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DESIGNING, PRODUCING AND EXEMPLIFYING VIDEOS TO SUPPORT REFLECTION AND METACOGNITION FOR IN-SERVICE TEACHER TRAINING

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In this paper we document a six-phase video production process designed to support teachers' continuous professional development in three disciplinary areas: scientific, linguistic-literary and foreign languages areas. This production has been carried out within the NOP[1] - National Operational Programme funded by European structural funds and conducted by INDIRE between 2007 and 2014.The originality of this work lies in the co-research action performed by the team involved (researchers, teachers, instructional designers, video director, etc.) aimed at capturing meaningful professional practices enacted by teachers in their classes for the achievement of a given educational goal.

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The documented and exemplified production process can, not only function as a guide for the production of educational videos, but is also strongly characterized by its reflective and meta-reflective functions for Teacher Professional Development or TPD. Several examples of videos are described and referenced in the paper.

1 Introduction

Over the last 3 years, INDIRE conducted an in-depth study of the most recent and widely-used approaches to online learning for teacher continuous development, i.e. MOOCs (Massive Open Online Courses), didactic video with filmed lectures, reading problem sets, etc. so as to account for their possible impact onTPD, in terms of inclusion, democratic access, quality of instruction (Oblinger, 2013; Conole, 2013; Salmon, 2014). What emerged is the awareness of the potential of the use of video as "learning mediator"[2] (Canevaro, 2008) when activities and objectives are well articulated.Videos as learning resources can help to represent in the learner's mind the development of a phenomenon or event, and also the useful representation of the interaction described in a text, could help to select relevant information and the memory process (Lowe & Schnotz, 2008). Moreover the video can be used at one'sown personal rhythm and learning timeframe, especially for complex events which otherwise loses details and lack the opportunity to analyze or notice other relevant details (Paoletti, 2011).

Video-based education has a long history that has registered a huge increase with Web 2.0. In accordance with the literature (Schwartz & Hartman, 2007), we conceived the video as *a tool for learning* and for *enhancing the quality of reflective practice* in teacher training[3] (Masats & Dooly, 2011; Calvani *et. al.*, 2015; Leblanc, 2014).Within the final phase of the NOP Programme[4], INDIRE has produced more than a hundred video-based didactic contents for promote in-service TPD; this ongoing process will be completed at the end of 2015. In the meantime, we have: a) defined a taxonomy to map the use of videos for teacher-training, b) work out a complex but virtuous process of video developing.

In this paper we document a six-phase production process of videos designed to support TPD in three disciplinary areas - scientific, linguistic-literary

[1] NOP - National Operational Programme 2007-2013 "Skills Development" (co-financed ESF), is administered by the Italian Ministry of Education, among the various actions provided, the B10 "National Projects on Distance Learning (ODL)" funded the INDIRE e-leaning project.For more detailssee "A training model for professional development of teachers in Italian Southern Regions"link:http://www.sie-l.it/phocadownload/Atti_siel_2014.pdf

[2] The mediator is a bridge, [(s)he] works as a link between what a person has and what the other brings. An effective mediator should match the characteristics of multi-modality and multimediality (Canevaro, 2008, in Corazza, 2012).

[3] While video has long been used to disseminate and share knowledge, today the focus in the educational debate is how video, also edited with video annotation tool, can be used to illustrate, share, review teaching practice to improve the reflection practice of the teacher.

[4] See note 1 above.

and foreign languages - corresponding to four different projects carried out by INDIRE during the years 2007-2014.

Video capturing[5] a teacher's practice is the result of a virtuous design project and of a rigorous selection of the practices in which the goal is not to choose a "perfect practice", but to spot meaningful ones among the hundreds and thousands of possible ones produced and documented by the teachers with INDIRE during a co-research process carried out in TPD projects. The production of a video-based educational resource implies at least three levels of development: 1) the authors' (typically teachers themselves) who translate their professional practice into learning paths; 2) the professional video makers' who shoot the video; and 3) the whole team that edits the video sequences so as to co-construct a meaningful and transferrable view of the teachers' practice which is the main subject of the video. It's worth highlighting that the content used by INDIRE in the teacher courses is both designed for the schools and comes from the schools, since content authors are teachers themselves who have 'translated' their professional practices into learning paths. The final format for the learning path as training content is a multimedia hypertext with the video insert.

The reflective and meta-reflective dimensions are the basis of a) the learning model, b) the work-flow of the artifact (starting from the internalization to the explanation of teaching practice in the video), c) the reflective approach, implied in each phases of the learning process. The final goal of the whole ecosystem is to increase the effectiveness of learning and teaching processes. The resources presented in this paper are to be seen from two perspectives: on the one hand, from a discipline-independent perspective which allows us to highlight the production flow, on the other hand, a discipline-specific perspective allows us to identify the most suitable video types with respect to the area needs.

The paper is organized as follows: section 2 provides the background to the projects in which the videos were developed, and illustrates the underlying educational model implemented as well as the instructional design principles that led to the definition of a taxonomy to support orientation among the possible use of video types in education. In section 3, we describe the design and the purpose, and we provide examples of the videos for teacher-training from the perspective of specific experiences and the goals of the different projects. In section 4, we discuss the production process models with different phases and roles and we examine the results and conclusions of the work.

[5] The video recording in the schools was carried out by professionals with the constant supervision and support of INDIRE researchers.

2 Background

2.1 Motivation

The OCSE-PISA[6] survey (2000) highlighted that students, in particular in Southern Italy, lack the basic competences and skills required in school life and in society. Given this situation, the improvement of teacher professional skills has been set as a priority. For these reasons, within the activities provided by NOP "SKILLS DEVELOPMENT" the training projects for teachers were commissioned and realized by INDIRE and aimed at primary and secondary school teacher starting in 2009.

Table 1
NOP PROJECTS AT A GLANCE

Disciplinary Areas	Project name	Target	Aim
Scientific Area	Science Education	Teachers from primary to upper secondary school	Aimed at science teachers proposes a hands-on approach based on investigation and inquiry
Foreign-language Area	Language, literature and culture in a European dimension - Area languages (L2)	Secondary school teachers	Aimed at teachers of foreign languages and developing their professional skills linking training with European guidelines and policies
Linguistic-literary Area	Language, literature and culture in a European dimension - Area Italian language (L1)	Teachers from primary to secondary school	Offers Italian language teachers the opportunity to revisit the epistemology and didactics of the discipline through dialogue with scientific research
Linguistic-literary Area	Linguistics and literature education in a plurilingual perspective	Teachers from primary to secondary school	Provides the model of plurilingualism in language teaching to teachers of Italian language, foreign languages and civilization, classical languages and literary subjects

[6] The Programme for International Student Assessment (PISA) is a three-yearly international survey which aims at evaluating education systems worldwide by testing the skills and knowledge of 15-year-old students. See http://www.oecd.org/pisa/

2.2 A blended course for TPD

The main aim of the TPD projects was to support the improvement of the effectiveness of learning and teaching processes.

The training programme consisted of 100 hours (80 online and 20 face2face) and implemented a learning activity in the classroom as an important part of the professional development. The course design was grounded in the action-research cycle (Losito & Pozzo, 2005)[7] and followed a specific four-phase learning approach model (Figure 1): for each phase the model envisaged goals, activities, face-to-face meetings, tools and documents.

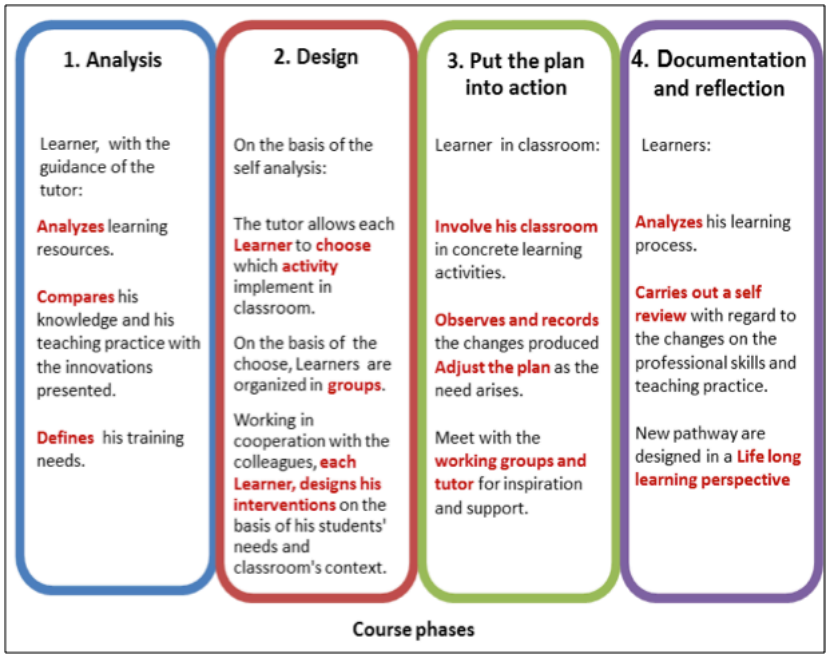

Fig. 1 - The four-phased Learning Model.

2.3 Instructional design

Every project proposed a syllabus articulated into two main parts: the "Theoretical Unit" and the "Learning path". Teachers, alternating practice and theory, are driven into an Action-Research process to reflect upon and evolve their teaching approach. The learning paths are the strategic elements of the training

[7] Action Research is a label that covers a broad family of approaches to carrying out research that shares similar characteristics: it is typically value-based, action-oriented and participatory. Lewin (1946) is often described as a major landmark in the development of action research as a methodology. To go deep into Action Research see (Losito & Pozzo, 2005).

courses, its contents have been continuously improved throughout the years, with always more articulated activities and new ideas to be implemented in the classroom. A specific analysis of the contents, published in Puntoedu[8] since 2002 and others, was carried out so as to develop a specific taxonomy to map the use of videos for teacher training.

The purpose of this taxonomy was to provide an additional tool to redesign the way we present learning contents so as to create an open repository namely *ScuolaValore*[9], for autonomous TPD. In such a context, video can be used to help people bring to light relevant knowledge to raise interest and to make sense of subsequent education (Schwartz & Hartman, 2007), promoting a better understanding of the content (Thornhill *et al.*, 2007). The resulting specific taxonomy[10] (Figure 2) is organized to map the communication purposes and the learning outcomes, that can be used as a "compass" to support orientation among the possible use of video types in education.

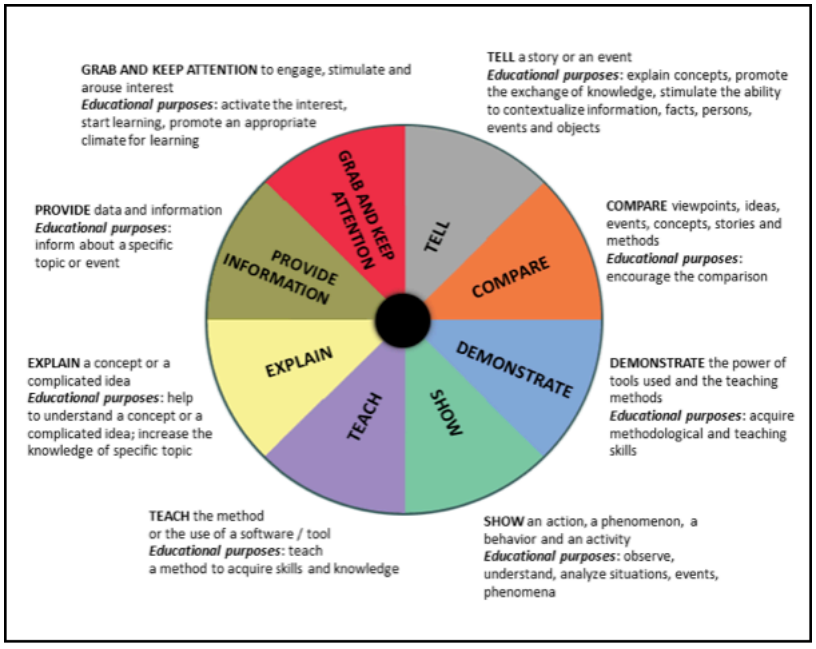

Fig. 2 - Video taxonomy for NOP's projects.

[8] PuntoEdu is INDIRE's learning environment (see Biondi, 2007) and other learning providers in the net, see for example TED, Coursera and edEx, Khan academy, etc.

[9] See http://www.scuolavalore.indire.it. The environment contains all the training contents produced within the NOP's Programme.

[10] The taxonomy was developed by the researchers of INDIRE (R. Borgi, A. Nardi, V. Toci).

The taxonomy has therefore contributed to the first reflection on the suitability of audiovisual language as an educational tool within our learning path.

3 Use of videos for teacher-training: specific experiences from the different projects

3.1 Science Education area[11]

The project's objective was to promote hands-on and inquiry based education (Rocard Report, 2007). The skills and competencies framework formulated for the teacher is certainly complex since the point is, not to achieve knowing on "how to do experiments", but to support teachers in reflecting on all dimensions of inquiry and hands-on based teaching. In this project, the use of video language was quite natural from the onset of the project since text and image alone were not effective enough to describe the hands-on activities (Moreno & Mayer, 2000; Mayer, 2005). The reflection on the use of videos for science teacher-training led us to relate, specifically, for three dimensions and purposes of the videos:

1. to design and conduct simple and meaningful laboratory activities;
2. to design, organize and conduct entire personalized and meaningful learning paths starting from student prior knowledge;
3. to reflect on some methodological dimensions for a change in teaching practice.

The choice and design of the video formats come directly from the reflection on the aims mentioned. Three different types of video formats were therefore designed according to the following criteria:

1. Short videos of experiments or investigations[12] (Type 1) (*to show*):

Educational purpose: to show the execution of single experiments and scientific investigations starting from a guiding question; to demonstrate the activation of cognitive processes in a realistic way.

Narrative structure:

- guiding question;
- description of aims;
- materials needed;
- procedure articulated in steps;
- conclusion and further inquiry-based question.

[11] This section refers to the project "ScienceEducation".

[12] These videos deepen some parts of the learning paths.

Setting: laboratory context with few actors who lead the experiment.

Duration: 5-10 mins[13].

Context of use: videos are implemented into the learning paths. In this case, autonomous use is limited. Videos can also be used in the classroom with students.

About 30-40 videos of this type have been produced throughout the project duration. Example: "How to inflate a balloon on the contrary?" (see Table 2).

2. Video documentation of an entire learning path (Type 2) (*to tell*):

Educational purpose: to show the development of a laboratory path focused on disciplinary content (from the students' prior knowledge and ends with the final evaluation).

Narrative structure: a sequence of activities (chapters) that focus on a specific learning objective. Each activity is commented on by the teacher in order to clarify their connection from the point of view of content, methodology and cognitive processes.

Setting: the class and/or the science lab with the whole class or small groups.

Duration: from 30 to 60 mins[14]. The videos were divided into chapters.

Context of use: the video can be used stand-alone as a synthesis of learning path. The single clips, however, can be put in the learning path. Some clips can also be used in the classroom with students. Three videos of this type were produced during the project related to sedimentary rocks (lower and upper secondary school), refraction (upper secondary school), and light and vision (primary and lower secondary school).

Example: "Earth Sciences Laboratory: the sedimentary rocks" (see Table 2).

3. Web-reportage (Type3) (*to tell*):

Educational purpose: to show the complexity of an inquiry-based teaching approach in its practical implementation and to stimulate teacher reflection on methodological and on disciplinary dimensions.

Narrative structure: contains more videos and texts documenting various stories and aspects related to a teaching approach:

- main video: documents a part of a laboratory path (a couple of laboratory-lessons) with commentary of teacher or expert;
- other related videos can cover:
    - details about some aspect (e.g., performing some experiments);
    - reinterpretation of the viewed practice according to other points of view (e.g., use of ICT);

[13] The time of the video is a summary of the real time.

[14] The duration of the video does not match the real-time, but documents and synthesizes an entire learning path that takes place in many months.

- interviews with players;
- texts: entire path, educational cards; outcomes of the students.

Duration: 30-40 min. main video; 5-10 min. other videos.

Context of use: can be used as an "alternative" of learning path. The individual clips can be put in the learning path.

Two web-reportageswere produced related to *cooperative learning* topics and *inquiry-based science education* e.g., Fruit fly under investigation (see Table 2).

3.2 Linguistic-literary area[15]

The learning path is divided into three steps, in which video language and textual language are integrated yet maintaining each a specific function organized into steps:

- Step 1 - A video presents a "stimulus situation": the exemplification of a theory, the analysis of an issue, the presentation of an innovative practice, etc.
- Step 2 - On the basis of the initial video proposal, the teachers are involved in analysis and reflection activities. These are presented in the form of text, with analysis grids or project format etc.
- Step 3 - The path proposes ideas for designing learning activities to be implemented in the classroom. This part consists of text and appendices.

In this context, the video plays a major role in fostering and promoting aspects of analysis and reflection. It allows the teacher to instantly center the "heart" of the matter, to arouse interest and curiosity, anticipating some key concepts, to raise issues, ask questions which the path chosen can answer, by providing teachers with opportunities for reflection and in-depth analysis.

The design of training videos chosen to pursue these objectives are:

1. video-documentation of educational activities (*to tell / to show*);
2. video-animation (*to explain / to demonstrate*).

1. With reference to the first case, videos can show a teaching practice on which to, subsequently, propose a reflection. In this context, it was intended to develop observation skills, critical analysis and reflection on specific teaching practices, which have elements of innovation in content as well as in methods. The format chosen for this model is the video-documentation of teaching activity accompanied by an optional audio commentary and / or an interview with

[15] This section refers to Linguistics and literature education projectsin a plurilingual perspective and Language, literature and culture in a European dimension– Italian Language Area.

experts, teachers, students who comment on the situation presented. It is worth highlighting that this is neither an ethnographic documentation, in which the objective is to observe the natural course of a teaching situation for research purposes, nor a simulation of a model lesson or classroom activities artificially proposed based on the model of the docu-fiction. Instead, it is the rewriting of a teaching practice already in use by the teacher and considered relevant for the purposes of the training project.

The activity so designed is filmed in each phase in class in its natural course without interference, in order to capture the real dynamics and processes activated. Two different typologies of video-documentation were produced (see Table 2). *The language in the "space- time": nouns and verbs* is an activity on Valency Grammar[16] done by a class V in a primary school. The goal was to show the possible implementation of this alternative approach to the study of grammar in the early years of schooling and the result in term of reflection on language by students.

The video documentation shows the different stages of the activity alternated with the teacher interviews, that focuses the teaching objectives and methodology adopted, and supports the interpretation of the sense of the experience. Also titles and keywords used in the video lead to the understanding of the different moments of the activity.

A different type of video-documentation was produced within the learning path entitled *Project Lucca*. In this case the starting point was the original material produced by a 2nd class in Upper Secondary School, consisting of a video produced as the final task of an educational project led by English language teachers.

2. In this experience the video animation was functional to achieve the following training goals:

- to *demonstrate* the potential of an approach or a theory starting from a didactic problem, in order to develop the ability for reflection and analysis in view of a possible application;
- to *explain* a concept, a methodology or a procedure in order to stimulate the understanding, deepen and analyze a topic, examine and apply a procedure.

Particularly meaningful in relation to the linguistic education is the video animation to illustrate a work on the written text. Animation enables a stratigraphic reading of the text and its different components based on specific objectives (lexical, grammatical, syntactic, textual, intersemiotic, etc.), thanks to the use of graphic elements and effects. The highlighting, the disassembly and the

[16] On this approach, see the theoretical unit of prof. Francesco Sabatini: http://forum.indire.it/repository/working/export/4716/

recomposition of the text are guided and explained step by step by an audio commentary that highlights the various stages of the process. Together with this, the expert interview is a further comment on the educational and methodological aspects that characterize the process of working on the written text.

An example of such video animation is the video entitled *Strategies to compare and integrate different texts*. The video shows three sequences of work on written text to be proposed to students of upper secondary school.

They are three strategies to compare and rewrite different written texts (iconic text, continuous and non-continuous written text) aimed at building a dossier.

3.3 Foreign Language Area[17]

The syllabus springs from common educational issues when teaching foreign languages.

Cutting issues on foreign languages teaching were developed in a graphic and communicative style adopted as characteristic of the whole video production for this area. From the taxonomy, we selected some video types as more suitable for our learning outcome: "*to grab and to keep attention*","*explain*" and "*show*". Considering the above models, the video-lesson and video-animation with audio commentary, concept maps, images, sound effect, make it easier to understand and capture the essential elements (LeFever, 2012).

Their use is certainly not new in foreign language learning. Indeed, the teacher's familiarity with this communication style was taken into account in the design phase, but at the same time our goals were completely different.

We identified the model of *video to "grab and to keep attention"* as functional to introduce our learning paths. It seemed useful to provide a preview of the topics, explain objectives, methodology and purpose, as defined by Ausubel (1963) with Advance organizers. This is in order to activate the teacher's attention, motivate his/her study, anticipate and define the framework behind the learning path, allowing him/her to activate and use prior knowledge and to acquire new knowledge (Ranieri, 2005).

This model of video was reproduced in either the *video-lesson* or *video-animation*, each of the duration of 3 to 5 mins. Examples of video-animation "to grab and to keep attention", used to enable the attention are those implemented in the introduction of the learning path "*Writing skills and communication strategies*" and "*The evaluation of a creative activity: Pablo Picasso, a life for art*" (see Table 2). Given that the author of the second one is not native speaker, we opted for the creation of a video-animation with the comment, written by the author, and recorded by a native Spanish speaker. The animation presents

[17] This section refers to the project Language, literature and culture in a European dimension – Foreign Language Area.

metaphors, images, making comprehension easier and emphasizing authentic language exposition.

The other two types of videos that we have identified as functional to our project's purposes are: video "*to show*" the potential of an approach or methodology from an educational problem, and video "*to explain*" a concept, a method, a work procedure. Both types of video apply the model of video-lessons or video-animation. Segmenting and sequencing of the learning content (Sweller, 2005) help the learning process, consequently our videos are structured in three steps for a total length of 7 to 10 mins:

- Step 1 - Why: formulation in operational terms of problematic situations, raised to be functional to an initial information process, addressing attention to the fundamentals.
- Step 2 - How/What: clarification of theoretical references and instructional strategies that we want to suggest to respond to situations raised.
- Step 3 - Conclusion and Summary: highlighting focal points for information retrieval and key points.

An example of video-lesson "*to show*" is in the learning path: "Writing skills and communication strategies" (see Table 2). The educational goal for the teacher consists of developing the ability to reflect and analyze the method and approach. Problematic situations concerning the learning outcome of the student's - to develop written communication strategies - are raised in the video lesson based on the assumption that students need a linguistic and extralinguistic goal. The clip emphasizes the core of these activities: student involvement, use of language from the real world, bridging the information gap with the communication exchange, offering samples of language and vocabulary usable by student, etc.

An example of video-animation "*to explain*" is in the path: "*Facilitate the written comprehension to help the written production*" (see Table 2). Video-animation helps one to understand the readability concept in research, how to make texts more comprehensible to readers, and how to apply this understanding in the classroom using a specific software. Video-graphic animations are alternated by screen capture showing the use of the software.

Table 2
VIDEOS-RESOURCES AT A GLANCE

Project name	Video types	Title	Link
Scientific Area	to show	*How to inflate a balloon on the contrary?*	The video was produced in collaboration with Prof. Falasca. Link: "https://www.youtube.com/watch?v=rPvtavyeksso&feature=youtu.be&list=PLFHQScjEG7hWeRqGphcAYNzTqYsOeaGFT. The video is implemented in the learning path "The kinetic -molecular theory " visible to the link: http://forum.indire.it/repository/working/export/4585/pag2_3_11_4.htm
	to tell	*Earth Sciences Laboratory: sedimentary rocks*	The video was produced in collaboration with Prof. Piccioni Link: https://www.youtube.com/watch?v=NYIrwiJOjSw&index=1&list=PLFHQScjEG7hUoyNKvOc8SuEzwpnaCgPSy. The individual clips are implemented into the learning path "The rocks tell". Link: http://forum.indire.it/repository_cms/working/export/6581/index.html
	to tell	*Fruit fly under investigation*	The video was produced in collaboration with Prof. Forni and Prof. Alfano. Link: https://www.youtube.com/playlist?list=PLFHQScjEG7hUOkZfSJUwTzc38BkDmX6yp
Linguistic-literary Area	to tell to show	*The language in the "space- time": nouns and verbs. The Valency Grammar in primary school*	The video was produced in collaboration with Prof. Lovison and Cogliandro Link: https://www.youtube.com/watch?v=A4qf1ua-Bpw
		Project Lucca. A reflection on the linguistic and communication strategy	The video wasproduced in collaboration with Prof. Calzetti, Pieri and Fantozzi. Link: https://www.youtube.com/watch?v=QQSsoOW128U
	to explain	*Strategies to compare and integrate different texts*	The video was produced in collaboration with Prof. Guerriero. Link:h ttps://www.youtube.com/watch?v=6e-79CR1ou8
Foreign Languages Area	to hold attention	*Writing skills and communication strategies*	The video was produced in collaboration with Prof. Amparo Mazzuchelli Lòpez. Link: https://youtu.be/jMlglX7rM48
		The evaluation of a creative activity: "Pablo Picasso, a life for art"	Link: https://youtu.be/M4nLjHWSXjw
	to show	*Writing skills and communication strategies*	Video was produced in collaboration with Prof. Amparo Mazzuchelli Lòpez. Link: https://youtu.be/TM_IOEOrWkc https://youtu.be/JV6LwXSScUw https://youtu.be/e_IBbziZSNU
	to explain	*Facilitate the written comprehension to help the written production*	The video was produced in collaboration with Prof. Spiezia. Link: https://youtu.be/Qmacw6MU6EI

4 Discussion and conclusion

The experience in video production for teacher education allowed us to recognize and reinforce the centrality of the design phase, as being a recursive process more likely as an action research model (Figure 1).

The integrated production flow is the result of a process highly characterized by the reflective, meta-reflective interiorization, as well as expertise systematization matured through the creation of more than a hundred video-based didactic content for teacher-training (35 for science education, 45 for foreign languages, 24 linguistics and humanities), just to mention the last two years production[18]. An important result of having gained a comprehensive perspective of video production for teacher training, beyond disciplinary specialization, let us describe the video-material production flow into six phases, as show in (Figure 3). The experiences illustrated for each project/discipline in section 3 can thus be seen as being characterized by putting more or less emphasis on one or more phases.

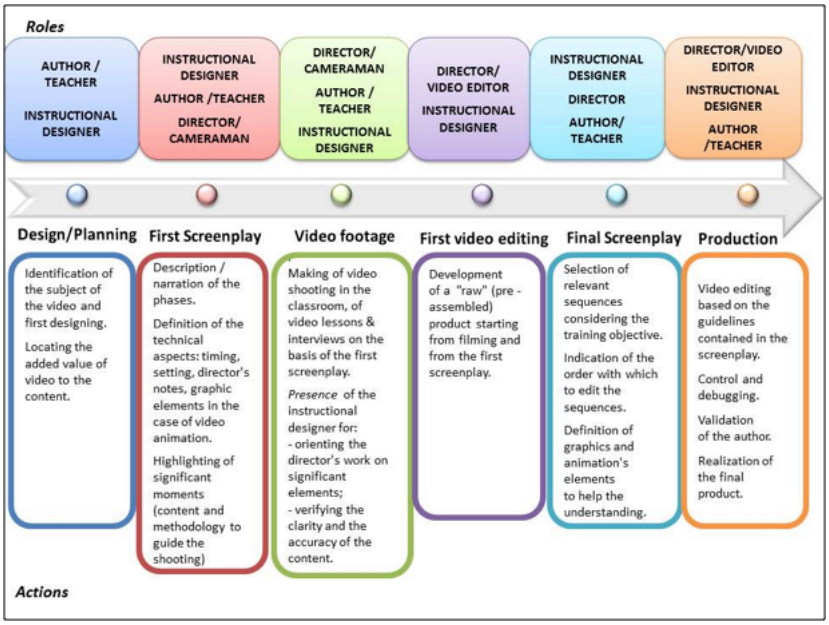

Fig. 3 - Workflow: description and roles involved.

Although each stage of the production process is characterized by a greater

[18] The production of videos described in this paper is framed within a wider videos production conducted in NOP projects, counting 74 more videos autonomously produced by teachers and 25 video-lab produced realized in collaboration with Galileo Museum (http://www.museogalileo.it/en/explore/onlinedidactic.html).

commitment of some roles (author, teacher, instructional designer, director, etc.), the recursive involvement of all roles becomes necessary to develop an effective instructional video. The video-capture of a practice, as explained, is the result of a virtuous design project and a rigorous process selection, different excellence factors are taken into account:

- the long-term experience and expertise of the teachers involved in the best-practice co-research processes;
- the continuous scientific scaffold, monitoring, revision and validation of the implemented choices carried out by scientific committees that are charged with selecting the most meaningful practices to be video-documented.

Such factors concur to qualify the video products presented in paragraph 3 in terms of their soundness as educational products for teachers, developed so as to support meta-cognition and reflection in their professional development.

The videos presented here are not videos "to show" but they are designed and implemented to become actual "tools of knowledge". In this paper we document the background and the processes that led us to achieve such objectives.

The implemented products have not yet been tested widely and so far only preliminary positive feedbacks from teachers involved in the production processes have been gathered. Unexpectedly, the teamwork conducted encouraged some teacher to engage in the autonomous production of other videos with a greater awareness of the underlying elements needed to make the product a truly meaningful "knowledge tool". In future works we will experiment such products in TPD so as to assess their impact and effectives. Moreover, we intend to carry out praxis analysis as well as the study of guided video-annotation as one of the possible uses of the implemented videos.

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