

# TECHNOLOGY IN THE CLASSROOM: A LOOK AT THE POSITIVE WAYS TECHNOLOGY CAN INFLUENCE CHILDREN'S EDUCATION

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## INTRODUCTION

Traditional classroom technologies are characterized by specificity, stability and transparency of function.<sup>1</sup> A pencil for example is specifically used for writing, has not changed a great deal over time and its inner workings are simply and directly related to its function.<sup>2</sup> Digital technologies, what we think of today as just technology, are instead variable, unstable and opaque.<sup>3</sup> Compare the pencil with an iPad. The iPad has a variety of uses, rapidly changes in its capabilities and hides its inner workings from end users.<sup>4</sup> Not only is the digital technology more elusive in its application, now administrators are held accountable for implementing a myriad of applications in an educational setting.<sup>5</sup> They are responsible for creating and implementing a technology curricula, ensuring that teachers and students have the opportunity to obtain skills in technology, and communicating to parents the

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<sup>1</sup> Koehler, M. J., & Mishra, P. *What is technological pedagogical content knowledge?*, Contemporary Issues in Technology and Teacher Education, (2009) at p.61.

<sup>2</sup> *Id.*

<sup>3</sup> *Id.*

<sup>4</sup> *Id.*

<sup>5</sup> Daniel, Philip T.K. & Nance, Jason P. *The Role of the Administrator in Instructional Technology Policy*, 2002 BYU Educ. & L.J. 211 (2002).

opportunities available to students in this area.<sup>6</sup> The task is daunting, but is this necessarily a bad thing?

The difficulties digital technology presents to administrators are at the same time opportunities for improving education and increasing efficiency in the classroom. With the right understanding of how to implement digital technology appropriately in the classroom, administrators and teachers can use it to successfully help students learn about emerging technologies while at the same time allowing the same technologies to assist in their ability to learn.

## HOW CAN SCHOOLS LEARN TO INTEGRATE DIGITAL TECHNOLOGY EFFECTIVELY INTO THE CLASSROOM?

In an extension of Lee S. Shulman's idea of Pedagogical Content Knowledge, Technological Pedagogical Content Knowledge, ("TPACK"), was created with a focus on utilizing digital technology to meet students' learning needs.<sup>7</sup> While quite a mouthful, TPACK actually provides a simplistic approach for using technology in the classroom.<sup>8</sup> TPACK is a framework that combines three knowledge areas: (1) content knowledge; (2) pedagogical knowledge; and (3) technological knowledge.<sup>9</sup> The framework demonstrates how these knowledge areas work together to increase

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<sup>6</sup> Daniel, *supra* Note. 5.

<sup>7</sup> Shulman, L.S., *Those who understand: Knowledge growth in teaching*, 15 Educational Researcher 4 (1986).

<sup>8</sup> Candace, M, TPAC in 2 Minutes, YouTube (May 13, 2104), <https://www.youtube.com/watch?v=FagVSQIZELY> "TPACK in 2 Minutes".

<sup>9</sup> *Id.*

student motivation and make content more accessible to students.<sup>10</sup> The content knowledge is the ‘what’ or the subject matter being taught such as ecology, music, algebra, etc.<sup>11</sup> The pedagogical knowledge is the ‘how’ such as direct instruction, group discussion, think-pair-share, etc.<sup>12</sup> The technological knowledge is the ‘what’ or the tool selected in making the content more accessible to the students while supporting the pedagogical strategy.<sup>13</sup> Examples of technological knowledge tools include laptops, iPads, Google Drive, etc.<sup>14</sup> At the heart of the TPACK framework, is the complex interplay of these three primary forms of knowledge.<sup>15</sup>

First is the interplay of Pedagogical Content Knowledge, (“PCK”).<sup>16</sup> This interaction occurs as the teacher chooses the subject matter and represents, adapts and tailors their instructional materials to students’ prior knowledge.<sup>17</sup> Second is an understanding of the manner in which technology and content influence and interact with one another, also known as Technological Content Knowledge, (“TCK”).<sup>18</sup> Teachers need to master more than the subjects they teach.<sup>19</sup> They must also have a thorough understanding of the manner in which those subjects can be changed by the application of particular technologies.<sup>20</sup> Teachers need to understand which specific technologies are best suited for addressing different

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<sup>10</sup> Candace, *supra* Note 9.

<sup>11</sup> *Id.*

<sup>12</sup> *Id.*

<sup>13</sup> *Id.*

<sup>14</sup> *Id.*

<sup>15</sup> Koehler, Dr. Matthew J., *TPACK Explained*, <http://tpack.org/> “TPACK Explained”.

<sup>16</sup> Koehler, M. J., & Mishra, P., *What is technological pedagogical content knowledge?* 9 Contemporary Issues in Technology and Teacher Education 60 (2009).

<sup>17</sup> *Id.*

<sup>18</sup> *Id.*

<sup>19</sup> *Id.*

<sup>20</sup> *Id.*

subjects and how those subjects dictate or perhaps even change the technology or vice versa.<sup>21</sup> Third is the interaction between Technological Pedagogical Knowledge (“TPK”).<sup>22</sup> TPK is understanding how the use of different technological tools can affect teaching and learning.<sup>23</sup> This includes knowing the affordances and constraints of a range of technological tools as they relate to appropriate pedagogical designs and strategies.<sup>24</sup>

The final, and arguably most important, intersection is what TPACK calls the ‘sweet spot.’<sup>25</sup> This is in fact where the name TPACK stems from as it signifies the interaction of all three types of knowledge: technological, pedagogical and content.<sup>26</sup> TPACK is the basis of effective teaching with technology requiring an understanding of: (1) the representation of concepts using technologies; (2) the teaching techniques that use technologies in constructive ways to teach content; (3) what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; and (4) how technologies can be used to build on existing knowledge to develop new teaching methods or strengthen old ones.<sup>27</sup>

While each interaction encompasses the usefulness of TPACK, an educator must not ignore the context surrounding TPACK, which is, of course, the individual teachers and their students.<sup>28</sup> TPACK, like all types of knowledge, is expressed in different ways and to different extents at different times with different students, and

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<sup>21</sup> Koehler, *supra* Note. 16.

<sup>22</sup> *Id.*

<sup>23</sup> *Id.*

<sup>24</sup> *Id.*

<sup>25</sup> *Id.*

<sup>26</sup> *Id.*

<sup>27</sup> *Id.*

<sup>28</sup> Candace, *supra* Note 9.

in differing contextual condition.<sup>29</sup> Looking at TPACK's use in the context of actual school settings leads to the need for a way to assess the practicality and usefulness of TPACK.<sup>30</sup> Self-assessment is the first step in any assessment of instructional decision-making.<sup>31</sup> However, other studies have also shown that measured gains over time are more reflective of teachers' actual increased knowledge regarding a particular professional development than their perceived increase.<sup>32</sup> Self-report data should, therefore, be analyzed along with external assessments of teachers' TPACK knowledge.<sup>33</sup>

A study done using performance-based assessment measures along with self-reported progress looked at the difference between teachers' competencies before they took part in a TPACK training session and after.<sup>34</sup> Overwhelmingly, teachers reported achieving significant increases in their ability to integrate technology into their lesson plans and in their classrooms.<sup>35</sup> Not only did the self-reported perception and awareness of TPACK competency increase, the performance-based measurements also showed improvement.<sup>36</sup> The observable data consisted of graded lesson plans, scores based on their use of TPACK and technology products in

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<sup>29</sup> Koehler, M. J., & Mishra, P., *Introducing TPACK*, AACTE Committee on Innovation & Technology (2008).

<sup>30</sup> Agyei, Douglas D. & Keengwe, Jared, *Using technology pedagogical content knowledge development to enhance learning outcomes*, 19 *Education Information Technology* 155 (2014).

<sup>31</sup> Roblyer, M., & Doering, A., *Integrating educational technology into teaching*, (5th Ed. 2010).

<sup>32</sup> Lawless, K. A., & Pellegrino, J. W., *Professional development in integrating technology into teaching and learning: knowns, unknowns, and ways to pursue better questions and answers*, 77 *Review of Educational Research*, 575 (2007). doi:10.3102/0034654307309921.

<sup>33</sup> *Id.*

<sup>34</sup> Agyei, *supra* Note 30.

<sup>35</sup> *Id.*

<sup>36</sup> *Id.*

the class and skills test for their students.<sup>37</sup> Their observed lessons were less teacher-centered and technology was used to facilitate active learning, which promoted collaborations and made students' learning more engaging and interactive.<sup>38</sup> While their Technological Knowledge increased most drastically as predicted, their Pedagogical and Content Knowledge also showed improvement as through technology they were able to understand in different ways how and what can be taught to students.<sup>39</sup> Finally, the study looked at students' ability to utilize technology, specifically Microsoft office applications, Windows operating system and Internet usage, through an ICT (information and communications technology) skills test.<sup>40</sup> While there was no reported correlation between the increases in TPACK knowledge and ICT skills test scores, the ICT skills post-mean test scores increased by over 4 points from 27.53 points on the pre-test to 31.63 points on the post-test.<sup>41</sup> Overall, teaching TPACK principles to educators showed improvement in their abilities to utilize technology and ultimately an increase in students' capabilities in using technology.<sup>42</sup>

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<sup>37</sup> Agyei, *supra* Note 30.

<sup>38</sup> *Id.* at 167.

<sup>39</sup> *Id.* at 168.

<sup>40</sup> *Id.* at 160.

<sup>41</sup> *Id.* at 163.

<sup>42</sup> *Id.* at 169.

## WHAT TOOLS AND PROGRAMS ARE AVAILABLE TO AID IN SCHOOLS' EDUCATION OF THEIR STUDENTS?

Digital technology is something our children under the age of eighteen have grown up with their whole lives. Today in the U.S. alone, 61% of Americans age 12 and up own a mobile device and 44% specifically own a smart phone.<sup>43</sup> Half of all U.S. homes own at least one Apple product, which adds up to 55 million homes with at least one iPad, iPhone, iPod or Mac computer.<sup>44</sup> Shockingly even a quarter of U.S. children under 6 years of age venture online regularly.<sup>45</sup> With the increase in usage of such devices, the technology companies have come out with new ways to use these digital technologies in an educational setting.<sup>46</sup> Mobile devices, tablets and game-based learning have all become trendy and useful tools in the education community.<sup>47</sup>

Specifically mobile devices prove to have become the primary way that youth interact with each other and learn new information.<sup>48</sup> In response to increased usage, smart phone companies have developed an extensive app platform that allows users to get apps free or at extremely low prices, usually around 99 cents.<sup>49</sup> Apps allow users to access print-based publications on their phone which increases

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<sup>43</sup> The New Media Consortium, *NMC Horizon Report: 2012 K-12 Edition* 11 (2012).

<sup>44</sup> Gralnick, Jodi, *Half of U.S. homes own Apple products*, March 28, 2012, <http://usatoday30.usatoday.com/tech/news/story/2012-03-28/cnbc-survey-apple-products-us-homes/53827254/1>.

<sup>45</sup> Rochman, Bonnie, *Young Kids Increasingly Use the Internet Regularly*, March 18, 2011, <http://healthland.time.com/2011/03/18/young-kids-increasingly-hang-out-online/>.

<sup>46</sup> The New Media Consortium, *supra* Note. 43 at 12.

<sup>47</sup> *Id.* at 11, 15, 19.

<sup>48</sup> *Id.* at 11.

<sup>49</sup> *Id.*

interactivity and frequency of use.<sup>50</sup> Also, with location and sensor technology, smart phones aid in science classrooms and experimenting indoors and out.<sup>51</sup>

However, cell phones also tend to be the technology most under attack for being allowed in the classroom setting.<sup>52</sup> Administrators, educators and parents historically tout cell phones, especially smart phones, as a distraction from students' studies instead of an aid in their learning.<sup>53</sup> In spite of this negative connotation, there is a growing trend towards lifting the ban on mobile devices and instead asking kids to use these devices as learning tools.<sup>54</sup> Several school districts have even seen increases in standardized test scores since introducing technology into their economically challenged schools.<sup>55</sup> In addition, technology companies are beginning to sponsor schools by providing mobile devices to be used in the schools at little or no cost to the schools.<sup>56</sup>

Educators are beginning to capitalize on this by integrating mobile apps into the curriculum and revising their school policies to allow the use of mobile devices and by extension, mobile apps.<sup>57</sup> Due to the usefulness of mobile devices and other technology schools are loosening the policy of mobile technology.<sup>58</sup> For example, Forsyth County Schools in Georgia have implemented a BYOT (Bring Your Own

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<sup>50</sup> *Id.* at 11-12

<sup>51</sup> *Id.* at 13.

<sup>52</sup> Dunn, Jeff, *10 Schools Encouraging Smartphones in the Classroom*, December 12, 2011, <http://www.edudemic.com/smartphones-in-classrooms/>.

<sup>53</sup> *Id.*

<sup>54</sup> *Id.*

<sup>55</sup> *Id.* (Examples of schools implementing technology to aid in low budgets and poor surrounding communities include Onslow County, Watkins Glen School District and St. Mary's City School).

<sup>56</sup> *Id.* (Sprint and Qualcomm have both participated in such pilot programs).

<sup>57</sup> *Id.* at 12.

<sup>58</sup> *Id.* at 13.



Technology) Program, a practice sometimes also known as BYOD (Bring Your Own Device).<sup>59</sup> The pilot program began with forty teachers across seven schools in which teachers explored innovative uses for students' technology tools.<sup>60</sup> Wireless capability was also installed throughout the school in an effort to assist in the use of the mobile devices.<sup>61</sup> Over time, the pilot program and participating teachers tackled issues such as equity of devices, responsible use, and classroom management.<sup>62</sup> Now, the district has rolled out the BYOT Program to every school in the district.<sup>63</sup>

Many other schools are also partaking in the BYOD or BYOT movement.<sup>64</sup> In addition to offering more learning opportunities for the students through digital technology's new capabilities, allowing students to participate in the BYOD programs frees up valuable school resources.<sup>65</sup> According to Doug Johnson director of media and technology for the Mankato Public School System, "By allowing kids to bring in their own devices, you free up school resources for the kids who don't have access."<sup>66</sup> This message is not only echoed in schools across the country, but even President Barack Obama and Secretary of Education Arne Duncan have recently spoke on the need for schools updating to the 21st century by finding ways to

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<sup>59</sup> Forsyth County Schools, *BYOT*, March 22, 2014, <http://www.forsyth.k12.ga.us/byot>.

<sup>60</sup> Forsyth County Schools, *supra* Note 59.

<sup>61</sup> *Id.*

<sup>62</sup> *Id.*

<sup>63</sup> *Id.*

<sup>64</sup> Dunn, *supra* Note 52; Barseghian, *In Some Cash-Strapped Schools, Kids Bring Their Own Tech Devices*, February 3, 2012, <http://blogs.kqed.org/mindshift/2012/02/in-cash-strapped-schools-kids-bring-their-own-tech-devices/>; Schoolbook Editors, *Time to Repeal the Cellphone Ban, Students Say*, November 2, 2011, <http://www.wnyc.org/story/303205-time-to-repeal-the-cellphone-ban-students-say/>.

<sup>65</sup> Barseghian, *supra* Note 64.

<sup>66</sup> *Id.*

integrate technology into the learning process.<sup>67</sup> The problem lies in the funding.<sup>68</sup> Some schools are lucky enough to find funding for entire computer labs or even laptops for their students.<sup>69</sup> However, the more prevalent economic reality is that schools struggle with shrinking budgets and can barely afford to hire enough teachers much less provide the most current technologies to their students.<sup>70</sup> The BYOD and BYOT programs help not only with increasing students' learning potential, but also aid in easing the tight budgetary restrictions schools are facing today.<sup>71</sup>

## CONCLUSION

Just as the boom in technology over the past five to ten years has affected the lives of adults at home and at work, technology affects our children both at home and in schools. Technology has made many things possible that would not have been possible just a short time ago. However, with the power of technology also come the issues of how to channel that power for useful purposes. Organizations such as TPACK aid in helping educators understand technology and more specifically how to use it in educating their students. They take existing educational paradigms and incorporate technology to make for a more current approach to teaching children. Further, technology companies have shaped technology to be targeted for educational capabilities, as well as participating in donating technology to schools. Innovative teachers and administrators recognize the growth in technology and the

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<sup>67</sup> *Id.*

<sup>68</sup> *Id.*

<sup>69</sup> Barseghian, *supra* Note 64.

<sup>70</sup> *Id.*

<sup>71</sup> Dunn, *supra* Note 52.

potential technology can have in their students' lives in and out of the classroom. Instead of fight it, they have begun to accept the trend and utilize it to increase test scores and engage their students in the classroom. For all its negatives, digital technology offers educators a chance to connect to the students in new ways and increase the ultimate objective — an engaged and successful student body.