THE USE OF *VIDEO CASES* IN AN ONLINE COURSE:
SUPPORTING TEACHERS IN DEVELOPING THEIR RiTPACK

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*In order to help the participating teachers on our online course engage critically with research to reflect on whether and how digital technology supports pupils' understanding and learning of mathematics, we propose to trial the use of **online video cases** in the next presentation of our newly designed online course. In this paper we will be reporting on trialling the use of video cases with the course participants and on the potential of using these videos as basis for entries in the online discussions with the aim of supporting the development of the participants' Research infused Teachers' Pedagogical Content Knowledge.*

INTRODUCTION

In this paper we will report on a pedagogical intervention in our recently re-developed on-line course 'Digital Technologies for Mathematical Learning' that focuses on the teaching and learning of mathematics supported by digital technologies.

Pedagogical underpinnings of our online course

There are two e-learning aspects of this masters level course: 1. its online delivery and 2. the e-focus of the course itself, consisting of i) familiarisation of the participants (practising mathematics teachers) with a wide range of digital tools and resources (graph plotters, dynamic geometry environments, statistical software, fully interactive online packages) and ii) critical reflection on the implications of using such tools in the learning and teaching of mathematics at secondary school level (11-18 years old).

The design of this course has been influenced by the Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006), which attempts to describe the body of knowledge and skills needed by a teacher for effective pedagogical practice in a technology enhanced learning and teaching environment.

At the same time, encouraged by previous research (e.g. Pepin, Gueudet & Trouche, 2013) on the value of involving teachers in the design process that demonstrated that when engaged in authentic design activities learners can develop significantly in their TPACK knowledge, we too introduced the participant teachers to task design. Throughout this course the participants designed sequences of mathematical activities that exploit the possibilities of digital technologies, trialled them in an authentic learning context (such as their own classrooms) and evaluated the learning in the light of research (key readings of the course).

Course evaluation and reflections

We conducted an evaluation of this course after its first presentation and reported on the emerging pedagogies (Crisan, Geraniou & Mavrikis, 2015): 1. the online pedagogy of us, the tutors, ensuring that online teaching and learning is effective (Stephenson, 2001) and 2. that of the participating teachers as they started experimenting with using the new technology in their teaching practices and linking it with the research knowledge base of the course. We refer to the former pedagogy as

teachers' Research infused Technological Pedagogical Content Knowledge (**RiTPACK** – our own acronym for this concept). While the participating teachers reported development of their TPACK knowledge, sharing online such experiences and applying the ideas encountered in the key readings in the particular learning context under scrutiny was a challenge. Research acknowledges that 'novice' (to new practices) teachers 'see' less of the complexity of classroom events than do experienced teacher (Yadav & Koehler, 2007), and while we expected that, we found that the more time consuming aspect of online communications added to the wanting quality of such exchanges.

The online tasks of this course include engaging with the ideas in the key readings; for example, during the weekly online discussions the participating teachers provided narratives of their own classroom based experiences. While these generated activity on the online forum discussions, the conversations were lacking *those* details needed to understand and analyse the actual learning taking place. Engagement with each other's experiences was limited, and very often about asking for more (and less relevant) details about 'what happened'. The time consuming aspect of trying to understand each other's experience invariably led to less reflection on 'why that happened', and to a lack of engaging with the research, connecting their 'research-based' learning with the particular instances reported (the **Ri** aspect).

THE INNOVATION: ONLINE VIDEO CASES

In order to help the participating teachers on our online course engage critically with research and use it to reflect on classroom practice with digital technology, we propose to trial the use of **online video cases** for the second presentation of this course (starting in January 2016). We propose to record one video covering each of the main themes of the course: Visualising, Generalising, Expressing and Modelling. With a focus on supporting participants in reflecting on how the digital environment supports pupils' mathematical work, the video will consist of pupils working in pairs 'doing some mathematics' in a digital environment. Since it is very important what pupils do in and with the digital environment provided, a screencast video-recording software will be used to enable video recording of pupils' on-screen work as well as an audio recording of any pupil-pupil and pupils-teacher interactions while working through the mathematics activity.

A search for resources such as Teachers TV, a website which provides video and support materials for those who work in education in the United Kingdom, including teachers, teacher trainers, student teachers and support staff failed to identify similar resources with a focus on using digital tools in mathematics lessons. For this reason, with the help of our partnership schools, we (the tutors on the course) plan to record a number of videos in authentic classrooms, with pupils working through mathematics activities in a digital environment. Tutors will then edit the recordings for a selection of significant episodes, which will then be presented as *video* cases to our online course participants for analysis.

MODELLING RiTPACK

Exploring ways in which participants can communicate and interact effectively is key to effective distance-learning. In this paper we will be reporting on trialling the use of video cases with the course participants. By using the videos as basis for entries in the forum discussions, it is hoped that the participants make their conversations more grounded in actual events, more insightful, and more resistant to oversimplifications.

The tutors will model engagement with research when analysing such scenarios by: 'slicing' the video, selecting sequences and moments in the video and audio captures, annotating the video to focus on specific aspects of pupil-pupil, teacher-pupil interactions with the digital tools significant to conceptual understanding of the maths under scrutiny and adding personal analysis, with annotations and explicit links to research and theory. The participants will be invited to contribute to this analysis by offering their own interpretation in online discussions and will begin the process of analyzing learning episodes in a meaningful way (van Es & Sherin, 2002) while provided with extensive scaffolding by the tutors. The participants will engage with research through using the ideas assimilated from the literature reviewed to evaluate and justify how the teaching and learning as portrayed by the video cases addresses conceptual learning. In an online learning environment, there are opportunities for contributions from all, for revisiting the given scenario as many times as needed, for reflection at own pace and engaging with and learning from each other's contributions.

Enhance development of participant teachers' RiTPACK

For one of the weekly online task, the participants will focus on a video case as the basis of a shared analysis. Since the videos are permanent records of pupils' activity, multiple analyses may be put forward. Putting forward arguments, justifying and defending them, evaluating the worth, validity and reliability of opinions based on own experiences and assimilated literature are skills that are hoped to develop from the start of the course. The participating teacher will be able to annotate the video, which together with the research knowledge will provide evidence for his/her interpretation.

We will address Leat, Lofthouse and Reid (2014) call for the need to develop 'teachers as researcher'. They acknowledge that (worldwide) the relationship teachers have with research is passive, that teachers may or may not choose to use it in their practice. The authors propose that developing 'teachers as researcher' may direct teachers towards more active engagement in undertaking enquiry themselves, which ultimately will benefit pupils.

EVALUATION

The course ends in March 2016 and we intend to present the findings of our enquiry: *In what ways do video cases enhance the development of participating teachers' **RiTPACK*** at the IMCE-13 conference.

The evaluation of the project will consist in analysis the quality of the online discussions, with a particular focus on participants' engagement with ideas from literature to analyse video episodes. Evidence of development of critical reflection skills will also be sought in the course participants' assignments where they are required to critically analyse and evaluate design, trial and evaluation of a sequence of mathematical activities in their own practice that exploits the possibilities of digital technologies.

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