

Digital Technology Skills of Grade 1 Teachers at Bayombong 2 District, Schools Division of Nueva Vizcaya: An Appraisal

Keenevie C. Bacud

Master of Arts in Education, Major in Educational Management, Northeastern College, Santiago City, Isabela, Philippines

Publication history: Received: April 02, 2026; Revised: April 10, 2026; Accepted: April 16, 2026

Email of Corresponding Author: keenevie.bacud@deped.gov.ph

Abstract

This study examined the digital technology skills of Grade 1 teachers in Bayombong 2 District, Schools Division of Nueva Vizcaya. It was anchored on the Input-Process-Output method and guided by the view that teachers play a central role in delivering quality education in the digital age. Using a descriptive survey design, the study involved 20 Grade 1 teachers from public elementary schools selected through simple random sampling. Data were gathered through a researcher-made questionnaire composed of two parts covering respondent profile and digital technology skills, with some items adopted and enhanced from previous studies. The data were analyzed using frequency, percentage, and weighted mean, while ethical protocols on consent, confidentiality, and data protection were observed. Findings showed that the respondents were all female, mostly 41 years old and above, largely married, and many had earned units in a master's degree. Most had 1–5 years of teaching experience, had outstanding performance ratings, and had attended seminars and trainings at different levels. The teachers demonstrated very evident digital technology skills in tools and operation, curriculum and assessment, and classroom organization and administration, while instructional integration was rated evident. The acquisition of digital technology skills was also found to be very evidently beneficial for professional development. However, some areas still needed enhancement, particularly hardware and software operations, troubleshooting and maintenance, and helping learners develop and implement project plans and solutions. The study concluded that Grade 1 teachers generally possess strong digital technology skills but still require continued support in more technical and advanced areas. It recommended sustained training, provision of digital resources, technical assistance, monitoring, and stronger institutionalization of technology integration in instruction, assessment, and classroom administration. The study is closely aligned with SDG 4 (Quality Education) because it focuses on strengthening teacher competence and improving instructional effectiveness through digital technology. It also relates to SDG 9 (Industry, Innovation and Infrastructure) by supporting technology-enabled teaching practices in schools. Its sustainability impact lies in promoting educational, technological, and institutional sustainability through evidence-based support for teacher development and improved classroom practice.

Keywords: Assessment, Classroom Organization and Administration, Digital Technology Skills, Grade 1 Teachers, Instructional Integration, Professional Development, Tools and Operation

1. Introduction

Digital technology has become a critical component of contemporary basic education because it reshapes how teachers teach, how students learn, and how schools cultivate 21st century competencies. In the Philippine context, quality basic education depends greatly on teachers who are prepared to manage instruction effectively and respond to the demands of modern learning environments. As schools are expected to develop collaboration, creativity, critical thinking, and communication among learners, teachers are likewise expected to integrate digital technology meaningfully into instruction. However, the mere availability of digital devices does not automatically improve educational outcomes, as effective integration also depends on policy support, infrastructure, funding, and teacher capability. For this reason, the present study examined the digital technology skills of Grade 1 teachers in Bayombong 2 District, Bayombong, Nueva Vizcaya, particularly in tools and operation, instructional integration, curriculum and assessment, and classroom organization and administration, as well as the benefits teachers obtain from these skills.

The study is anchored on the view that teachers remain central to the delivery of quality education in the digital age. Although students now have access to devices that allow them to create, communicate, and collaborate, teachers are still expected to guide learning and maintain standards aligned with the goals of the Department of Education. Digital technology has transformed classrooms into more interactive and collaborative spaces, making students more active participants in learning. At the same time, educational institutions face continuing challenges in technology infusion due to inadequate government funding, affordability issues, lack of infrastructure, and limited skilled human resources. These

realities underscore the need to assess the extent to which teachers are equipped with digital technology skills necessary for effective teaching of 21st century learners.

The reviewed literature shows that digital technology significantly affects teaching, learning, motivation, collaboration, and academic performance, although its effects are not always uniformly positive. Choney, (2010), MehMood & Taswir, (2013), Kist (2008), Jacobsen & Forste, (2011) noted that technology such as the internet can influence educational performance positively or adversely. Underwood (2014) emphasized that technology is not a “silver bullet,” although it continues to play an important role in education. Lankshear & Knobel (2006) and de Winter et al (2010) explained that technology enables new and more efficient ways of facilitating student learning, while European Union (2013) observed that actual technology use remains limited in many contexts. UNESCO’s ICT competency framework further stresses that teachers must go beyond basic ICT use and develop the capacity to form collaborative, problem-solving, and creative learners. Similarly, Mishra & Koelhar (2006) and Loveless (2011) argued that technology integration requires a new knowledge base for teachers, while Price & Kirkwood, 2010; Chen et al, 2009 emphasized that professional development should integrate technology, pedagogy, and content rather than treat technology as a separate concern. These themes collectively suggest that digital technology is most effective when supported by teacher readiness, pedagogical alignment, and continuing professional development.

Globally, developed countries have demonstrated that digital technology in education can create more flexible, learner-centered, and accessible systems through e-learning, blended learning, open and distance learning, and mobile learning. In developing countries, however, technology integration remains an emerging issue, even as governments, non-government organizations, and industries increasingly promote its use. In the Philippines, the National Information Technology Action Agenda for the 21st century and the Philippines’ Digital Strategy (PDS) sought to build a “digitally empowered, innovative, globally competitive, and prosperous society,” with technology in education serving as a means of equitable access to opportunities. The study also aligns with the National Higher Education Research Agenda (NHERA-II), particularly the clusters on Education and Teacher Training (ETT), and Information and Communication Technology. At the local level, the study focuses on Grade 1 teachers in Bayombong 2 District, Bayombong, Nueva Vizcaya, where understanding teachers’ digital capability is necessary for improving classroom instruction and professional development.

The study is conceptually anchored on the Input-Process-Output Method. The input consists of the respondents’ profile and their digital technology skills in terms of tools and operation, instructional integration, integration in curriculum and assessment, and classroom organization and administration. The process involves the use of a survey questionnaire, data gathering, analysis, and interpretation. The output is the improvement of the digital technology skills of Grade 1 teachers, while feedback from the findings serves as input for future related studies. In addition, the related literature supports the view that technology integration depends not only on access to devices but also on teachers’ technological and pedagogical competence. Mishra & Koelhar (2006) explain this through Technological Pedagogical Content Knowledge (TPCK), which emphasizes that effective technology integration must connect technology with pedagogy and content knowledge.

Although the literature extensively discusses the potential of digital technology to enhance motivation, collaboration, classroom interaction, and academic performance, the studies reviewed also reveal continuing barriers such as lack of knowledge, outdated equipment, limited technical competency, and insufficient time for teachers to develop new practices. Celik & Yesilyurt, 2013; Kreijns et al, 2013; Wastiau et al, 2013; Ertmer & Ottenbreit-Leftwich, 2010 identified teacher beliefs and teacher-related factors as major barriers to ICT integration, while Harris et al (2009) emphasized the difficulty of keeping pace with rapid technological change. Despite these findings, there remains a need for localized appraisal of teachers’ actual digital technology skills, particularly at the elementary level and within specific district contexts. This gap justifies the present study, which seeks to determine the level of digital technology skills of Grade 1 teachers in Bayombong 2 District and identify the professional benefits associated with those skills.

The study naturally aligns with SDG 4 – Quality Education because it focuses on improving teacher capability and instructional effectiveness through digital technology integration. It also connects with SDG 8 – Decent Work and Economic Growth because digital technology skills contribute to teacher productivity, professional competence, and workforce readiness. In addition, the discussion on access, infrastructure, and innovation links the study to SDG 9 – Industry, Innovation and Infrastructure, particularly in relation to technology-enabled educational systems. The study may also relate to SDG 17 – Partnerships for the Goals, as the reviewed literature and contextual discussion recognize the role of government, non-government organizations, industries, and other stakeholders in advancing digital technology use in education.

This study contributes to educational sustainability by supporting evidence-based improvement of teacher competencies needed for effective and relevant instruction in the digital age. It contributes to technological sustainability by identifying areas where teachers need strengthening in order to sustain meaningful use of digital tools in classrooms. It also supports institutional sustainability because the findings can guide school administrators in planning technical assistance, resource

allocation, monitoring, and professional development initiatives. Finally, the study has community and socio-economic sustainability value because better digitally equipped teachers can help develop learners who are more prepared for lifelong learning, social participation, and future work in an increasingly technology-driven society.

2. Material and methods

2.1 Research Design

The study used the descriptive survey design to describe the characteristics of the population and the phenomenon being investigated. The researcher considered this design appropriate because the study aimed to generate knowledge, derive insights, and provide a more accurate understanding of the digital technology skills of Grade 1 teachers.

2.2 Locale of the Study

The study was conducted in Bayombong District, Nueva Vizcaya, where the researcher was stationed. The site was selected because of its relevance to the research interest and its accessibility, which facilitated the distribution and retrieval of the survey questionnaire. The broader geographical context identified Bayombong as the capital town of Nueva Vizcaya, a province located in the north-central part of Luzon in Region II.

2.3 Respondents of the Study

The respondents were Grade 1 teachers from the public elementary schools of Bayombong 2 District. These participants served as the primary source of data for determining the level of digital technology skills in relation to tools and operations, instructional integration, curriculum and assessment, and classroom organization and administration.

2.4 Sample and Sampling Procedure

The study involved twenty (20) Grade 1 teachers. The researcher used simple random sampling, which was described as a probability sampling technique that gives each member of the population an equal chance of being selected. The sampling procedure was considered appropriate because every member of the population had the opportunity to be included as a respondent. After the questionnaires were administered, the gathered data were tallied, computed, analyzed, and interpreted.

2.5 Research Instrument

The primary data gathering tool was a survey questionnaire composed of two parts. The first part covered the demographic profile of the respondents, while the second part dealt with the main variables of the study. The questionnaire was prepared by the researcher through consultation of reference materials and related studies, and some items were adopted from previous studies and enhanced to suit the present investigation. Content validation was undertaken with the assistance of knowledgeable teachers. The instrument used a five-point Likert scale for interpreting responses, with qualitative descriptions ranging from Not Evident to Very Evident.

2.6 Data Gathering Procedure

The researcher first sought permission to conduct the study from the Schools Division Superintendent through the district and school officials. After approval, the questionnaires were administered to the selected Grade 1 teachers in the public elementary schools of Bayombong 2 District. The respondents were given sufficient time to answer the instrument. The researcher closely supervised the administration of the questionnaire to ensure complete retrieval of responses.

2.7 Data Analysis Techniques

After the questionnaires were collected, the data were classified, tabulated, interpreted, and statistically analyzed. Simple frequency and percentage count were used to describe the profile of the respondents, while weighted mean was used to determine the level of digital technology skills of the Grade 1 teachers.

2.8 Ethical Considerations

The study observed protocols necessary to ensure data privacy and the security of the respondents and the school. These included consent, confidentiality, and data protection. The cooperation of the respondents was sought, and they were assured that all information gathered from them would be treated with strict confidentiality.

3. Results and Discussion

3.1 Profile and Digital Technology Skills of the Respondents

3.1.1 Respondents' Profile

The respondents were all female. Most were 41 years old and above, the majority were married, and many had earned units in a master's degree. Most had been teaching for 1–5 years, most received an outstanding latest performance rating, and they had attended seminars and trainings at different levels. These findings suggest that the respondents possessed varied personal and professional characteristics that may shape their readiness to engage in technology-based teaching. The dominance of female teachers is consistent with the observation of Moses, et al (2014) that the teaching profession is mostly dominated by females. The age profile may also reflect professional maturity and commitment, while the educational attainment and participation in seminars indicate continuing efforts toward professional growth. The importance of advanced studies and training is supported by Zhang (2008), who cited that teachers with advanced degree have significant effect on student achievement, and by Bancual (2019), who noted that work experience provides important knowledge, skills and personal attributes and complement academic studies.

3.1.2 Digital Technology Skills as to Tools and Operation

The findings revealed that teachers displayed very evident digital technology skills in tools and operation, with a computed average weighted mean of 4.37. They were very evident in using the internet and network applications in the classroom, applying the techniques of necessary tools, demonstrating basic literacy of digital technology, and working with key computer components and email management. However, they were only evident in hardware and software operations, basic computer operations including troubleshooting, and productivity, communication, and management applications. This result indicates that the respondents were generally competent in fundamental digital tasks essential to classroom work, although some technical and application-based skills still need strengthening. The finding supports the view that digital skills are vital in organizing workload, streamlining processes, and accessing information efficiently. It also aligns with the idea that digital technology supports teaching and learning when teachers are technologically literate and capable of integrating these tools into classroom practice.

3.1.3 Digital Technology Skills as to Instructional Integration

The respondents demonstrated evident digital technology skills in instructional integration, with a computed average weighted mean of 4.18. They were very evident in supporting student collaborative projects through digital technology, helping students develop, implement and tract project plans and solutions, and experiencing the actual instructional infusion of digital technology. They were evident in guiding student understanding, organizing problem tasks, and interpreting digital pedagogical integration. These findings show that teachers were able to incorporate digital technology into instruction in ways that support collaboration and project-based learning. This suggests that digital instructional integration had moved beyond mere access to tools and had become part of actual classroom practice. The result affirms that digital integration can make instruction more flexible and learner-centered, allowing teachers to act as facilitators and collaborators rather than mere transmitters of knowledge.

3.1.4 Digital Technology Skills as to Integration in Curriculum and Assessment

The data showed that teachers very evidently manifested digital technology skills in curriculum and assessment, with a computed average weighted mean of 4.37. They were very evident in increasing learner interest to be active and collaborative, applying knowledge in varied situations, demonstrating thorough subject knowledge, making content more reliable, flexible and stimulating, using knowledge and performance-based rubrics, and creating complex problems to measure understanding. They were evident in integrating digital technology in the school's curricula and assessment and in demonstrating a variety of software packages in their subject area. This result indicates that the respondents were confident in using digital technology to enrich curriculum delivery and assessment practices. Their ability to connect digital tools with active learning and performance-based assessment suggests meaningful instructional use rather than superficial adoption. The finding implies an affluence and confidence in teaching and learning using digital devices to achieve teaching objectives and improve learning outcomes.

3.1.5 Digital Technology Skills as to Classroom Organization and Administration

The respondents also displayed very evident digital technology skills in classroom organization and administration, with a weighted average mean of 4.37. They were very evident in applying technology to support collaboration, creating flexible learning environments, collaborating with others and using networks to access information, and creating and managing complex projects. They were evident in integrating student-centered activities. This finding suggests that teachers were able to use digital technology not only for direct instruction but also for managing classroom processes and organizing learning environments. The result supports Chandra, Theng, Lwin & Foo (2009), who said that, "the incorporation of technology in the classroom can be quite useful, as the use of virtual environments for collaboration and learning can result in unprecedented flow of ideas, leading to higher levels of productivity". It also reflects the view that successful integration

depends on teachers' ability to structure learning in new ways, align it with pedagogy, and encourage cooperative interaction and collaborative learning and group work.

3.2 Professional Development Benefits of Digital Technology Use

3.2.1 Benefits of Digital Technology Skills for Professional Development

The findings revealed that the acquisition of digital technology skills was very evidently beneficial to teachers, as shown by a computed average weighted mean of 4.46. Teachers very evidently benefited in guiding learners through complex problems, accessing colleagues and outside experts for professional support, reflecting on the use of digital technology for development and innovation, accessing information at any time, making collaboration with other teachers more effective, and personalizing the educational experience of learners. They were evident in managing dynamic teaching. These results indicate that digital technology skills extended beyond classroom delivery and contributed to teachers' continuing professional growth and instructional adaptability. The finding confirms that digital competence supports more responsive and innovative teaching practice. This affirms the conclusion of Ozaslan & Maden (2013) in their study that students learned better if the course material is presented through some visual tools. They, also, reported that teachers believed that PowerPoint presentations made the content more appealing; therefore, they helped them to take students' attention.

3.3 Areas for Further Improvement in Digital Technology Skills

Although the overall findings were positive, some skills were only marked evident rather than very evident. These included familiarity with hardware and software operations, basic computer operations including basic trouble shooting and maintenance, and helping students develop, implement and tract project plans and solutions.

These results imply that while the respondents already possessed strong digital technology skills, targeted enhancement is still necessary in more technical and project-oriented areas. The study suggests that such improvement may be achieved through participation in learning and development activities, workshops, and hands-on practicum exercises. As Chandra, Theng, Lwin & Foo (2009) said, the integration of technology in the classroom can be quite useful, as the use of virtual environments for collaboration and learning can result in unprecedented flow of ideas, leading to higher levels of productivity. Subscribing to Ozaslan & Maden (2013) conclusion in their study that students learned better if the course material was presented through technology tools, it is therefore necessary for the teachers to know well new educational media and technology and use these with positive attitude.

3.4 Implications for Teaching and Learning

The findings imply that Grade 1 teachers are generally prepared to use digital technology in teaching and learning, as shown by their evident to very evident skills in tools and operation, instructional integration, curriculum and assessment, and classroom organization and administration. This suggests that digital technology can support more interactive, collaborative, and learner-centered classroom practices. It also indicates that teachers are able to use technology not only for lesson delivery but also for assessment, classroom management, and the creation of more flexible and engaging learning environments for 21st century learners. At the same time, the findings show that some areas were rated only evident, which suggests the need for continued capability-building and technical support. Although the respondents already demonstrated strong digital competence, sustained professional development remains necessary to strengthen more advanced and specialized technology skills. This means that improving teacher competence in digital technology can further enhance instructional quality, classroom efficiency, and the overall learning experience of pupils.

4. Conclusion & Recommendations

The study concludes that the Grade 1 teacher-respondents varied in age, gender, civil status, position title, highest educational attainment, length of service, performance rating, and levels of seminars or trainings attended, and that they profoundly displayed very evident digital technology skills in tools and operations, instructional integration, integration in curriculum and assessment, and integration in classroom organization and management. However, further enhancement is still needed in evidently marked skills such as familiarity with hardware and software operations, basic computer operations including basic trouble shooting and maintenance, and helping students develop, implement and tract project plans and solutions. Digital technology skills are vital in this digital age because they help ease workload, streamline processes, and access digital information. As Chandra, Theng, Lwin & Foo (2009) said, the integration of technology in the classroom can be quite useful, as the use of virtual environments for collaboration and learning can result in unprecedented flow of ideas, leading to higher levels of productivity. Subscribing to Ozaslan & Maden (2013) conclusion in their study that students learned better if the course material was presented through technology tools, it is therefore necessary for the teachers to know well new educational media and technology and use these with positive attitude.

It is recommended that teachers continuously enhance their digital technology skills through attendance in learning and development activities relative to digital technology; that school administrators and officials include technology integration in their technical assistance; that teachers design engaging activities involving the use of digital technology; that school

officials acquire digital instructional resources for instructional integration; that school officials poster linkages to external partners who can provide classroom access to digital resources; that school officials constantly monitor and evaluate facilities to determine the technology needs of teachers in employing quality teaching; that school officials provide opportunities for teachers to enhance their digital technology skills; and that teachers institutionalize the integration of digital technology in instruction, assessment and administration of classes.

The study was limited to the twenty (20) Grade 1 teachers currently teaching in the Public Elementary Schools of Bayombong 2 District, Bayombong, Nueva Vizcaya, and focused only on their profile, digital technology skills in tools and operation, instructional integration, curriculum and assessment, classroom organization and administration, and the benefits obtained in using digital technology for professional development. It also employed a descriptive research method using a survey questionnaire, with some items adopted from previous studies and enhanced for the present investigation.

Compliance with ethical standards

This study adhered to institutional ethical standards and observed proper research protocols throughout its conduct. Participation was voluntary, informed consent was secured, and confidentiality and data privacy were strictly maintained. Permission to conduct the study was obtained from the proper authorities, and all data gathered were used solely for academic purposes. The researcher declares no conflict of interest, acknowledges the contributions of the respondents and those who assisted in the study, and affirms that copyright ownership of the final work remains with the author subject to institutional academic policies.

REFERENCES

- Abud, G. G., Jr. (2014). *The impact of one to one computing on student achievement in schools*. <http://abud.me/the-impact-of-one-to-one-computing-on-students-achievement-in-schools>
- Afshari, M., Bakar, K., Luan, W., Samah, B., & Fooi, F. (2009). Technology and school leadership. *Technology, Pedagogy and Education*, 18(2), 235–248.
- Allen, I. E., & Seaman, J. (2013). *Ten years of tracking online education in the United States: Changing course* (pp. 1–47). <http://www.onlinelearningsurvey.com/reports/changingsourse.pdf?ref=driverlayer.com/web>
- Amparo S. Lardizabal. (1991). *Principles and methods of teaching*. Phoenix Publishing House.
- Ang, J. Y. (2003). *Non-intellectual factors related to doing homework and their effects to the academic performance of the Grade Three pupils* (Unpublished master's thesis). Trinity College of Quezon City, Quezon City, Philippines.
- Arnett, T. (2014). *Does blended learning work?* <http://www.christenseninstitute.org/does-blended-learning-work/>
- Attwell, G., & Hughes, J. (2010). *Pedagogic approaches to using technology for learning: Literature review*. <http://dera.ioc.ac.uk/2021/>
- Bailey, J., et al. (2013). *How blended learning can improve the teaching profession*. Digital Learning Now. <http://digitallearningnow.com/site/uploads/2013/05/Conditions-and-Careers-Final-Paper1.pdf>
- Becta. (2001). *ImpaCT2 emerging findings from the evaluation of the impact of information and communications technologies on pupil attainment*. Becta.
- Beetham, H., & Sharpe, R. (2007). *Rethinking pedagogy for a digital age*. Routledge.
- Bebel, D., et al. (2010). One to one computing: A summary of the quantitative results from the Berkshire wireless learning initiative. *The Journal of Technology, Learning, and Assessment*, 9(2), 5–60. <http://napoleon.bc.edu/ojs/index.php/jtla/article/viewFile/1607/1462>
- Best, J. T. (1987). *Research in education* (p. 88). McGraw-Hill Book Company.
- Britland, M. (2013). *How has technology transformed the role of the teacher?* [Web log post]. <http://www.theguardian.com/teacher-network/teacher-blog/2013/jun/18/technology-transform-teaching-students-schools>
- Brown, E. (2011). *Questions about virtual schools' effectiveness*. *The Washington Post*. http://www.washingtonpost.com/blogs/virginia-schools-insider/post/evidence-of-virtual-schools-effectiveness-is-scant/2011/11/19/gIQAGJ3K5N_blog.html
- Chen, M. (2010). *If technology motivates students, let's use it*. <http://www.edutopia.org/blog/motivating-students-technology>
- David, F. (2002). *Understanding and doing research: A handbook for beginners*. Educational Publishing House.
- Dunmire, R. E. (2010). *The use of instructional technology in the classroom: Selection and effectiveness* (Unpublished master's thesis). Center for Teacher Excellence, United States Military Academy. http://www.usma.edu/cfe/literature/dunmire_10.pdf
- Gardener, J. (2011). *Learning motivation in technology-rich training*. http://www.jclarkgardner.com/uploads/5/4/1/4/5414483/jclark_gardner_learnig_motivation_2.pdf

- Goodman, E. (2013). *What are the advantages of a virtual school: Student perspective*. <http://www.examiner.com/article/what-are-the-advantages-of-a-virtual-school-student-perspective>
- Graffin, M. (2011, April 29). *What the heck is a PLN?* http://www.blog.mgraffin.com/2011/04/29/what-the-heck-is-a-pln/#.VNqk6LDF_3o
- Granito, M., & Chernobilsky, E. (2012). *The student's motivation and knowledge retention* (Doctoral dissertation, University of Connecticut). Northeastern Educational Research Association. http://digitalcommons.uconn.edu/cgi/viewcontent.cgi?article=1016&context=nera_2012
- Heick, T. (2012). *A primer: 3 ways technology has changed education*. <http://www.edudemic.com/a-primer-3-ways-technology-has-changed-education/>
- Hom, E. (2014). *What is STEM education?* <http://www.livescience.com/43296-what-is-stem-education.html>
- Huneycutt, T. (2013). *Technology in the classroom: The benefits of blended learning*. <http://www.nms.org/Blog/TabId/58/PostId/188/technology-in-the-classroom-the-benefits-of-b>
- Hung, C., Hwang, G., & Huang, I. (2011). A project-based digital storytelling approach for improving students' learning motivation, problem-solving competence, and learning achievement. *Educational Technology & Society*, 15(4), 368–379. http://ifets.info/journals/15_4/31.pdf
- Lynch, M. (2014). *4 ways technology has changed K12 learning*. http://www.huffingtonpost.com/matthew-lynch-edd/4-ways-digital-technology_b_4802846.html
- Mandrano, D. R. (2011). *The effect of modern technology infusion on at-risk high school students' motivation to learn* (Unpublished doctoral dissertation). Appalachian State University. http://libres.uncg.edu/ir/asu/f/Mandrano,%20Danielle_2011_Dissertation.pdf
- McMillan, D. (2010). *Education vs. technology*. <https://medium.com/teaching-learning/education-vs-smartphones-b87949c9efcd>
- Norris, C., & Soloway, E. (2013, April 17). *To see increases in student achievement in 1:1/BYOD classrooms teachers must be given curriculum with technology activities baked in*. <http://thejournal.com/articles/2013/04/17/curriculum.aspx>
- Parvis, S. (2012). *Time for kids: Almanac 2013*. WS Pacific Publication, Inc.