Classroom Technology Transformation using the 4 T's Framework
International Partnerships between K-12 Teachers and University

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Abstract: How do educators develop the theoretical and practical knowledge and skills required of 21st century teachers? Teachers need effective technology exposure and practice in order to develop the skills required to integrate current technologies into daily lessons. A partnership between Education Department faculty in the United States and K-12 private school teachers in Southern Europe revealed the necessity of the 4Ts of Time, Tools, Training, and Teamwork when exposed to emergent technologies.

1 INTRODUCTION

Technology has 'invaded' the K-12 public and private classrooms globally. The advancements in technology, from simple document cameras to iPads and interactive whiteboards, have increased the need for teacher technology training and infusion of technology in daily classroom instruction. Models of what effective use of technology in the classroom should look like have been proposed, including the SAMR (Substitution, Augmentation, Modification, Redefinition) Model (Puentedura, 2013) and the TPACK (Technology, Pedagogy, and Content Knowledge) Model (Mishra, P., and Koehler, M., 2006) However, research suggests that despite the increased training offered to K-12 teachers, high-level technology integration is low (An, Y., and Reigeluth, C., 2011; Kozma, 2003; Mueller, Wood, Willoughby, Ross, and Specht, 2008; Smeets, 2005; Tondeur, van Braak, and Valcke, 2007a; Project Tomorrow, 2008;).

The question remains: How do educators develop the theoretical and practical knowledge and skills required of 21st century teachers? Based upon our work with university faculty in an education department, pre-service teachers, as well as veteran classroom teachers, we have found they need the 4Ts of Time, Tools, Training, and Teamwork *intentionally* cultivated and structured in ways that promote their dynamic interdependence with powerful results that multiply their impact. An ongoing project with teachers at a rural, K-12 school in Southern Europe, reflects the successful, transformative effect on teachers of professional development based upon the 4Ts framework in becoming digital educators.

2 THEORETICAL FRAMEWORK

Figure 1: Four T's of Technology Transformation

Many researchers have identified components of professional development that effectively support teacher growth and specific skill development. The components of effective teacher transformation in technology practice include **Time** (Cuban, l., Kirkpatrick, H., and Peck, C., 2001), **Tools** (Cuckle, P. and Clarke, S., 2002), **Training** (Desimone, L.M. 2009; Garet, M., Porter, A., Desimone, L., Birman, B., and Yoon, K.S. (2001), and **Teamwork** (Wei, R. C., Darling-Hammond, L., Andree, A., Richardson, N., Orphanos, S., 2009). However, these components of effective professional development

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are often seen as isolated elements, and the integral connectivity among the elements is missing. In addition, our work with various groups of educators highlighted the critical thread of **Leadership**, pulling the 4Ts together, supporting and nurturing each of the elements as needed in these communities of practice (Probst, G. and Borzillo, S., 2008).

2.1 Setting and Participants

Researchers have found that teachers' meaningful use of technology is lacking in education (Cuban, Kirkpatrick, and Peck, 2001; International Society for Technology in Education [ISTE], 2008; Partnership for 21st Century Learning, 2007). Administrators at a K-12 rural school in Southern Europe saw a similar need, and initiated a collaboration between the school and faculty at an American university's school of education.

The private school is an independent, nonprofit institution that was founded in the early 1900. Today, its three major educational divisions include a primary, elementary and secondary school. It is a leading school in the rural development of Southern Europe, and focuses on sustainability and environmental studies. The school applies learner-centered and project based instruction to strengthen academic knowledge and enhance sensitive towards the environment.

The school currently serves approximately 500 students in the K-12 classroom. It is notable that 97% of the K-12 faculty have advanced degrees in education and on average have 17 years of teaching experiences in the K-12 environment.

School administrators identified a select number of K-12 teachers, who expressed an interest in technology integration, to participate in the workshops. Three education faculty members facilitated the workshops. The sessions focused on technology integration in the K-12 classroom, with a concentration on iPad applications, Mimio Tech Tools and Web 2.0 tools to increase academic achievement in low performing students. Upon completion of the program, all participants received an iPad mini to use in their classroom.

Twenty K-12 teachers applied to participate, but only eight were accepted into the program the first year. The school administrators selected teachers that were employed full time, had more than four years of teaching experience, collaborated well with colleagues and had a positive outlook toward change. The participants were required to demonstrate basic technology skills, commit to attending eight evening webinars, and engage in a three-day on ground workshop and showcase. The teachers were at various levels of technology proficiency, which was expected. Some teachers served students in the primary grade levels while others taught English and Social Studies at the secondary level.

The eight participating teachers were asked to identify their strengths and weaknesses in the classroom, as perceived by them, The primary need for professional development identified by these participating teachers was differentiated instruction and technology integration in daily K-12 classroom instruction. The workshop content, therefore, was based on the teachers' professional goals and the institution's goal to increase innovative instructional practices with an emphasis on technology.

The facilitating education faculty came from diverse educational background; two were experts in technology and one on exceptional student education and differentiated instruction. The combined expertise helped highlight the success of technology tools integration in differentiated instruction classrooms. It allowed the facilitators to focus on academic growth in kinesthetic, tactile, visual and auditory learners.

2.2 Communities of Practice in Virtual and Face-to-Face Worlds

The workshop was separated into two segments. The first part was provided virtually via 8 weekly modules using shared Google Documents and Google Hangouts. These tools were selected because they were free for the facilitators and the participants. Furthermore, the school used Google as the primary email provider. All of the K-12 teachers, administrators, and staff had been trained on Google, Google docs and other free Google sources. In addition, the university faculty facilitators wanted to support the school initiatives, demonstrate the use of the provided tools, and encourage teachers to use / master tools they had access to within their system. The Google Hangouts also allowed for discussions parallel to the contact presentation and document sharing. Although the facilitators faced some unexpected connectivity challenges, the virtual sessions were successful. To help facilitate the discussion board / chat during each session, one of the education faculty members responded to questions and addressed comments, while the others provided the virtual content instruction. The 1½ hour sessions were presented in eight virtual modules. A community of practice was soon established, and foundational information began to be assimilated. This community of practice provided the 2 Ts of Training and Teams. For

educators to develop the skills to successfully integrated technology into their classrooms, they need relevant training (in this case, based on their own identified needs), and they need communities of practice that support the members. Together, the participants interacted in the modules, and later continued supporting each other as a team, as will be discussed later.

The modules focused on eight interconnected topics: a) What is differentiated instruction? b) How can teachers differentiate instruction for student with specific learning disabilities, attention deficit disorders and behavioural challenges? c) What web 2.0 tools are available to K-12 classroom teachers to support differentiated instruction? d) How can interactive white boards such as the Mimio Teach be used to differentiate instruction? e) How can teachers use Mimio tools and Mimio Studio to differentiate instruction? f) How can teachers support students' higher order thinking, and what assessment tools can be used? g) How can technology support students as readers and writers? Google Docs was used to provide the content materials for the K-12 teachers to review. All of the materials were uploaded a week prior to the Google Hangout session, and participants were expected to review the content, ask clarifying questions, respond to the weekly discussion questions, and be prepared for the weekly presentation sessions. Each week a designated participant shared a 'new' instructional practice that was successfully incorporated into his or her instruction. The teacher was responsible for sharing the strengths and weaknesses of the new tool/instructional method. This practice encouraged participation and accountability despite the virtual setting.

A five day on-ground workshop was scheduled at the end of the eight modules. The three education faculty members travelled from the United States to Southern Europe and provided face-to-face interactive sessions to the nine K-12 participating teachers. The workshop included morning presentations and time was allocated to 'play' with the various devices in the afternoon. The agenda included morning presentations of content, followed by guided exploration and finally independent exploration. At the end of each day, the participants shared the practicality of the device, expected adaptations to current instructional methods and expected challenges. The trainings included an introduction to the use of the Mimio, Mimio mobile, Web 2.0 tools, iPad, and educational iPad applications. The facilitators also focused on successful practices in a one iPad classroom. The primary focus was to make teachers comfortable with using technology to differentiate instruction. The introduction of each device was accompanied by pedagogy supporting infusion of technology in the K-12 classroom and differentiated instruction strategies / methods. In addition to daily interaction during hands-on learning sessions, participants were expected to develop a plan for how they would demonstrate their learning gained from the online and face-to-face sessions and share these plans with fellow participants, thus strengthening the element s of teamwork, as well as leadership. Time was allocated, throughout the on-ground workshop, for teachers to use the technology tools. The advantages and limitation of each device became apparent to each participant, and they were able to develop a plan for classroom instruction. This time was very beneficial to help answer questions as teacher explored the devices. Time is a precious commodity for teachers. It is one of the most significant reasons teachers struggle to develop new technology skills. It is challenging to find time to engage in professional development (training), and as well as to find time to experiment and implement. The participants in this community of practice committed to engage in the 8 weeks of pre-workshop modules as well as the on-ground training.

In addition, upon completion of the program, the participating teachers committed to incorporating at least one device or Web 2.0 tool and using differentiated instruction in their teaching. In order to continue evolving as digital educators, they also agreed to continue meeting monthly as a team to share what they were learning and doing. One teacher was assigned to serve as the leader of this group, which soon adopted the name "SWITCH," reflecting the pedagogical changes teachers were making in their classes. Meeting monthly provided members of the team opportunities to learn from each other and to begin to rely on each other for help and support. Regular meetings also provided an element of collegial accountability; they knew each month they had to share what they had learned or done with technology in their classrooms. In these monthly meetings, the elements of time, training, and teamwork continue to reinforce the work begun during the online modules. The SWITCH group also began to play a pivotal role in furthering the development of other teachers at the school, conducting training sessions on topics such as differentiated instruction. Diffusion of knowledge through these early adopters offers an important, effective alternative to top-down mandates.

Leadership and teamwork, then, combine to create systemic institutional change.

To support the teacher efforts, the school administration purchased each participating teacher an iPad Mini along with an Apple TV. This encouraged the teachers to use their iPads and Apple TV to connect to the classroom projectors. Having immediate access to the tool(s) is one of the Ts in the 4 T's model. The school's support by providing the tool for each participant, was a critical factor in the progress the teachers were able to make, as was the time the teachers committed and their work and support together as a team.

2.3 On the Path to Becoming Digital Educators

Becoming a digital educator is an evolutionary process that takes time, teamwork, training, and tools. The initiative encouraged the participating teachers to work closely together as a team to discuss how they would implement the differentiated instruction in their classroom. They developed an action plan by continuing the Google Hangout sessions and sharing ideas of 'how' and 'where' to start. The teachers began learning from each other and scheduled monthly meetings to share their experiences, talk about their successes and work through their challenges. The team determined useful iPad apps, from the pool of applications that was shared during the workshop, to incorporate in the classroom. The participating teachers decided on using the same applications so there would be continuity among their lessons and the students would feel more comfortable and not threatened or challenged by the new technology. The four T's, symbiotically integrated together, provided teachers the opportunity to grow and develop as digital educators. The committed, sustained leadership of the school administrators, the university faculty, and the teacher leaders in the group helped assure that each of the 4 T's was provided/managed in a way that would contribute to the professional development of the participants.

Comments on a post-training survey confirm the power of technology professional development based upon the elements of the 4Ts:

- "I really enjoyed learning from each other and watching what worked for my colleagues in their classrooms. I liked the open forum/chat where we were able to express our ideas. I enjoyed being exposed to the diversity of methodologies and having the time to 'try them on' for size.
- "This course was very useful and has helped me improve my teaching. The apps are a very useful teaching tool. It also gave me the opportunity to meet three wonderful ladies who are experts in their field. More importantly, it led to the SWITCH group, which is a great opportunity to meet my colleagues regularly and exchange information and thoughts regarding our teaching."

3 NEXT STEPS

The university education faculty has been invited to offer the professional development workshop again during the 2015-2016 academic year to 15 new participating teachers from the K-12 school in Southern Europe. With feedback from last year's participants to inform their practice, the three university faculty members have revised/refined the content of the eight modules to meet the needs of the participants, with a continued emphasis on the meaningful use of technology in the classroom. To build upon and extend the community of practice at the K-12 school, participants from the first year will attend each of the eight virtual meetings to share their own growth and expertise.

Using the 4Ts as a guiding framework, our work with the K-12 teachers in Southern Europe continues to offer support for the importance of time, tools, training, and teamwork in helping educators to develop the technology knowledge and experience necessary to facilitate 21st century learning.

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