioritized in lectures.

## CONCLUSIONS

According to the results, there is an overall agreement that use of videos in math courses is beneficial for student learning. Instructors used the videos in class with different purposes, and supporting the development of math knowledge was prominent. Enhancing the motivation of the students and their willingness to participate in class, seems to be the most important effect of the use of videos. This effect was shared by teacher educators, who also felt motivated and challenged by this type of instructional resource. This effect in motivation seems very important since, as the entry scores in the national admission test show, mathematics is a challenge for the majority of pre-service teachers.

The pilot process was relevant for the production of the final version of the multimedia textbook. The new video segments lasted 10 minutes at most, the activities were shorter and had a more specific focus, some of them proposed by the participating teacher educators themselves. We also included introductory activities for classroom observation and practical advice about collecting evidence. The pilot also showed that teacher educators need to have specific training to be able to

lead productive discussions in their classroom, and that students perceive discussion as relevant in their learning process.

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**Figure 1**

Example of a video-based activity.

**Explaining how to solve**

The teacher asks two students to present their solutions to the problem in the board.



**Activity**

1. Which error did the pupil make the first time he counted?
2. Describe common error students make in the first stages of the counting process.
3. Describe the actions the teacher does to promote the development of the ability to argue and communicate.

**Table 1**

Instructional purpose for the activities as declared by teacher educators in the questionnaires.

<b>Instructional purpose of the video-based activity</b>	<b>Number of uses reported</b>
<b>Address mathematical content</b>	56
<b>Address mathematical pedagogical knowledge</b>	71
<b>Analyze teaching practices</b>	59
<b>As complementary material for homework assignment</b>	11
<b>For the assessment of contents of the course</b>	7
<b>Other use</b>	10