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Even after conducting a robust planning process, the introduction of advanced technological tools in classrooms can fail to produce positive outcomes if implemented poorly.<sup>15</sup> The process of e-learning adoption requires significant investments in dedicated IT staffing and human resources training.<sup>16</sup> Leaders will also need to identify solutions to the challenge of extending connectivity to the homes of all students so that access to the types of learning made possible in schools is not limited to the premises.<sup>17</sup>

planning.<sup>23</sup> Integrating technology “[appears] to increase their students’ productivity and outputs by accelerating their students’ rate of learning.”<sup>24</sup> This is because for students with learning disabilities, assistive technology tools such as word prediction and speech-to-text help them overcome the physical barrier of writing by hand. In addition, sharing their projects with peers or online, motivates students to take pride in their work and in turn, produce higher quality assignments.<sup>25</sup>

Another beneficial aspect of online learning is the ability for student autonomy and interest-based learning. With technology, teachers can cater to unique learning styles and interests, motivating students to learn by allowing them to pursue areas of study they find especially interesting. For example, using “multiple means of expression” (various types of media to display information) boosted students’ performance, overall achievement, and willingness to engage.<sup>26</sup> Further, by using technology, students can access content at home, allowing for continued learning outside the classroom.

There are obstacles to applying e-learning tools in the classroom. Students, particularly those with learning disabilities, often lack the analytical skills necessary to effectively conduct online research.<sup>27</sup> Given that students with learning disabilities can become overwhelmed when performing complex tasks, some classrooms use chunking, a tool that, “minimizes the number of new technical skills introduced, so that the focus remains on learning the content of the lesson and not on learning the tool.”<sup>28</sup> In addition, it is often challenging for students to find information on the internet as sources often exceed their reading ability.<sup>29</sup> Thus, for students who struggle to read, online reading can be overwhelming. Finally, one universal concern about technology in the classroom is the heightened access students have to distracting content. Steps can be taken to address distraction, including limiting or blocking websites, using software that monitors student’s online activity, and even configuring the classroom so that the students’ screens are visible to the teachers.<sup>30</sup>

Online learning encompasses a wide range of educational activities and resources presented to students via the internet.<sup>31</sup> An online curriculum can be administered in three distinct ways: through entirely online distance learning, integration into a traditional classroom setting, or through a blended model. Online distance learning refers to a method of teaching done either entirely or almost entirely via the internet.<sup>32</sup> Under this model, in-person interaction between students and instructors may be very limited or even non-existent. Instead learning is largely self-directed, as students complete assigned

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lesson plans with the assistance of online instructional tools or remote contact with an educator.<sup>33</sup> Online learning does not, however, necessarily have to be done from a distance.

Educational technology can also be integrated into traditional classroom settings. In this method, technology is used to assist and supplement instruction from an actual teacher, and students still attend a physical school during weekdays.<sup>34</sup>

In between distance learning and integration into a traditional setting are blended models of online learning. Blended learning "describes any combination of online learning and site-based, face-to-face education."<sup>35</sup> This definition includes schools in which curriculum is delivered through a mixture of distance learning and either traditional in class time or in person tutoring time. Each of these definitions is relatively broad and leaves significant room for variance. Within blended learning courses alone, there is a range, on average, of 30-79 percent of content being delivered via an online medium.<sup>36</sup>

Many scholars study the efficacy of online and blended learning models in comparison to traditional forms of classroom instruction.<sup>37</sup> On average, fully online distance education produces learning outcomes that do not differ substantially from traditional classroom instruction.<sup>38</sup> Still, there is wide variability between studies, as some favor distance learning and some favor classroom instruction. Blended learning has recently been thought of as the "best of both worlds," combining the efficacy of online and classroom learning.<sup>39</sup> Research has supported this notion, demonstrating blended learning models to be, on average, slightly more effective than traditional learning.<sup>40</sup> However, Means et al. caution against construing these results as evidence that online learning is superior as a medium: "Rather, it is the combination of elements in the treatment conditions, especially the inclusion of different kinds of learning activities, that has proved effective across studies."<sup>41</sup> Any conclusion drawn from research on online learning outcomes must, therefore, recognize the wide variety of factors that determine results, as well as the ever changing technological base for online education.

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<sup>33</sup> Digital Learning Collaborative, "Snapshot 2019."

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<sup>35</sup> Digital Learning Collaborative, "Snapshot 2019."

<sup>36</sup> Maria Joseph Israel, "Effectiveness of Integrating MOOCs in Traditional Classrooms for Undergraduate L6.3 (i1h)-3.9 (b)-6.e L6.3 (i1

Another shift that has been prominent among newly developing models of education involves the physical space of the classroom. Educational scholars note the importance of academic architecture, emphasizing how learning is influenced by the space in which it occurs.<sup>42</sup> In this context, changes have been employed to improve the efficiency of classrooms beyond simply addressing capacity and acoustics. Most of this research into classroom design has occurred at the college undergraduate level, notably with North Carolina State's 'Student-Centered Active Learning Environment for Undergraduate Programs' (SCALE-UP) project.<sup>43</sup> The classrooms designed in this project facilitate group work by large numbers of students (100 or more), and include laptops, 7-foot diameter round tables, projection screens at opposite ends of the room, and large whiteboards.<sup>44</sup> The round tables are key in reducing the inadvertent

designed classrooms and schools have attempted to account for technological development encouraging group work in common spaces and self-directed learning.

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This report was completed on May 7, 2019, by Hunter Heberg, Olivia Matthews, and Timothy Nyhus under the supervision of VLRS Research Assistant Eric Tucker and VLRS Director, Professor Anthony "Jack" Gierzynski in response to a request from Representative Austin (D-Chittenden District).

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