Creating meaningful learning environments with technology

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When developing goals and objectives designed for long-term student learning, it is critical to do so in a way that is research-backed and is rooted in not only behaviorism but also constructivism. Technology plans are critical instruments developed by school districts and institutions of higher education with the purpose of laying out short and long-term goals for the implementation and integration of technology into pedagogical practices and the various curricula offered at their respective institutions. There are various frameworks within education, such as the ADDIE model, that not only inform the construction of such models but also the evaluation processes that guide the nature of these plans as living documents that are subject to revision and change as the nature of education evolves (Hess & Greer, 2016). Particularly with regard to technology, which is arguably in a constant state of change, an entity's plans for its optimal integration should always be subject to evaluation and revision, if necessary. The work of Bers (2012) provides a framework for evaluating such technology plans, by means of viewing such a plan though her Positive Technological Development (PTD) framework, which delineates various facets of technology use, which support the psychosocial, the cultural, and the emotional aspects of childhood development (Bers, 2012, p. 9; Coffin & MacIntyre, 1999). With respect to the word *positive* in the name of the model, Bers (2012) emphasizes the overarching goal of technology to engage in a "good, healthy, and productive developmental trajectory" (p. 10).

The PTD framework which will be used to evaluate the technology plan of the Rocky Cliffs School District (RCSD) (name has been changed to protect the authors of this paper) is based off of six characteristics, known as the six "C's," originally developed by Lerner et al. (2005) and adapted by Bers for the PTD framework. Those six characteristics are competence, connection, character, confidence, caring, and contribution. Bars furthers those characteristics into a second set of "C's" that reflect behaviors: content creation, creativity, choices of conduct,

communication, collaboration, and community building. It is through this lens that the Rocky

Cliffs School District's Technology Plan for 2016-2019, which is divided into *guiding principles*

and *goals/rationale*, will be cross-referenced along with the recommendations of these authors.

Bers (2012) describes the behavior of *content creation* as involving the tasks of working

with various forms of media and multimedia, including text, video, audio, and animation, and the

ability to use those skills to create original media, troubleshoot existing tasks, and active problem

solving. In order to develop a viable technology plan to meet these goals, it is recommended that

districts provide teachers will numerous professional development (PD) opportunities to create a

student-centered, project-based learning environment in which students demonstrate their

understanding in non-traditional ways, but which are developmentally appropriate for their age.

These PD opportunities need not come from a high-priced consultant, but rather a peer-to-peer

style setting where teachers can assist their colleagues learn about the ever-evolving myriad of

online resources available. Examples of formative and summative assessments utilizing the pillar

of content creation include developing animations, writing code to program a robot, starring in

their own video, designing 3D models, making their own games using tools like Kahoot, and

creating augmented reality experiences using apps like Aurasma. Additionally, it is critical that

districts have the technology infrastructure in place to support these initiatives, including either a

BYOD (bring-your-own-device) policy, a 1:1 device initiative, or technology labs to enable

students to interact regularly with relatively modern computing hardware.

Within the RCSD's Technology Plan, Guiding Principle #1 is to "demonstrate creative

thinking, construct knowledge and develop innovative products and processes using technology."

Also, Guiding Principal #4 states, "use critical thinking skills to plan and conduct research,

manage projects, solve problems, and make informed decisions using appropriate digital tools

and resources." Additionally, the Plan notes specific PD opportunities that are being made available to their teachers, including "Learn and Play," "Google Immersion Workshop," and "Technology Boot Camp" sessions run by the district's directors and peer faculty members. Furthermore, the Plan offers a "Tech Advisor" PD opportunity to assist teachers in integrating newly purchased technology into their instruction. In terms of a technology hardware initiative, there are some steps that the Plan outlines, including Goal #2 of "equitable access" to technology, "budget permitting," including growing the number of devices available for students at both the elementary school and high school levels, as well as expanding device availability into high school common spaces, including computers, 3D printers, and so on (Rocky Cliffs School District Technology Plan, 2016). Such steps are consistent with the recommendations of this plan, and the authors encourage the RCSD to continue hardware availability and PD initiatives.

  Creativity is the second behavior that Bers (2012) delineates as part of the Positive Technology Development framework. Creativity, in a technological context, is described as formulating means in which that technology is used in novel, imaginative ways, as well as the ability to use such technology to create innovative, original products. Bers notes that in many ways, creativity and content creation, the previous facet discussed, are closely intertwined. That being said, there are a few ways in which the concept of technological creativity can be individualized from the previous concept discussed. Specifically, Guiding Principle #2 in the RCSD involves, "apply[ing] digital tools to gather, evaluate, and use information." In a way, this differs from content creation in that a novel product isn't necessary being produced here, but rather information is being manipulated in ways that emphasize independence of thought and inquiry. That is, a solution to a prescribed problem isn't being delivered as a "right" or "wrong"

answer, but rather there is no one single right answer, but rather is context driven for each

student. It is recommended that teachers, in place of assigning problems to investigate with a

black-and-white or yes-or-no answer, allow students to research information and to place it in

their own context, in a way that brings individual meaning to that solution, and thus the problem

that is being investigated. In expressing their solutions, students will then have that same

creativity available, along with the technological tools discussed in the previous section, to

demonstrate their understanding by creating products of various forms. The RCSD alignment to

this facet closely mirrors that of content creation, with a diverse array of PD offerings, as well as

a closely curated collection of hardware that allows students to engage in these information-

gathering and sharing activities.

Bers (2012) includes *choices of conduct* as a PTD activity that may lead to more positive

learner outcomes. People learn by making choices about their own learning through autonomous

interaction with their environment and interacting with technology. Through exploration of the

physical and digital environment, the experiencing of consequences through trial and error

processes, and the freedom to evaluate the results of different problem solving scenarios,

students learn more about themselves and their abilities. There is a relationship between choices

of conduct and character, which Bers suggests is the moral compass that guides responsible

technology use. In designing digital landscapes we should consider providing chances for

learners to develop a moral compass that will guide future actions with the world (2012).

The RCSD technology plan guiding principles broadly touch on *choices of conduct* in

regards to Bers' PTD activities for positive learner outcomes. Guiding principle #1 states that the

learner will "demonstrate creative thinking, construct knowledge and develop innovative

products and processes using technology." Developing innovative projects would fit within the

description of choices of conduct that gives students freedom of choice to guide decisions.

Guiding principles #3 and #4 mention applying digital tools and using creative thinking skills to

manage projects, solve problems, and make decisions. Guiding principle #5 mentions

understanding societal, cultural, and human issues in regards to technology and considers legal

and ethical behaviors of human technology interactions. This relates well with Bers' description

of allowing learners freedom to evaluate consequences of various situations while helping

develop a sense of character (2012). There is a focus on student literacy and equitable access

within the RCSD technology plan which emerges throughout the stated goals. The plan addresses

the preparing of students by allowing them to fully participate within a changing economy which

is increasingly based on information skills and products. These broad goals do allow for the

flexibility that the plan intended, however, more emphasis on preparing learners through

innovative and creative products would be a positive adaptation within the stated goals.

   Communication, as a component of the PTD positive outcomes activities suggested by

Bers (2012), is described as the way in which opinions, ideas, or information surrounding the use

of technologies are interchanged among users. Supportive communication mechanisms offer

opportunity to expand learning by connecting learners through social media and other newly

developed communication tools. The PTD model emphasis the importance of supporting

different forms of communication via text, voice, sound, videos, and pictures. These tools

provide opportunity for sharing of ideas, forming of new social relationships while strengthening

old ones, and develops positive interactions for positive youth development. Lave & Wagner's

discussion of communities of practice supports this concept by describing learning as a process

which occurs through interactions with other people and it is mediated through the different ideas

and perspectives among the participants (1991).

In considering the RCSD tech plan in regard to the communication component of Bers PTD recommendations more emphasis could be placed on ways of engaging students in communication processes. This would be beneficial as a deliberate target for integration of social media, communication, and collaborative tools. The technology plan specifically mentions communication and working collaboratively within the guiding principles, which state that learners will "use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others." A target within the guiding principles mentions understanding human, societal, and cultural issues regarding technology use. This principle can be intertwined with each of the goals within the plan. The rationale for equitable access to all learners, is highlighted in the goals which state that students will have skills to fully participate in a society based on information skills and creating products. In addition, the goals state that learners should have opportunity to fully participate in the decision-making process and have means to access information and resources to make informed decisions. The RCSD plan mentions communication in a general sense, and assumptions can be inferred as to the intent of the plan's guiding principles in relation to the stated goals. More specific objectives may be warranted as to how educational opportunities may be developed to more purposefully guide these goals.

Another facet of Bers' (2012) PTD framework is *collaboration*. She suggests that collaboration relates to caring and creates positive connections and relationships. More caring can lead to better collaboration. People can connect and interact with one another through collaborative technologies. Bers mentions the fact that the internet has simplified the collaboration process making it easier for organizations or groups of people to work together with shared goals in mind. With tools like Google Apps, social media, instant messaging, blogs,

wikis, and audio and video conferencing, collaboration with students sitting next to one another or students across the ocean can be facilitated. This idea of collaboration also meshes with Lave and Wenger's (1991) communities of practice.

The only true mention of collaboration in RCSD's technology plan is in Guiding Principle #2 which states, "use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others." Within the Goals and Rationale section of the technology plan, Goal #1: Student Literacy says, "To have a guaranteed and viable, curriculum-embedded roadmap that students, teachers and leaders follow to achieve proficiency in the ISTE Standards for Students." While the goal doesn't refer to collaboration, it does refer to the ISTE Standards for Students (2016), in which ISTE Standard #7 is called Global Collaborator. This standard is written as, "Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally." The principle and goal in RCSD's technology plan are both supported through the district's PD at which faculty and staff engage in activities that involve Google Classroom, Google Sites, Google Apps, and other general Educational Technology. Google Apps for Education, now called G Suite for Education, is known for shareability. With the district clearly being a "Google District," it is already moving in the right direction with technology tools that support collaboration. Providing PD around these tools will help educators bring them into their classrooms and use them with students. It is recommended that the district continue to offer this type of PD and continue to build upon it as it is all in alignment with the PTD behavior of collaboration.

Bers (2012) also discusses *community building* as another PTD activity. Community building within the realm of technology suggests that children should use it to, "enhance the

community and the quality of relationships among the people of that community" (p. 12). Bers adds that community building connects to being able to "contribute to society by using and inventing new digital tools to solve social problems" (p. 12). She also discusses the work of Lerner et al. (2005) about contributing to society. Their research found that children who are self-assured and capable, have a strong moral compass, who bond with and are thoughtful about others, they will also contribute to society. Many educators think of contribution to society as civic engagement, for which technology and the internet can offer many opportunities for children to engage in activism and volunteerism. Virtual worlds are one tool, in particular, that can provide civic education.

Within RCSD's technology plan, the idea of community building is somewhat addressed in Guiding Principles #1 and #5 which state, "demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology" and "understand human, cultural, and societal issues related to technology and practice legal and ethical behavior" respectively. These principles do not state community building directly, but community building could come of them. Goal #1: Student Literacy in RCSD's technology plan also touches upon community building by adhering to the ISTE Standards for Students (2016). Both ISTE Standard #4: Innovative Designer which is, "students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions," and Standard #5: Computational Thinker stating, "students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions" hit upon community building. The PD offered by the district would likely address these goals and principles but the technology plan does not discuss specifics. If the PD does address these goals, it might address community building on a more basic level, not

necessarily focusing on civic engagement. Although it is possible, it is not clear. Bers (2012)

discusses the theory of constructionism, coined by Papert (1980), which could be employed by

the district through activities that would provide more opportunities for community building.

Constructionism builds upon Piaget's constructivism where children construct knowledge based

on the interactions with their environment. Constructionism is the theory that children learn

better when making their own creations, developing their own ideas, and inventing their own

solutions. As a recommendation to RCSD, implementing Makerspaces and incorporating more

Maker Education into the curriculum could allow students to engage in projects that would have

them act as creators instead of consumers. Makerspaces more likely would provide a simple

introduction to providing community building opportunities to students. Once in place, more

advanced community building like civic engagement could emerge.

In this paper, we have proposed some core recommendations to any district seeking to

compile a holistic, long-term technology plan, as well as aligning it to a sample plan, that if the

Rocky Cliffs School District. In doing so, we built on the work of Bers (2012) and her

framework of Positive Technological Development. It is the hope of these authors that the

district will embrace these recommendations in the spirit in which they are given, in a reflection

that in any plan must come an evaluation component to ensure its continued short and long-term

relevance in the field of education and, specifically, the ever-evolving field of technology.

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