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One-to-One Technology Initiatives in K-12 Education

INTRODUCTION

One-to-one initiatives, which pair each (one) student with one laptop, mobile device, or tablet to use in the classroom, have become popularized in recent years as schools seek to effectively and authentically integrate technology and learning. For a program like this to succeed, it is necessary to review both one-to-one success stories to get an idea of what worked as well as stories of one-to-one implementation failure to understand where the weaknesses of this program lie so they can be addressed before they become a problem.

We reviewed 22 published papers that focused on the implementation of one-to-one programs in school environments, and the results of these studies vary. The target population consisted of students who ranged in grade level from first grade to high school who were either from Europe, Australia, or North America. Among these studies, some reported the practice can benefit students in the technical, cognitive, and ethical categories in technology-based education (Léger & Freiman, 2016; Peterson & Scharber, 2017) while others did not find evidence that one-to-one can sufficiently benefit students (Harper & Milman, 2016; Selwyn, Nemorin, Bulfin & Johnson, 2017; Blackley & Walker, 2015). In this review, we will firstly summarize both the pros and the cons of one-to-one, and then we will list the suggestions and principles those studies recommended for future applications.



PROS

The relationship between teachers and students changes from the traditional instructor and apprentice to technical supporter and assistant.

Blau, Peled, and Nusan (2016) found that students enjoyed helping their teachers solve technology-related problems, which resulted in an increase of the students' technological knowledge. It turns out that actively integrating technology into class in this way gives students a sense of responsibility and autonomy (Blackley & Walker, 2015) and improves engagement and motivation (Harper & Milman, 2016).

One-to-ones support language learning.

One-to-one instruction can improve children's writing (Warschauer, Zheng, Niiya, Cotton, & Farkas, 2014) and support English Language Learners (ELL; Prince, 2017)—since technology is able to support visual learning, language translation, and multimodal demonstration of learning for international students.

One-to-ones necessitate a student-centered, dynamic teaching style focused on equity.

One-to-one implementation naturally lends itself to creating equity in the classroom, which encourages teachers to shift their teaching styles to a student-centered, dynamic approach that enables students with different needs and learning styles to engage with materials in a manner best suited to enable each of them be successful (Walker, Johnson, & Silvernail, 2012). A study by Lu, Ottenbreit-Leftwich, Ding, and Glazewski (2017), for example, showed that instruction is more efficient when teachers can assign students different applications to work on, based on their literacy levels, then track and assess their progresses later.

CONS

Funding shortage is one of the biggest obstacles addressed in the literature.

A shortage in funding for a program makes it difficult for these districts to provide the equipment and training necessary to implement and sustain a one-to-one, such as professional training for teachers, equipment maintenance, and IT specialists. In these cases, any significant cut in funding could very possibly lead to the program's failure. Reallocation of existing funds, as opposed to one-time funding these resources, was suggested by one study (Simmons & Martin, 2016), but such redistribution of funding poses difficulties for some schools (e.g., a Birmingham one-to-one program eventually failed because of a funding shortfall caused by redistribution; Warschauer et al., 2014).

Studies reported that they did not find a correlation between one-to-one programs and overall academic improvement.

Many studies (Blackley & Walker, 2015; Beaver, et al., 2015; Blau, et al., 2016; Blikstad-Balas & Davies, 2017; Selwyn et al, 2017) reported that they could not conclusively determine if the one-to-one technology-enriched educational environment positively affects academic performance, citing that when regularly using technology in class, students would often be less focused and more easily distracted (Blau et al., 2016; Blikstad-Balas & Davies, 2017; Harper & Milman, 2016); that there is no guarantee that the teacher will be able to create or manage the "controlled classroom chaos" this program requires; and that dependence upon digital equipment for routine reading and writing could negatively impact students' performance on tests (because many public school exams are still administered in the traditional "pen and paper" style Blikstad-Balas & Davies, 2017).



Additionally, some researchers noted that offering technology in the classroom created more learning obstacles, appearing to contribute to increased relational aggression via cyberbullying (Walker et al., 2012; Selwyn et al., 2017).

Teachers can struggle with both learning new technology and finding their role in the classroom after adding technology to it.

Introducing new technological tools into the classroom takes teachers out of the position of experts on subjects and on imparting knowledge and puts them, instead, into the position of a “guide on the side,” which can be a difficult adjustment (Blackley & Walker, 2015; Blau, et al., 2016; Pautz & Sadera, 2017). Teachers must not only be knowledgeable about the material, but to correctly implement new technologies, they must also have excellent technical skills. To do this well, teachers need to spend more hours in professional development and other training. Blau and colleagues (2016) reported that a school in Israel required teachers to take a 30-hour professional development course just to learn how to implement laptops in the classroom.

Running, maintaining, and remaining educated about classroom technology presents a challenge to any one-to-one implementation.

To implement technology effectively in the classroom, each teacher must quickly become a relative expert at that technology. However, different devices and apps utilize different platforms to operate, which can create an issue when training teachers to use them (Peterson & Scharber, 2017; Selwyn et al., 2017). The additional strain caused by quick changing devices creates problems for one-to-ones.

Keane and Keane (2016), for example, reported that switching from Netbooks to iPads brought about the failure of their one-to-one. Since these new iPads ran on a different operating system from the Netbooks, teachers were required to undergo training. Training was expensive, and some teachers never felt like they understood the new operating system well, despite that training (Pautz & Sadera, 2017). Complications caused by these issues eventually resulted in the discontinuation of the one-to-one program.

Beyond equipping teachers with a basic working knowledge of the devices, apps, and operating systems, a school that is implementing a one-to-one will also specially train technical staff to understand and troubleshoot various devices and address requests outside of the boundaries of their original responsibilities (Simmons & Martin, 2016). This puts a greater responsibility on these IT-focused educators and requires a larger time commitment from those educators. Beyond that, it also puts a heavier fiscal responsibility on the school to ensure these specialists are trained thoroughly.

Even when training isn’t an issue, keeping devices charged and maintained properly is a constant concern. Even something as simple as lack of access to power outlets can prevent a device from being charged in time for use during an activity or lesson, creating what could become a common problem (as seen in Selwyn et al., 2017).

“ The literature shows that the most important factors in the successful implementation of a one-to-one program are stable financial support (Pautz & Sadera, 2017) and dedicated leadership (Simmons & Martin, 2016; Keane & Keane, 2017). ”



SUGGESTIONS

The literature shows that the most important factors in the successful implementation of a one-to-one program are stable financial support (Pautz & Sadera, 2017) and dedicated leadership (Simmons & Martin, 2016; Keane & Keane, 2017). School leaders whose schools take on a one-to-one must both understand and uphold special, new roles that a one-to-one program will create for them and must be prepared to manage a lot of behind-the-scenes support for teachers.

FINANCIAL SUPPORT

Stable and sufficient financial support matters a great deal to a one-to-one program. Suggestions from Simmons and Martin (2016) indicated the best source of funding are public-private partnerships, as well as some grants to cover short-term costs.

LEADERSHIP

Pautz and Sadera (2017) perhaps best defined the special, new roles a school's leader must take on with a one-to-one and listed five important tasks/roles for these school leaders.

Leaders must take on the responsibility of optimizer and understand the change process.

Principals need to maintain high morale, convey confidence in their staff, and act as an emotional support for teachers. In a one-to-one program, they take on the responsibility of an optimizer, ensuring efficiency and overall program success, while keeping in mind that this change is challenging and adjustment takes time. They need to take a slow, measured approach to one-to-one implementation and accept differences in the rate at which people change. In addition, they need to “build relationships with their staff, demonstrate comfort with uncertainty, and foster a collective mindset of continual improvement” (p. 54).

Principals must act as an agent of change, supporting risk-taking and innovation.

Principals need to publicly acknowledge and celebrate teachers who take risks, encouraging them to do so by also celebrating failure and what can be learned from it. This means that principals should maintain a high degree of comfort with uncertainty and conflict and be willing to have difficult conversations. They also must be ready to change approach and leadership, based on staff needs.

Principals must grow as instructional leaders.

Principals need to keep passion in technology integration and supported innovation through risk taking. It is important for them to have continuous improvement through a multitude of collaborative, ongoing, job-imbedded professional learning opportunities. The learning is not only on technology integration, but also on standards and students' choices.

Principals must be ready to respond to new challenges.

For the teachers who are unwilling or too slow to change, principals need to focus on continued improvement, encouraging these teachers to consider alternatives. They also need to maintain a high morale in the face of challenges, such as managing their own emotions and feelings.

Principals need to work at fostering relationships.

Principals need to build relationships among staff members and encourage them to use a collaborative approach to change and reaching goals. They also need to find their own support networks that consist of people who are able to support their processes of emotional change as well as their leadership needs.



MANAGEMENT

Plan well ahead of time

Simmons and Martin (2016) recommended that planning take place at least one year in advance of deployment of a one-to-one, planning for long-term sustainability and identifying locally appropriate strategies. Identifying clear goals and student outcomes for the one-to-one to target is an important part of this planning process. With specific objectives (e.g., improved writing test scores, developing multimedia programming skills, remedial study tools), teachers and schools can identify how technology can be incorporated into pedagogy and curriculums to better serve these goals.

Professional development for teachers

As far as the new tools go, teachers are learners as well. To keep them up to speed, teachers need well-designed and comprehensive trainings. Simmons and Martin (2016) suggest using collaborative professional learning teams at various levels (teachers, principals, and district leaders) as well as hiring professional IT staff or providing on-line training tools. This kind of training is helpful, allowing teachers to solve concrete problems after routine practice rather than overwhelming them after throwing them into the classroom with no preparation.

Program development and equipment selection/cost

It is still unclear as to which operating system or platform would be better for one-to-one. In general, the choice of device depends on the cost that a district can afford and the demands that the goals of the program would place on the technology. One study suggested that cheaper devices were sufficient for the needs of the school when comparing across different devices (Walker et al., 2012).

Class management: The way teachers use the electronic equipment is more important than the original design before classroom integration

Lu and colleagues (2017) provide suggestions to make good use of iPads in literacy learning. They suggest:

1. Students should constantly focus on tasks. Especially let them focus on short activities.
2. Teachers should differentiate instruction, assigning students to work on different applications depending on their own proficiency with the topic/information being studied.
3. To best manage this differentiated instruction, teachers should track and assess students' individual progress, following individual learning paths for each student.
4. Teachers need to take advantage of the unique features of tablet technology to create developmentally appropriate learning environments.





CONCLUSION

One-to-one programs fail when they become costly or funding cannot be obtained. To keep costs down, schools that implement one-to-ones must be prepared to change: teachers have to keep open minds and be willing not only to learn from traditional training but their students, as well; they have to be prepared to take a step back, becoming a guide to help their students explore and create their own learning while maintaining “controlled chaos” in the classroom; and principals have to be ready to support and challenge their teachers while remaining open to new innovations themselves (Pautz & Sadera, 2017).

Technology can expand the number of topics that can be taught authentically and be an integral classroom tool, but it cannot replace teachers (Henderson-Rosser & Sauer, 2017). By creating an environment where students have access to both their own technological devices and their teacher, they have the opportunity to connect their learning across subjects and understand its application in a real-world context.

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