

CHAPTER 34

Current and Potential Uses of Technology to Enhance SEL

What's Now and What's Next?

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By some estimates, more than 200 classroom-based social and emotional learning (SEL) programs are used in U.S. schools (Collaborative for Academic, Social, and Emotional Learning [CASEL], 2003). SEL encompasses a broad array of emotion skills, cognitions, and behaviors, organized as the five core competencies: self-awareness, social awareness, self-management, relationship skills, and responsible decision making (Zins & Elias, 2006). The growing field of SEL demonstrates that students can acquire these competencies through structured interventions, and that learning these competencies enhances their relationships, academics, and effectiveness at home, at school, and in life (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011). In fact, students participating in SEL programs have shown increases in prosocial behavior, reductions in behavior problems, and improvements in academic performance (Durlak et al., 2011). Our intention in this chapter is to look at how SEL has incorporated and might envi-

sion incorporating various technologies to teach or enhance these five competencies. Research on outcomes of technology-enhanced SEL programming to date is sparse, yet the proliferation of new technologies invites us to explore potential ways they might support and enhance SEL competencies and educational programming. We start broadly by describing the state of research about technology in general education, and from there situate SEL into the larger educational landscape, looking at both research and practical application. We conclude by discussing the potential problems and pitfalls, as well as proposing recommendations for the research and application of technology in SEL. Our presentation of technology research and applications is not intended to be exhaustive; rather, we chose to highlight a representative sample of technologies with current use or future potential in SEL.

The Current State of Technology in Education

Researchers in the field of education have for decades been exploring and studying the use of various technologies for instructional purposes. A growing body of research has

With gratitude and deep respect for Dr. Frank Moretti's contribution to elevating the conversation about digital technology and education, we dedicate this chapter to him. Sadly, Frank passed before he could see this chapter in print.

shown positive outcomes from using educational technology across a variety of subject areas in K–12 education. For example, a large-scale, second-order meta-analysis of 25 meta-analyses encompassing over 1,000 studies and 40 years of research on technology and classroom learning found that the use of technology in classrooms shows a moderately positive effect on student learning, as compared to technology-free traditional instruction (Tamim, Bernard, Borokhovski, Abrami, & Schmid, 2011). Another meta-analytic study by the U.S. Department of Education (USDE), Office of Educational Technology (2012) found evidence that hybrid models of instruction—those that combine online learning with traditional, face-to-face instruction—produce better test scores and grades than either wholly online or wholly face-to-face instruction alone, across courses and subjects. The types of technologies studied were diverse and included student-centered learning, learning through computer simulation, project-based learning with technology, video games, and collaborative learning.

A problem with many of the studies listed, however, is that although research has led to what are perceived to be positive results across pedagogical approaches and supportive technologies, most studies fall short of describing the specific aspects of various technologies, as well as the specific variables within their contexts of use, that seem to produce certain outcomes. We mention this problem of vagueness with technology research in education because it applies across educational domains. This poses a challenge to a nuanced understanding of how certain technologies might improve educational programming, within which SEL is of primary interest.

Though the level of detail we wish to have about specific technologies and their contribution to education is lacking, the increasing number of studies showing positive outcomes of incorporating technology into teaching should not be overlooked. The USDE has published a national education technology plan for better incorporation of educational technology into teaching and learning in public education (Office of Educational Technology, USDE, 2010). The plan calls for using prevalent technologies to enhance public education by improving

student learning, scaling best practices, and using data for continuous improvement. The plan outlines a vision “to leverage the learning sciences and modern technology to create engaging, relevant, and personalized learning experiences for all learners that mirror students’ daily lives and the reality of their futures” (Executive Summary; Office of Educational Technology, 2010, p. x). The plan also calls for “connected teaching” (p. xii), in which educators connect to “resources and expertise that improve their own instructional practices and guide them in becoming facilitators and collaborators in their students’ increasingly self-directed learning” (p. 40). Educational institutions are incorporating technology into professional development via online courses, webinars, podcasts, and other technology with some promising findings in terms of increasing teacher media literacy and instructional efficacy (Barr & Bardige, 2012; King, 2002; Reich, Romer, & Barr, 2014). Given the push into educational technology being described by the USDE and the start of research on best practices of its use, our hope is that research will begin to shift toward more empirical testing that can help illuminate the features of specific technologies that improve learning. Furthermore, of central concern to this chapter, we look forward to more in-depth research into aspects of technology that can enhance the particular competencies of SEL. Yet, as we look at how the SEL field is beginning to incorporate a variety of technologies into programs, it is important to bear in mind that the evidence base supporting specific technologies in this effort is limited but promising, and requires more rigorously designed studies. Few studies investigating the specific aspects of technologies used in SEL have been done, and almost none have been carefully replicated to increase confidence in early findings.

A Brief History of Technology in Relation to Social and Emotional Variables

We are educating our children in a time when people are more connected to information and to each other than ever before. Eighty percent of teenagers in the United States use social networking sites; 93% of

them have Facebook accounts; furthermore, U.S. students spend as much time using digital media as they do in the classroom (Rideout, Foehr, & Roberts, 2010). Important to remember is that Facebook, YouTube, Friendster, MySpace, and Twitter all originated between 2002 and 2009. At the same time, Daniel Goleman's book *Emotional Intelligence* (1995) was only a few years old, and the field that we now call SEL was just emerging. So, of course, the creators of these early social technologies were educated before SEL was as widespread as it is across schools today. By 2010, nearly half of U.S. Internet users had online social profiles; hundreds of millions accessed Facebook on their cell phones; and television viewing reached an all-time high (Arbitron, Inc. & Edison Research, 2010; Media Literacy Clearinghouse, 2010). These statistics about increased use of social technology have been accompanied by questions about whether being more connected through technology has possibly led to people being less connected to each other in other ways (Putnam, 2000; Putnam & Feldstein, 2004).

During the same time frame in history (1990–2000), the field of SEL developed alongside rapid growth of technology with leaders and educators in both SEL and technology discussing overlaps in concepts and applications. One of the first psychologists to write about the convergence of emotion and technology was Sherry Turkle, in her 1995 book *Life on the Screen: Identity in the Age of the Internet*. Turkle expounded on how people were developing new identities online. Her patients' struggles and triumphs made problematic the idea of self-awareness in the online world, and its impact on mental health and healing. That same year, scientists saw the nascency of emotional intelligence theory and research (Mayer & Salovey, 1997; Salovey & Mayer, 1990), and the popularization of the concept of emotional intelligence around the globe (Goleman, 1995). The field of SEL and its educational programs surfaced soon after (Weissberg, Gullotta, Hampton, Ryan, & Adams, 1997). In 2000, Rosalind Picard published her book, *Affective Computing*, basing its title on the term she had coined, to highlight the importance of emotion in human–computer interactions, to influence the design of such interfaces, and to create

a vision for research on technology to sense, communicate, model, teach, and respond to human emotion. Higher education launched its interest in the intersection of technology and SEL competencies in the 90s. In 1996, Teachers College, Columbia University offered the first course on SEL competencies and digital technology. Just a year later, Teachers College held the first conference on the topic, and now, nearly two decades later, the conversation continues among educators, educational technologists, course designers, researchers, and psychologists around the world. In fact, in the late 1990s, one of the first technology platforms that specifically targeted SEL skills development for school communities, Project ExSEL, was launched. This interactive website, with a wide array of resources and games for students and teachers, was created in conjunction with a program bringing SEL into District 2 in New York City through the agency of school counselors. There are now a number of conferences, interdisciplinary research communities, and even departments at universities dedicated to understanding the relationships among technological innovation, social interactions, and emotion.

In response to the merging interplay of technology and SEL, some experts expressed skepticism about the potential for the Internet and social media to impact social and emotional development and well-being positively (Postman, 1993; Tiles, 1995). The perspective was that increasingly portable, omnipresent, and powerful communications technology was a large source of distraction and alienation. Now, 20 years later, some wonder whether social media have been stunting the emotional development of children (Gentile et al., 2004; Landhuis, Poulton, Welch, & Hancox, 2007; Zimmerman, Christakis, & Meltzoff, 2007). As Myers and Sadaghiani (2010) described in the introduction to their National Institutes of Health (NIH) study of millennialists in the workplace, popular media describe technologically savvy millennialists as being self-centered, lacking motivation, and acting in ways that are more disrespectful of or disloyal to supervisors and organizations than their generational counterparts. Millennialists are frequently categorized as digital natives, leaving some to wonder whether this has made them less attentive and more

disconnected in face-to-face interactions. Nevertheless, attributing a causal relationship to technological progress and large-scale change in human social behavior is extraordinarily complicated, requiring great caution.

Counterbalancing the critical views of technology is a focus on the potential for positive impact on human development, and, specifically, SEL (Jones & Issroff, 2005). Thus, it seems the optimists' goals in a world of inevitable technological growth are to find solutions to the social and emotional problems that new technologies may create, to employ them to help solve existing social and emotional challenges, and to generate novel uses of them to enhance our social and emotional worlds in innovative ways. In these ways, technological advancement can be constructive instead of destructive, and its benefits can outweigh its detriments.

Leveraging Technology to Enhance SEL

Consistent with the USDE plan for educational technology integration that we mentioned earlier, it becomes incumbent on SEL leaders to identify how to leverage existing technologies, so many of which are social in nature, to enhance students' self-awareness, social awareness, self-management, relationship skills, and responsible decision making. In the pages that follow we discuss how some SEL programs have taken up this challenge. Many SEL organizations currently use technology to support program delivery, supplement professional development, and cultivate community, yet there is great potential to leverage technology further to enhance the five SEL core competencies. In this section we explore how the marriage between SEL and technology is currently unfolding and what it might look like in the future. In our efforts to understand the current landscape, we interviewed leadership personnel at the Committee for Children (Second Step), the Developmental Studies Center, Educators for Social Responsibility, Facing History and Ourselves, Open Circle, Responsive Classroom, Ripple Effects, and the Yale Center for Emotional Intelligence (RULER [Recognizing, Understanding,

Labeling, Expressing, and Regulating Emotions]). Our primary objective in these interviews was to learn how leading organizations currently use (and envision using in the future) technology specifically to enhance SEL. What follows is a summary of our discoveries, outlined in Table 34.1 (Established, Emerging, and Future Technology to Enhance SEL). Our terms "established," "emerging," and "future" refer to the application of these technologies *within the field of SEL* specifically. During our interviews, we operationalized the term "established" to describe technologies mentioned by several (more than four) of the organizations. Technologies mentioned by only a few, or even just one, of the organizations were defined as "emerging." Finally, we compiled a list of "future" technologies that currently exist but do not have current applications, to our knowledge, within the field of SEL. In categorizing various types of technologies in this way, we hope to provide SEL organizations and program developers with a vision for how various technologies might be employed in the field of SEL in the years to come.

Established Technology to Enhance SEL

SEL organizations, knowing that teacher training/support, schoolwide coordination, integration with subject matter, and effective instructional strategies are key aspects to the successful implementation of SEL, approach teachers as agents of change (Elias, Zins, & Weissberg, 1997; Kress & Elias, 2006; Payton et al., 2000). In fact, in order for SEL programs to be identified as CASEL SElect, the program must offer "high-quality training and other implementation supports, including initial training and ongoing support to ensure sound implementation" (CASEL, 2012, p. 4). Therefore, it makes sense that many SEL organizations use teacher training as a point of entry to reach their goal of ultimately impacting students. Existing technologies, such as webinars, podcasts, online libraries, and discussion boards, support online training and resources for SEL programming by providing teachers with worldwide access to content, lesson plans, research, and skills-building strategies.

Several SEL programs, such as Second Step, RULER, Responsive Classroom, and

TABLE 34.1. Established, Emerging, and Future Technology to Enhance SEL

Established: Technology being used by > 4 interviewed organizations	Emerging: Technology being used by < 4 interviewed organizations	Future: Technology envisioned as future projects or directions
<ul style="list-style-type: none"> • Online supplementary trainings: <ul style="list-style-type: none"> ◦ Webinars ◦ Podcasts ◦ Video conferencing (e.g., Skype, Hangout) • Online supplementary support materials: <ul style="list-style-type: none"> ◦ Online libraries (i.e., PDF downloads, lesson plans) ◦ Software support (DVD sets) ◦ Online discussion forums ◦ Blogs/microblogs ◦ Social media 	<ul style="list-style-type: none"> • Online professional development: <ul style="list-style-type: none"> ◦ Certification/badging ◦ Onsite/online hybrid ◦ Synchronous–asynchronous • Online learning communities for teachers: <ul style="list-style-type: none"> ◦ Mobile learning management systems or collaboration platforms ◦ Remote video coaching ◦ Video libraries or podcasts (showcasing best practices) ◦ Digital teacher manuals • Online learning communities for students: <ul style="list-style-type: none"> ◦ Mobile learning management systems or collaboration platforms ◦ Video libraries or podcasts (showing SEL in action) ◦ Student generated media • Adaptive learning technology • SEL-focused online games and mobile apps 	<ul style="list-style-type: none"> • SEL-focused video games and mobile apps • Simulation centers (for teachers and students) <ul style="list-style-type: none"> ◦ Avatars ◦ Embodied agents ◦ Multimodal sensors ◦ Biofeedback • Current technologies with potential adaptation for SEL: <ul style="list-style-type: none"> ◦ Social media sites ◦ Texting ◦ Digital media cartoons ◦ Graphic novels

Open Circle, are moving supplementary trainings and support materials online to enhance communication between program users and to support sustainability. In fact, all of the organizations we interviewed use some combination of supplementary trainings, such as webinars, podcasts, and video conferencing, to provide elements of teacher professional development. Supplementary Web-based support materials, including online libraries, blogs, and discussion forums, extend access to research, curricula, lesson plans, teaching tips, and best practices to hundreds of thousands of teachers. For example, the Second Step website gives program users and families access to online training and extensive implementation support tools such as video libraries, implementation time lines and checklists, assessment tools, and electronic versions of sample homework. Furthermore, these groups track teacher engagement with their program materials using access keys linked to use of

the site (J. Kandel, personal communication, November 26, 2013). Some organizations, such as Responsive Classroom and RULER, have been using webinars to provide ongoing training to their certified consultants, in addition to their professional development for teachers. These established uses of technology provide SEL organizations with opportunities to expand their reach and scale-up as they are able to communicate with and provide resources to a large number of program users quickly. For schools that have ready access to computers and the Internet, supplementary trainings and support materials online can provide low-cost (for user) pathways to keep teachers engaged as learners and to inform them about new SEL-related content. However, studies and evaluations of these technologies are necessary to determine whether they lead to more frequent use, more effective teacher instruction, or more effective student outcomes related to SEL programs.

Emerging Technology to Enhance SEL

Our interviews with leading SEL organizations revealed several categories of technologies that are being used or developed in less than four organizations, and sometimes in only one organization. Although some of these technologies have been used for many years within specific organizations (i.e., the use of adaptive learning technology [Ray, 2009] by Ripple Effects), we classify them as *emerging* with respect to wider use within the field of SEL. The categories of *emerging technology* we discuss in the next section include online professional development, online learning communities for teachers and students, adaptive learning technologies, and SEL-focused games and apps (see Table 34.1).

Online Professional Development

Beyond simple online resources for teachers, online professional development, complex in design and implementation, requires tech savvy content expertise and ongoing management. Courses, workshops, and seminars can be designed in a variety of ways that can blend in-person and online learning, synchronous and asynchronous activities, and even reward users with badges and certifications as participation milestones are achieved. An example of an organization using online professional development to teach SEL, particularly empathy, which falls under the core competency of “relationship skills,” is Facing History and Ourselves (FHAO), which provides online, hybrid (both online and in-person), and face-to-face professional development generally delivered through an intensive seminar, followed by ongoing coaching and a wealth of online and actual resources that help teachers foster students’ historical thinking skills, social and ethical reflection, and civic learning (Reich et al., 2015; Romer, 2011). This intervention integrates content and pedagogy intended to engage students with diverse backgrounds in an examination of racism, prejudice, and anti-Semitism, in order to promote the development of a more humane and informed citizenry. The goal of this professional development is to increase teachers’ self-efficacy in creating

student-centered classrooms and developing students’ critical thinking and empathy. According to our interview with the organization, the online course strives to emulate this student-centered process that cultivates empathy skills. For instance, participants may enter an online space, where they can hear testimonials from Holocaust survivors or even tune into a live appearance with this type of speaker in a conference call in which they can converse with the speaker or other participants of the course (D. Chad, personal communication, November 21, 2013).

The CASEL SElect Second Step program created hybrid onsite and Web-based video training for middle school teachers, complete with all necessary materials and handouts that can be conducted in school in front of a live audience. Teachers watch the training video as if they are watching a live trainer, then stop at different points to have discussions and participate in small-group activities. This hybrid approach that blends the best of online professional development with the merits of live audience participation/collaboration allows them to scale their program and provide training that is easily accessible for all schools/districts (J. Kandel, personal communication, November 26, 2013).

The Developmental Studies Center provides SEL skills development to both teachers and students, embedded within math/literacy programs and as an explicit SEL program called Caring School Community. They have created an interactive, digital teacher manual that provides real-time (or “just-in-time”) collaboration and professional development opportunities. For example, if a teacher wants to see an example of a particular instructional skill mentioned in a lesson plan, he or she can immediately access an information link or video using an iPad, mobile phone, or computer. Teachers can make notes about their lesson plans on the digital teacher manual, which can instantly be transferred to other teachers in their school using the same manual. This kind of instant access to information enhances collaboration among providers and has the potential to be used in similar ways with student populations (F. Snyder, personal communication, January 30, 2014).

Online Learning Communities

Online learning communities complement online courses by providing users with ongoing access to resources (i.e., video libraries) and opportunities to enhance self-awareness and practice other SEL skills like social awareness, relationship skills, and responsible decision-making, through reflection, feedback, and collaboration (i.e., collaboration platforms, video coaching). They provide users with an easily accessible way to engage in sustained learning on a particular topic and with a specific cohort or community (Luppicini, 2007). Moreover, they provide opportunities for educators across the world to engage in dialogue with one another, learning from diverse perspectives and experiences and cultivating empathy (Reich et al., 2015). There is a growing body of research describing the nature and impact of online communities on our social awareness and understanding of others. The term “online community” generally refers to people who meet and communicate in an online environment (Preece, Maloney-Krichmar, & Abras, 2003). An increasing number of people spend time in online communities to develop relationships and exchange emotional support (Rainie, Cornfield, & Horri-gan, 2005) and more recently, to engage in educational experiences (Hollins-Alexander, 2013). Findings thus far suggest that among online communities, empathy occurs most often through textual communication (Dasgupta, 2006), primarily in various styles of posts, comments, and responses, rather than other forms of media, such as video or audio posts.

Some organizations focused on SEL have started developing these communities of learning for their certified consultants and/or program users. One example of such an organization is the Yale Center for Emotional Intelligence and its CASEL SElect program, The RULER approach to SEL (Rivers & Brackett, 2011). RULER uses a Web-based learning platform to create and support a community of educators who share their work, challenges, successes, and creative ideas. After educators receive initial in-person, intensive training, the online platform serves as a medium both for ongoing coaching support and for Yale researchers to monitor program fidelity of implementation.

The platform also includes an online certification program for trainees, who move through the certification by attending coaching sessions in virtual meeting rooms, viewing instructional videos, uploading materials based on program implementation, journaling about their experiences with the program, and receiving feedback from Yale staff members. Teachers confronting various challenges can collaborate online with other teachers or with coaches to review student work, lesson plans, and videos of instructional practices.

Online communities also can provide platforms for remote video coaching and mobile collaboration. Open Circle, another CASEL SElect provider of evidence-based curricula and professional development for K–5 students–teachers, has historically focused on face-to-face training and coaching. Since 2012, they have started building in the option of online coaching to expand their geographic reach. Teachers using Open Circle film themselves teaching their lessons and review them, together with their coach, online using software such as Google Hang-out with YouTube. Teachers have an opportunity to see themselves in action, watch their own emotional expressions and body language, hear their own tone of voice, and see their students’ emotional reactions to them. Although this method of coaching has not yet been formally evaluated, the teachers self-report that alongside a coach, they are able to see strengths and weaknesses in themselves that they otherwise may not have seen, which helps them to become more emotionally literate and self-aware (N. Biro, personal communication, November 14, 2013).

Less common than online learning communities for teachers are online learning communities and collaboration platforms that include teachers and students. Only one of the organizations interviewed, FHAO, has developed and evaluated an online learning community that includes students in the online learning process and experience. The Digital Media Innovation Network was designed to help diverse educators around the world connect to share knowledge, resources, pilot materials, and strategies for how to incorporate new media into the teaching of FHAO curricula. During this project, teachers first engaged their own

students with new media, then joined the other participating teachers and their students from diverse classrooms from across the world (United States, South Africa, China, Canada, and the United Kingdom) in a 1-week online community to share their online projects. The project had multiple learning goals for students: to provide new platforms for student expression and student-generated work; to enhance their media literacy; and to foster their appreciation of difference and their own agency. Teachers employed new media as knowledge and as culminating projects; students created and shared on a Ning platform their digital reports on topics ranging from teen pregnancy to voting rights to gang violence. To illustrate how this works, an urban student from the midwestern United States could watch and provide feedback on a video report created by a student in China, using the social media tools provided on the site. The FHAO evaluation team looked at student outcomes of this project by qualitatively analyzing and coding students' patterns of interaction during their online discussions and by collecting students' self-reports about their experiences. Although the evaluation was conducted internally, the evaluation team was separate from the educators working on the project. The evaluation results indicated that students increased their sense of agency and civic engagement while practicing tolerance for different cultures and points of view (Romer, 2011). The analyses suggested that the online platform helped students to engage in civic dialogue, experience diversity, and appreciate multiple perspectives from student peers all over the world at a much deeper and experiential level than simply studying the topics with their local peers.

Adaptive Learning Technology

Another type of technology that supports student SEL skills development directly is adaptive learning technology, in which computers adapt assignments and content based on students' learning styles, assessed through their responses. The most widely used, direct-to-learner SEL technology is the Ripple Effects Whole Spectrum Learning Intervention[®], an adaptive (expert system), skills-building, and motivational counseling

platform and library of content. In addition to systematic SEL skills building, it empowers students to address privately multidomain risk factors that may underlie presenting problems or emotional distress. Matching users' natural selection patterns to multidisciplinary domain expertise, the program provides the "set" of SEL strategies most correlated with effective approaches to each learner's case. Each of 700+ tutorials include at least nine instructional modes: case study, cognitive framing, behavioral instruction; peer modeling (video); assisted journaling, role-play opportunities, transfer training, and media analysis; and game-based assessment of content mastery (Ripple Effects, 2014). In addition, many have video true stories and interactive personal profiles. All content is illustrated and peer narrated. NIH and foundation-funded randomized controlled trials conducted by third parties in urban, suburban, and rural settings have demonstrated significant positive impacts on grades, retention in school after 1 year, suspension rates, empathy and problem-solving scores, and attitudes toward alcohol (De Long-Cotty, 2008; Perry, Bass, Ray, & Berg, 2008a, 2008b). An iPad-based app for early learners has recently been added to the suite.

SEL-Focused Online Games and Mobile Apps

Over the last couple of decades, online gaming and video gaming have been on the rise, and some developers have already established games and mobile apps that target SEL skills development. One example, The Empathy Games[®], is an interactive teaching platform (available online and as a mobile app) that provides children with an opportunity to introspect and practice the skills of empathy in a fun and engaging way. When players enter the site, they begin a series of interactive games that lead them through an experiential process designed to reveal different aspects of the empathic attunement process. Integrating a variety of media, including video, images, audio, text, animation, and instant messaging, each game helps players become more aware of their personal self-state, as well as the inner experience of the other person. The games are designed to strengthen players' ability to put themselves into the other person's shoes. In essence, the games focus on increasing

empathy skills, which can contribute to students' abilities to resolve conflict peacefully and respectfully. Another educational game that specifically aims to enhance SEL competencies, called IF, was developed out of a partnership between If You Can Company and educators and researchers from Nueva School, Yale, Stanford, and CASEL. This adventure video game teaches conflict resolution skills and stress reduction strategies such as breathing exercises. The game asks students to practice what they are learning in their lives. An IF app for adults allows parents, caregivers, and teachers of students to receive updates on what the children are learning, which includes discussion questions and activities to reinforce what the game is teaching. Games such as these create opportunities to increase access and exposure to effective educational programming for children everywhere. While some SEL-focused games and educational apps have existed for many years, many SEL organizations have yet to explore the tremendous potential of these learning tools.

Potential Technology to Enhance SEL in the Future

New technology emerges every day; yet many technologies that have been in use for years, or even decades, have yet to be explored in the context of SEL. In this next section, we discuss new technologies that have potential to enhance SEL in the *future*. The technology categories and specific applications mentioned here (and in Table 34.1) are by no means exhaustive, especially given the rapid pace of technology innovation across industries outside of education, from cinema to manufacturing. Nevertheless, our hope is that SEL program developers and users will find this overview helpful.

SEL-Focused Video Games and Mobile Apps

Although several SEL-focused games and apps currently exist as mentioned in *emerging technology*, we believe that there is great potential for further development of new games by SEL organizations and use of existing games within SEL programs and in schools. One example of an app that is in beta format, soon to be released to the public, is the Mood Meter, designed by

HopeLab in collaboration with researchers at the Yale Center for Emotional Intelligence. This app helps users learn how to accurately recognize, label, understand, and manage their emotions by recording them on an emotion grid and tracking them over time. Users can see reports of their feelings over time to discover patterns, and the app provides recommendations on strategies to help manage different types of emotions. We envision many more games and apps like this one being developed in the future by SEL organizations in collaboration with game developers. In addition, as game developers become more aware of SEL through its increasing exposure, they might consider creating games that incorporate SEL competencies.

Simulation Centers: Avatars and Embodied Agents

Simulation centers that utilize avatars and embodied agents can provide opportunities for students to explore and develop core SEL competencies. Embodied agents are digital, visual representations of an interface, often taking a human form (Cassell, 2000). In the context of computers and the Internet, an *avatar* is defined as a graphical character that represents the user in another environment (Boberg, Piippo, & Ollila, 2008). An example of how technology can enhance students' understanding of others (social awareness) is through participatory role play conducted online through simulations in which embodied agents encourage emotional and cognitive engagement between the user and the online environment (Ong et al., 2011). Simulations offer opportunities to practice new scripts and behaviors in physically and emotionally safe online environments. One such example is Kognito Interactive, which creates role-playing training simulations and games related to behavioral health and well-being. Users learn effective communication skills for managing emotion-laden and difficult situations by practicing with animated, intelligent, and emotionally responsive embodied agents. Currently, a variety of Kognito products allow educators to learn how to support at-risk students or diverse student populations. Developers could create a series of interpersonal student simulations about a variety of

challenging situations to teach SEL competencies such as relationship skills and social awareness. In the future, simulations of this kind have great promise for the social and emotional development of both adults and students. Some SEL organizations, such as the Developmental Studies Center (DSC), have already started developing simulation technology. DSC will be incorporating something called a “thoughtful discipline program” to support teachers with behavior challenges in the classroom. The simulation center provides teachers with a safe space to practice new scripts and behaviors, and get feedback on their communication and behavior modification style. This format allows teachers to learn from their mistakes without being in a vulnerable position in front of their colleagues; furthermore, this technology allows schools and districts to scale-up their professional development by providing teachers with quick access to this technology. Ultimately, DSC plans to develop similar types of virtual simulations for middle- and upper-grades schoolchildren to practice how they would handle challenging or emotion-laden situations.

The Trust Project, a collaboration between the Yale Center for Emotional Intelligence, Wright State University, and Firestorm software, creates a simulated environment that uses both avatars and embodied agents to teach social and emotional development for Army personnel. After a short, 5- to 10-minute training on how to navigate the simulation world, users create their avatars and meet their avatar teammates. They learn various SEL skills development tools used in the RULER approach to SEL (i.e., Mood Meter, Meta-Moment) guided by a computerized empathetic partner (or CEP). Once they have received the training, they have to perform a task within the virtual environment in which they can choose to listen to or ignore feedback from the CEP. While they are doing these tasks, multimodal sensors that measure skin conductance and track their eye movements (pupil dilation and initial fixation) measure their emotions and engagement (in the future, facial recognition software and electroencephalic [EEG] measurements will also be included). Eventually, this technology could be used to create software that responds to participants’ emotional states in real time and gives congruent

feedback. In a classroom, for example, the software could provide emotionally intelligent responses to students based on their facial expressions and physiological indicators (M. McCoy, personal communication, February 19, 2014).

Simulations like these can incorporate biofeedback technology to help users develop self-management skills. EmWave Desktop and Handheld Technology, developed in the last decade by a team of researchers at Rutgers University, provide students with computer-assisted learning supports to help them regulate emotion and obtain optimal performance and focus. The program provides biofeedback, auditory coaching, and a series of games that reinforces gradual progress toward optimal calm and focus. Through repeated practice, these methods help students learn, kinesthetically, how to regulate emotion and manage stress, leading to improved mental clarity and overall health. Studies on EmWave, some peer reviewed and others not, have demonstrated encouraging results in children with attention deficits (Goelitz & Lloyd, 2012; Lloyd, Brett, & Wesnes, 2010) and test anxiety (Bradley, McCraty, Atkinson, & Tomasino, 2010); we look forward to additional studies that clarify the specific role that EmWave contributes to these results. When bundled with simulations and other technologies such as Ripple Effects, students can learn in real time how their bodies respond to emotion-laden situations and practice self-regulation strategies.

Current Technologies with Potential Adaptation for SEL

In addition to video games, mobile apps, and simulation centers, several other, current technologies have potential adaptation uses for the field of SEL, including social media sites, texting, and digital media cartoons/graphic novels.

Social Media Sites. Although there are some potentially negative effects from the use of various social media sites, such as cyberbullying, these sites can also provide opportunities for ongoing social and emotional development. Victims of cyberbullying experience higher levels of depression and anxiety, poorer academic performance,

and higher rates of suicidal thoughts and attempts (Bauman, Toomey, & Walker, 2013; Slonje & Smith, 2008). However, technology can create and preserve examples of damaging exchanges that occur; cyberbullying and harassment can be studied and reviewed; and discussion between parties and with teachers or other adults becomes possible. One example of how social media can be modified to help users deal with upsetting reactions is a current project by Facebook. Facebook is now collaborating with a team of psychologists and researchers at Yale University and the University of California at Berkeley to develop tools that can increase reporting of online abuse and encourage teens to communicate with one another safely and effectively. Originally, when users of Facebook experienced a problem with something that someone posted, the platform offered to “report” the post, then brought users to another screen with the option of either blocking the person or getting help from a trusted friend. With information gleaned from focus groups conducted by the Yale researchers, Facebook has added a series of screens that (1) ask users to select an option to describe their experience (e.g., “I just don’t like it,” “The post is mean or disrespectful,” or “This is an example of threatening behavior”), (2) question how the post made them feel, (3) provide simple, effective guidance for less threatening versus more threatening posts, and (4) offer positive prepopulated messages based on the emotions users report, which they can edit and send to either the creator of the content or trusted adults or friends. The overarching goal of this project is to cultivate social awareness and responsible decision making in Facebook users and especially youth.

Texting. Texting is another technology being used by teens with potential for further exploration in SEL. One example of this is Crisis Text Line, a service that provides young people in any type of crisis access to free, 24/7, emotional support and information they need via text messaging. Essentially, a teen texts the Crisis Text Line, and a live, trained specialist receives the text and responds quickly with counseling and referrals through text message. SEL organizations might consider how texting could be used to share information with teens about

effective social and emotional strategies, such as positive self-talk, and reframing of unpleasant emotions.

Digital Media Cartoons and Graphic Novels. Given the growing popularity of cartoons and graphic novels among teens today, these media translated online about SEL-specific content could have a positive impact. *The Transporters* (Baron-Cohen, Golan, Chapman, & Granader, 2009), a digital media cartoon series, teaches children how to read faces and emotions better. It was originally designed for children with autism but can be adapted to teach identification of feelings among a variety of young people. The content itself includes episodes showing basic emotions in context, interactive quizzes, and an instruction booklet for educators. The results of research on this project showed that the media helped teach children emotion recognition and the translation of this emotional awareness into real-life situations (Baron-Cohen et al., 2009). Certainly, digital media cartoon series, like this one, and online graphic novels can be targeted specifically to topics related to SEL for a wider student audience.

From video games to simulation centers and social media, a wide array of current technologies exist that have potential to support SEL professional development for teachers and programming for students.

Problems and Pitfalls

Although we have primarily focused on the new possibilities that technologies can offer the field of SEL, we cannot ignore the many challenges that need to be addressed. This following section provides the reader with some key problems and pitfalls within the current state of technology in SEL, most notably, that research on technology in SEL is very limited, technology can cause harm, and ethical concerns must be considered.

Research on Technology in SEL Is Very Limited

- Because of the momentum around technology in education, there is a tendency to assume rather than to confirm the advantages of using technology. For example, put-

ting an SEL course online might not be the best way to conduct that course.

- SEL program research typically focuses on the effectiveness of the program overall (using a variety of criteria) and rarely includes empirical studies of the specific technology aspects used within the program and how they may (or may not) enhance the overall effectiveness of the program.

- Because many variables determine the outcome of an educational program, it is difficult to attribute cause-and-effect relationships between technologies and outcomes. The pitfall is the potential for attributing a falsely causal relationship between the technology used and a successful SEL outcome.

Technology Can Be Harmful

- Communications using technology without the nonverbal cues of face-to-face interactions, such as body language, tone of voice, facial expression, and other visual cues, can lead to miscommunication and misunderstanding, ultimately limiting and sometimes damaging social interactions. Some believe that technology may even weaken our skills in these areas by pulling us away from meaningful interpersonal exchanges.

- Social technologies permit the expression of potentially offensive or critical words that can be viewed by countless others and live in cyberspace for eternity. For example, bullying online is a repeat offense requiring just the click of a button; for such a simple action, the consequences for others can be life altering.

- Some studies have revealed that higher levels of self-disclosure exist in online spaces compared to face-to-face exchanges (Joinson, 2001); this may contribute to the growing trend in cyberbullying as personal information becomes fodder for hostility and public ridicule, which can remain potent long after its posting.

- Social technologies can promote unhealthy comparison, self-criticism, or devaluing, which can be more selectively avoided in offline interactions. For example, a person working through the breakup of a relationship and the associated feelings of loneliness can choose his or her offline inter-

actions carefully, whereas being online can lead to continual updates and pictures that may make it difficult to be anything but self-critical about the situation.

Ethical Concerns Must Be Considered

- Using Web-based mobile technologies increasingly requires one to share personal information to various degrees. The decisions about where that information lives, who has access to it (and for how long), and who is making these decisions, is an ethical concern, particularly for educators who request student participation in these technology-driven programs. What responsibility do educators have, or might they have, to students whose information goes into cyberspace? This is particularly pertinent in SEL, where children are recording private thoughts and feelings online. Could these private moments accidentally be accessed and cause harm to the student in some way?

- Encouraging students to use certain social technologies requires their understanding and literacy about their online presence and reputation. The lines between private and public are blurring, and the ethical concern here is the degree to which teachers and parents are or should be responsible for this “literacy” of children, and when to shift that responsibility to students as they grow up.

- We must consider whose responsibility it is (e.g., parents, teachers, school leaders, game developers) to ensure developmentally appropriate exposure and involvement with technologies.

Recommendations and Guidelines

Though we cannot ignore the challenges that technology begets, we can focus on the potential that lies within technological development and its integration into the field of SEL. In this section, we provide recommendations and guidelines for schools committed to SEL, and SEL organizations and programs to consider. Specifically, we recommend how schools, application developers, and SEL organizations can (1) integrate research on technology into their SEL

program evaluations, (2) look outside the field of SEL for inspiration, (3) form strategic partnerships, (4) develop more effective communication and delivery methods, and (5) address important ethical concerns.

Integrate Research on Technology

- Research and understand whether and how technology applications in SEL lead to more effective teacher professional development and instruction, and more effective student outcomes.

- Consider formal methods of educational technology creation to foster an iterative cycle of exploration, construction, and formative assessment. We recommend a method of development that allows for the study of technology and its use alongside established and empirical pedagogical theories and practices.

- Assess a range of positive and negative outcomes (e.g., attention problems, anxiety, stress management, self-efficacy, motivation) to understand what is likely or unlikely to be positively influenced by specific technologies and their applications.

- Conduct research on the best ways to disseminate different technologies effectively to various audiences.

- Evaluate blended learning: how technology impacts professional development and student learning. What is the most effective balance between online and offline learning in terms of successful training transference and sustainability, as well as student performance?

Look Outside of SEL for Inspiration

- Look at existing mobile technologies, video games, apps, and simulations that already teach skills that might be transferable to SEL programs.

- Look at technologies in development at universities or emerging companies that are beginning to test innovations in human-computer interactivity, such as robots, artificially intelligent agents, avatars, virtual realities, and simulated actors. These may have great potential for expanding teaching and learning of SEL across a variety of audiences.

- Continue to create and optimize emotion recognition software, computer games, and other technologies to help specialized populations with social and emotional deficits.

- Incorporate technologies such as Web and software resources, and online coaching and communities, into SEL skills training.

- Consider ways to incorporate SEL skills building into those systems that educators are already using as the framework for course delivery (learning management systems [LMS], such as Blackboard). The opportunity for skills building could exist alongside or be integrated within the formal academic curriculum.

- Ensure that game developers and curriculum designers have SEL experts as part of their groups prior to designing or building SEL into games or courses with technology.

Form Strategic Partnerships

- Align with organizations or educational institutions that already have wide distribution and online learning platforms (e.g., *amplify.com* and *greatschools.org*).

- Partner with technology centers and research institutions to evaluate technology in SEL programs and/or develop new technologies.

Develop More Effective Communication and Delivery Methods

- Develop more effective communication and delivery methods by getting parents and teachers on board with new mobile technologies.

- Offer more and varied courses on media literacy for students and for school staff.

- Use technology to promote SEL by educating various groups, such as the public, policymakers, educators, and researchers, about the value and application of SEL.

Address Important Ethical Concerns

- Monitor how technology is used and by what populations, and carefully evaluate any potentially negative, as well as positive, impacts it may have on students and adults.

- Increase awareness of cyberbullying and use technology platforms to create experiences that can foster a variety of means to prevent it and encourage more prosocial interactions and communities online.

- Encourage everyone, including researchers, educators, parents, and policymakers, to take up the challenge to educate themselves about the potential benefits and limitations of technologies as they are uncovered by evidence-based research and practice.

Concluding Comments

We look forward to a time when we can refer to a strong body of evidence showcasing the added value of technology in cultivating SEL competencies. Currently, state-of-the-art digital technologies are evolving so quickly that some approaches will likely be transformed or supplanted by the time this chapter goes to print. In the last few decades, scientists, psychologists, and educators have only scratched the surface of the many challenges and potential benefits of the marriage between technology and SEL. Far more than being just a medium for playing video games, sharing text messages, or passively watching hours of television, technology holds potential for active, interactive, creative, educational, and positive purposes, including social and emotional development. Despite some of the challenges cited in this chapter, we see tremendous potential and an abundance of hope for the future. It is both curious and exciting to ponder the possibilities that lie ahead for this unique partnership between digital innovation and SEL.

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