



National Standards for Quality Online Teaching (K-12)

Literature Review

Conducted and Compiled by Kay Shattuck, D.Ed., QM Director of Research, and
Barbra Burch, QM Manager of Research & Development
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Introduction

This literature review has been conducted to inform the work of the National Standards for Quality Online Teaching revisions, a project led by a partnership between Quality Matters and the Virtual Learning Leadership Alliance. It includes a short summary of the relevant peer-reviewed literature followed by an alphabetical listing of the resources correlated to the National Standards for Quality Online Teaching in which they apply. This review includes an appendix that lists additional standards sets, which can be consulted as resources, as well as abstracts for most of the references listed.

Methodology

The review of the research literature was conducted in February through April of 2018 by the QM Research team of Barbra Burch and Kay Shattuck. Searches, using keywords K-12, online learning, online teaching, and online programs, within the date range of 2014-2018 were completed. Only references from research-based publications were recorded. The following databases were searched in order to achieve saturation:

- [Michigan Virtual Learning Research Institute's Research Clearinghouse](#)
- [QM Research Library](#) The QM Library contains more than 1,200 expert vetted references focused on online and blended learning.
- Academic databases Academic Search Complete, ProQuest Dissertations & Theses, Google Scholar, Google
- Virtual academic repositories Research Gate and Academic.edu

The findings were recorded on an Excel spreadsheet, with each entry including the reference, the abstract from the original publication, and, often, reviewer notes. An analysis of each reference as to its relationship with each of the iNACOL Standards was made and documented on a Google spreadsheet by the QM Research Team. The final step was an analysis of the research gathered in general relationship to the iNACOL standards, which resulted in a summary of the findings.

Summary of K-12 teaching review of the literature

Although distance education in K-12 has a longer than often realized history, focused research has been emerging only in the past few years. As Barbour (2018) noted, needed definitions and descriptions are being established, which furthers the opportunities to share and, importantly, to build upon previous research.

While there is still a heavy reliance on findings from high education research, current research is shifting from attempts to simply transfer findings from higher education to K-12 to translating and adapting higher education findings into the K-12 context. Emerging in the K-12 research is an important blending of K-12 best practices (See Ferdig & Kennedy, 2014; Kennedy & Ferdig, 2018) with theoretically informed frameworks (primarily Community of Inquiryⁱ and some use of TPACKⁱⁱ). For example, interaction, presence, and engagement are well-researched constructs in higher education online learning that are being contextualized into K-12 research. The Adolescent Community of Engagement (ACE) framework (Borup, 2013; Borup, West, Graham, & Davies, 2014) expands the research by including parent engagement to the existing emphasis on learner, teacher, and peer engagement. Another example is the K-12-focused research on pre-service, teacher training within the well-established higher education professional development literature.

The quality teaching standards currently provide well-focused attention on the pedagogical issues. Inclusion of needed attention to parental engagement in the online and blended learning processes would be encouraged by emerging research.

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ⁱ <https://coi.athabasca.ca/coi-model/>

ⁱⁱ <http://www.tpack.org/>

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Reference	A	B	C	D	E	F	G	H	I	J	K
<p>Themes from a Survey Administered to Teachers in Four Online Learning Programs. Journal of Online Learning Research, 2(4), 399-418. Waynesville, NC USA: Association for the Advancement of Computing in Education (ACE). Retrieved January 31, 2018 from https://www.learntechlib.org/p/172573/.</p>											

Appendix

Other Standards Sets

Other Standards for online teaching that can be correlated to the *National Standards for Quality Online Teaching*:

- [University of Illinois Master Online Competencies \(Varvel\)](#)
- [Idaho Standards for Online Teachers - edtech boise state university](#)
- [NEA Guide to Teaching Online Courses](#)
- [Report on the Online Teaching Standards and Teacher Certification Workgroup for Students with Disabilities](#)
- [Online Teaching in K–12 Models, Methods, and Best Practices for Teachers and Administrators](#)
- [ISTE: What works in K-12 online learning:](#)
- [SREB Essential Principles of High Quality Online Teaching:](#)
- [Preparing K-12 Teachers for Online Instruction](#)
- [Future Ready Framework](#)

Abstracts

Allison, C. (2015). The use of instructional videos in K-12 classrooms: A mixed method study (Doctoral dissertation, Indiana University of Pennsylvania). Retrieved from <https://knowledge.library.iup.edu/cgi/viewcontent.cgi?article=1146&context=etd>

[Author-provided abstract] - The purpose of this study was to explore the use of instructional videos in K - 12 classrooms. This study sought to determine how often the use of instructional videos occurred in K - 12 classrooms, how the instructional videos were used, teachers' perceptions of the advantages and disadvantages of using instructional videos, and the frequency with which the cognitive theory of multimedia learning recommendations were included in the design of the videos that were being used. A mixed-method study was used to answer the research questions. The superintendents at two different school districts in southwestern Pennsylvania distributed an online, researcher-created survey via a mass e-mail system. A total of 324 classroom teachers were invited to participate in the study, and 73 teachers responded to the survey creating a 23% response rate. Based on the findings, 85% of the K - 12 educators who responded used instructional video technology for educational purposes. The frequency of use results indicated that the teachers used instructional videos frequently and maintained a collection

of different video titles. Teachers reported using instructional videos to reinforce, motivate, meet student needs, provide authentic content, and demonstrate. Advantages to using instructional videos included maximize instructional time, teacher and student control, multi-modal instruction, and motivation. Teachers reported the following disadvantages to using instructional videos: lack of access, full group viewing, lack of interaction, and learning barriers. The cognitive theory of multimedia learning is a theory of how people learn from multimedia messages and defines specific design features that, based on empirical research, improve learning. This study investigated the use of the design principles recommended by the cognitive theory of multimedia learning. Although the principles of voice, politeness, pre-training, personalization, and signaling were present the majority of the time in the instructional videos used by K - 12 teachers, the principles of redundancy, spatial contiguity, temporal contiguity, coherence, and segmentation were used less frequently.

Barbour, M. K. (2017). The state of K-12 online learning. In J. G. Cibulka & B. S. Cooper (Eds.), *Technology in the Classroom: Can It Improve Teaching and Student Learning in American Schools?* (pp. 37-51). Lanham, MD: Rowman and Littlefield Education. Retrieved from [https://www.academia.edu/35571422/Barbour M. K. 2017. The state of K-12 online learning. In J. G. Cibulka and B. S. Cooper Eds. Technology in the Classroom Can It Improve Teaching and Student Learning in American Schools pp. 37-51 . Lanham MD](https://www.academia.edu/35571422/Barbour_M._K._2017._The_state_of_K-12_online_learning._In_J._G._Cibulka_and_B._S._Cooper_Eds._Technology_in_the_Classroom_Can_It_Improve_Teaching_and_Student_Learning_in_American_Schools_pp._37-51_.Lanham_MD)

Historical outline of K-12 online learning by one of the leaders in the K-12 online/blended learning field. In the concluding thoughts section, he points out that K-12 distance education has a longer history than most would realize, there still is a lack of research evidence of effectiveness, likely as suggested by the author, "the research is still too immature to describe these [research-based promising practices] as best practices or strategies that are tried and true" (p. 45). Examples from Michigan Virtual Schools were highlighted as promising practices, such as "teachers to have their own experience as online learners before they teach online" and that online and blended schools should create their own professional development" (p. 46).

Intro - Ferdig, R. E., & Kennedy, K., (Eds.) (2014). *Handbook of research on K-12 online and blended learning*. Retrieved from <http://press.etc.cmu.edu/content/handbook-research-k-12-online-and-blended-learning-0>

Barbour, M., K., Grzebyk, T. W., & Eye, J. (2014). Any time, any place, any pace-really? Examining mobile learning in a virtual school environment. *Turkish Online Journal of Distance Education*, 15(1). Retrieved February 13, 2016 from <http://files.eric.ed.gov/fulltext/EJ1042983.pdf>

[Author-provided abstract] Over the past decade, the number of K-12 students engaged in online learning has increased from between 40,000 and 50,000 to more than two million. Students have also gained increased access to mobile devices throughout recent years, and educators have

actively looked for ways to capitalize on this trend. A case study of students enrolled in an Advanced Placement European History course, offered by a statewide, supplemental virtual school in the Midwest. The students were studied over the course of four weeks, using Mobl21, an app that works on mobile devices, and offers an emulated version that runs on a computer. The results showed that despite the fact that existing literature indicated students' perceptions were positive toward mobile technologies; these students' perceptions were negative. The isolated implementation of the project may have affected these perceptions. However, students' access to mobile devices limited the project implementation. (p. 114).

Barbour, M. K., Siko, J., Gross, E., & Waddell, K. (2012). Virtually unprepared: Examining the preparation of K-12 online teachers. In R. Hartshorne (Ed.), *Teacher education programs and online learning tools: Innovations in teacher preparation* (pp. 60-81). Hershey: IGI Global.

[Author-provided abstract] At present, there are very few examples of the preparation of teachers for the online environment in teacher education. Even more unfortunate is that less than 40% of all online teachers in the United States reported receiving any professional development before they began teaching online. While some virtual schools provide some training to their own teachers, in most instances, no such training is provided to the school-based personnel. This is unfortunate, as K-12 student success in online learning environments require support from both the online teacher and the local school-based teacher. Clearly, there is a need for teacher education programs to equip all teachers with initial training in how to design, deliver, and – in particular – support K-12 online learning. This chapter begins with an examination of the act of teaching online and how that differs from teaching in a face-to-face environment. Next, the chapter describes existing teacher education initiatives targeted to pre-service teachers (i.e., undergraduate students) and then in-service teachers (i.e., graduate students). This is followed by an evaluation of current state-based initiatives to formalize online teaching as an endorsement area. Finally, a summary of the unique aspects of teaching online and how some initiatives have attempted to address these unique skills, before outlining a course of action that all teacher education programs should consider adopting.

Basham, J. D., Stahl, W., Ortiz, K. R., Rice, M. F., & Smith, S. J. (2015). *Equity matters: Digital and online learning for students with disabilities*. Lawrence, KS: The Center on Online Learning and Students with Disabilities. Retrieved from <http://ht.ly/Vpmus>

Introduction Paragraph: *Equity Matters: Digital and Online Learning for Students with Disabilities* is the annual publication from the Center on Online Learning for Students with Disabilities (COLSD). The publication highlights selected findings from COLSD's various research projects. The publication's core message is that to design and implement equitable digital learning systems, the needs of all learners, including those with disabilities, must be considered. An equitable learning environment requires the integration of sensible policy, effective practices, usable tools,

and meaningful use of data and assessment.

Beese, J. (2014). Expanding learning opportunities for high school students with distance learning. *The American Journal of Distance Education*, 28(4), 292-304. doi:10.1080/108923647.2014.959343

[Author article abstract] - "The purpose of the Synchronous Interactive Video Conference Distance Learning pilot program was to use emerging technologies to expand learning opportunities for students at an urban public high school. Through grant funding, students were able to enroll in Advanced Placement and foreign language courses through an online learning provider. Using case study methodology, the pilot program was thoroughly examined through the analysis of multiple sources of data such as surveys of multiple stakeholders, interviews of program administrators, and the examination of student course documentation. The attrition rate was high at 61.9%. The combination of insufficient time for planning and preparation, lack of support for students, and poor communication was detrimental to the program" (p. 292). [QM Reviewer's Note] - Study results point out need for deliberate, well-designed online courses, along with institutional support and instructor responsiveness. Poor results without those.

Blackburn, H. A. (2014). A mixed methods study: Assessing and understanding technology pedagogy and content knowledge among college level teaching faculty. (Doctoral dissertation, Drexel University). Retrieved from https://idea.library.drexel.edu/islandora/object/idea%3A4531/datastream/OBJ/download/A_Mixed_Methods_Study_Assessing_and_Understanding_Technology_Pedagogy_and_Content_Knowledge_Among_College_Level_Teaching_Faculty.pdf

[Author Provided Abstract] - Online higher education has grown rapidly over the last decade. While online higher education has improved access for many students, it suffers from the problem of higher learner attrition. Student persistence engagement in online learning may be enhanced through improvements in instructor technology and pedagogy knowledge. This mixed-methods study on online learning is an exploration into the online instructional faculty's knowledge of integrated Technological, Pedagogical, and Content Knowledge (TPACK). TPACK has been used to assess teaching in the K-12 classroom setting and is currently being utilized as an assessment in the U.S. Department of Education's Race to the Top grant selection process. This study applied the TPACK framework to college level teaching faculty to assess their technology and pedagogy knowledge, their TPK, and TPACK. The primary research questions of this study were, "What is the level of TPACK among college level teaching faculty within a diverse college at a large, private four year university?", "What processes do online higher education instructors use in developing their technological pedagogical knowledge of new technologies?" and "What techniques do instructors with high TPACK utilize to engage online students?" The study began as a quantitative study and measured the level of TPACK among college level teaching faculty. A qualitative method followed with one-on-one interviews of nine selected instructors demonstrating high TPACK

components. Quantitative findings of the study indicate that there is high technology, content, pedagogy, and technological pedagogical knowledge amongst the college level teaching faculty within the college studied. The level of full, integrated TPACK amongst the faculty has not fully been explored due to limited data on content knowledge. Qualitative findings of the study indicate that the college level teaching faculty instructors are engaged in high impact practices with their online students that demonstrate their TPACK skills and that the college level teaching faculty use their TPK to assess inclusion of new technologies tools in the online classroom. [QM Reviewer's note] - Reader will find of interest a FY2011 QM Research Grant The Development of Technological Pedagogical Content Knowledge (TPACK) in Instructors Using Quality Matters Training, Rubric, and Peer Collaboration: Cheryl Ward, Principal Investigator, University of Akron. Findings: Pedagogy is central to the quality development of online course design and that the TPACK (Technological, Pedagogical, Content Knowledge) conceptual framework is key in enabling instructors to develop new schema for a re-conceptualization of content, pedagogy and technology. Posited that use of the Quality Matters process helps instructors develop this complex knowledge that enables them to discuss, develop and implement more effective online learning. Therefore, the purpose of the project was to study the process of how the QM Rubric and QM training help instructors develop TPACK knowledge that enables them to discuss, develop and implement more effective online learning. Here are the research questions that guided the study: *Is the QM rubric consistent with the TPACK framework to help instructors construct knowledge in quality design and online instruction? *How is the QM rubric implemented and integrated as a catalyst to inform and guide online instructors for quality design and instruction? *An alignment between the QM Rubric and the TPACK conceptual framework was done to determine if any gaps existed between the rubric and the six areas of the framework. Three professors of instructional technology and three instructional technology students did independent alignment processes with the TPACK framework and the QM Rubric. One premise of this study was that the QM Program can inform and facilitate knowledge growth in the TPACK areas. *The alignment indicated that the QM Rubric is fairly well aligned with the TPACK conceptual framework. It was interesting that a rubric that purports to only address the design elements of an online class aligns so highly with the pedagogical elements in the TPACK conceptual framework. *This alignment supports initial contentions that the elements of the QM Rubric foster discussion and knowledge development in more areas than just design of these environments. Technological, pedagogical and content discussions are overlapping and connected in a dynamic way that result in the inability to discuss or work on them in isolation for online course development. Four participants were recruited after they finished QM training. Multiple data resources collected in the study revealed that becoming online learners themselves for the QM training helped the participants understand the needs of online learners. *The QM Rubric increased the instructors' knowledge of the importance of aligning learning objectives to assessment, instructional activities, and technology integration. *Even though QM training and the QM Rubric did not specifically introduce the Technology Pedagogical Content Knowledge conceptual framework to the instructors, it is clear that their knowledge increased in the areas of technology, pedagogy and content. *The learning experiences they shared with the researchers about the QM training also demonstrated that they grew to be more sophisticated online instructors because of the way they designed, modified and implemented their online courses through the knowledge they gained. The data analysis results from this study suggest a developmental model that depicts a few key transitional points in order to become effective online

instructors, and how QM training can effectively consider these transitional points to deliver the training more efficiently to enhance the quality of online courses with more explicit guidelines to not only course design, but permeate to the other aspects of online teaching and learning.

[<https://www.qualitymatters.org/fy10-12-%28completed%29>]

Borup, J. A. (2013). Types, Subjects, and Purposes of K-12 Online Learning Interaction. All Theses and Dissertations. Paper 3711.

<http://scholarsarchive.byu.edu/etd/3711>

[Author-provided Abstract]: Although K-12 online learning has experienced exceptional growth, research in the area has lagged behind. This dissertation addressed this gap in the literature using a multiple article dissertation format. The first article used survey data from two online English courses at the Open High School of Utah (OHSU) to examine students' reported interactions with content, peers, and instructors. The large majority of students viewed all investigated types of interaction as educational and motivational. Students perceived learner–instructor and learner–content interactions to have significantly higher educational value than learner–learner interactions, and viewed learner–instructor interaction to be significantly more motivational than learner–content interaction. Furthermore, nine significant correlations were found between the time students spent on human interaction and course outcomes. The second article examined learner–parent and parent–instructor interactions within the same context. Similar to the first article, survey data was used to measure parents' and students' perceived quantity and quality of parental interactions with students and teachers. It was found that generally students and parents viewed parent–instructor and learner–parent interactions as motivational. Students viewed learner–parent interaction as significantly more motivational than did their parents. The quantity of reported parental interactions tended to negatively correlate with course outcomes. These negative correlations may be the result of parents' tendency to increase interaction levels following poor student performance and may not reflect the actual impact of parental interactions on individual student learning. When discussing the results in the second article, the claim was made that future research should look beyond the quantity of interactions and develop a theoretical framework that identifies and categorizes the roles of individuals in improving student outcomes. The third article of this dissertation presents such a framework that can help guide K-12 online research and design. The Adolescent Community of Engagement (ACE) framework consists of four main constructs that make up a K-12 online learning community. The first three (student engagement, teacher engagement, and peer engagement) build on previously established online frameworks that originally emerged from higher education contexts. In addition, the ACE framework recognizes the role of parents in their child's learning and introduces a fourth construct, parent engagement, which builds on two previously established face-to-face frameworks.

Blaine, A. M. (2017). Interaction and presence in the secondary online classroom (Order No. 10684770). Available from ProQuest Dissertations & Theses A&I. (2008509399).

[Author provided abstract] Interaction has been shown to be a key component to the success of online and blended learning, so it is crucial to understand how teachers and students perceive the interaction taking place in online and blended K-12 courses. The following study is part of a larger study of the effectiveness and evaluation of the New York State Virtual AP Program, which used a mixed-methods approach to understand the implementation of online and blended AP courses throughout districts across New York State. Grantees of the Virtual AP program included large individual districts, small individual districts, BOCES, and BOCES consortia, which combined to offer courses in a broad region of the state. Within that study, we conducted focus group interviews with students and teachers to inquire into the interaction experiences of both groups of stakeholders. I analyzed the transcripts of those focus group interviews using a qualitative content analysis coding and analysis process. Results show that students and teachers had very different perceptions of the quality and frequency of interaction within the Virtual AP courses, with teachers largely having a positive outlook on the interaction within the courses, and students having a prevailing negative view of the interaction between students and teachers in the courses. I discuss the significance of the findings in this study using the community of inquiry framework, focusing specifically on the teaching and social presence within the courses. In both cases, students reported that there was less community and less teacher guidance than was desirable for them, while teachers either reported that the opposite was true or expressed their thoughts in alternate ways. Though this study is limited in a number of ways, results of this qualitative content analysis coding scheme shows that we can do more to communicate both the expectations and the process of communication between students and teachers in online and blended coursework, especially at the K-12 level. I also suggest one possible revision to the community of inquiry framework based on the results of this study.

Borup, J., West, R.E., Graham, C.R. & Davies, R.S. (2014). The adolescent Community of Engagement Framework: a lens for research on K-12 online learning. *Journal of Technology and Teacher Education*, 22(1), 107-129. Waynesville, NC, USA: Society for Information Technology & Teacher Education. Retrieved from https://www.academia.edu/attachments/53684518/download_file?st=MTUyMzU1MzM4Niw2Ny4yMzQuNS4xNjQsNTcxMTQyMTQ%3D&s=work_strip&ct=MTUyMzU1MzM4OCwxNTIzNTUzMzk3LDU3MTE0MjE0

[Author provided abstract] This paper describes the Adolescent Community of Engagement (ACE) framework as a lens to guide research and design in adolescent online learning environments. Several online learning frameworks have emerged from higher education contexts, but these frameworks do not explicitly address the unique student and environmental characteristics of the adolescent online learning environment. The ACE framework consists of four main constructs that make up an adolescent online learning community. The first three (student engagement, teacher engagement, and peer engagement) build on previously established online frameworks that originally emerged from higher education contexts. In addition, the ACE framework recognizes the role of parents in their children's learning and introduces a fourth construct, parent engagement, which builds on two previously established face-to-face frameworks. [QM Reviewer note] The Adolescent Community of

Engagement (ACE) framework is an emerging key concept in K-12 research by the identification of parent engagement.

https://www.academia.edu/attachments/53684518/download_file?st=MTUyMzU2NDA1MSw2Ny4yMzQuNS4xNjQsNTcxMTQyMTQ%3D&s=swp-toolbar&ct=MTUyMzU2NDA1NiwxNTIzNTY0MTg5LDU3MTE0MjE0

Burdette, P. J., & Greer, D. L. (2014). Online learning and students with disabilities: Parent perspectives. *Journal of Interactive Online Learning*, 13(2), 67-88. Retrieved February 13, 2016, from <http://www.ncolr.org/jiol/issues/pdf/13.2.4.pdf>

[Author Article Abstract] - While research has been conducted on parental involvement in K-12 online learning, none of this research relates specifically to the parents of students with disabilities. Thus, researchers developed a survey around the following constructs: parental roles, instruction and assessment, communication and support from the school, and parental challenges. Researchers then distributed the survey to parents who had a child with a disability enrolled in an online setting. This article describes the survey findings based on 119 qualified responses from across the United States. In general, parents were pleased with the outcomes that their children were experiencing in online learning, but some issues still exist for educating students with disabilities within this environment (p. 67). [QM Reviewer's Note] - Parents' concerns included: (1) instruction and assessment, for example, "the following instructional methods were not incorporated in the instructional activities: social media (39%), simulation (11%), discussion (10%), and games (9%)" despite discussion and games often used in f2f situations" (p. 83). (2) the parental role of being placed in an untrained teacher role. (3) Communication: Parents might need training with online educational communication to act as effective models and learning coaches (pp. 85-86).

Cavanaugh, C., Maor, D., & McCarthy, A. (2014). K-12 mobile learning. In R. E. Ferdig & K. Kennedy (Eds.), *Handbook of research on K-12 online and blended learning* (pp. 391-414). Retrieved February 13, 2016, from http://press.etc.cmu.edu/files/Handbook-Blended-Learning_Ferdig-Kennedyetal_web.pdf

[Author article abstract] - "Mobile devices have been the focus of a push in many nations and internationally as part of efforts to achieve greater literacy and numeracy among students. Research has shown a strong link between Internet usage, the spread of broadband in a country, and its GDP. Those countries that are the highest performing educationally already integrate mobile devices in their education. This paper synthesizes empirical research on mobile devices from 2010 to 2013 in K-12 schools by focusing on studies that demonstrate emerging themes in this area. It is also clear that the pedagogy needed to be successful in creating positive outcomes in the use of technology has to be student-centered with the aim of personalizing the learning experience. Research found that students could become collaborators in designing their own learning process. As students become independent learners, they become more prepared in the skills needed for college and in their careers" (p. 391). [QM Reviewer's Note] - This chapter in Ferdig, R. E., & Kennedy, K. (Eds.) (2014). *Handbook of Research on K-12 Online and Blended Learning*.

Retrieved from <http://press.etc.cmu.edu/content/handbook-research-k-12-online-and-blended-learning-0> provides an overview of pedagogical theories tied to approaches to mobile learning (see p. 393) and summarizes research lit regarding mobile learning in k-12. They offer k-12 focused research in support of student engagements, motivation, project-based/inquiry-based practices, collaboration, and interaction. The authors point out the need for professional development to prepare teachers for mobile learning.

Chappell, S., Arnold, P., Nunnery, J., & Grant, M. (2015). An examination of an online tutoring program's impact on low-achieving middle school students' mathematics achievement. *Online Learning*, 19(5). Retrieved from <http://onlinelearningconsortium.org/read/online-learning-journal/>

[Author-provided abstract]: The purpose of this study was to determine the impact of Focus Eduvation's (FEV) synchronous online tutoring service on struggling middle-school students' math achievement. The online tutoring was provided as a response to intervention (RTI) Tier 3 support (intensive, individualized intervention) in schools implementing a school-wide math program that addresses Tier 1 (high-quality classroom instruction) and Tier 2 (small group interventions). We employed quasi-experimental, within - and between -group designs to examine impacts for 120 students in two schools to measure the supplemental program's impact on math assessment scores. We also conducted qualitative analyses of student and tutor post-session commentary. The findings suggest that the tutoring contributed to statistically significant gains in student assessment scores post-intervention. Online tutors' descriptions of their practices centered on ongoing progress monitoring of student learning, delivery of guided practice to students, the use of multiple explanations, and representations of target concepts. Student perceptions of the online tutoring were predominately positive in nature.

Chiu, C.-H. (2013). Verification of theory based design features for designing online instruction for students with learning disabilities and other struggling learners. https://kuscholarworks.ku.edu/bitstream/handle/1808/15127/CHI_U_ku0099D_12758_DATA_1.pdf?sequence=1&isAllowed=y; Unpublished dissertation.

[From abstract] This study involved a comprehensive review of the literature on multimedia design to identify theory based design principles applicable to online instruction. Seven theories were reviewed. They included Cultural Historical Activity Theory (CHAT), Human Computer Interaction (HCI), Cognitive Theory of Multimedia Learning (CTML), Cognitive Load Theory (CLT), Universal Design for Learning (UDL), Kosslyn's (2007) eight Psychological Principles, and Wickens's (1999) thirteen Principles of Display Design. The focus was on all learners including those with disabilities. Forty theory based design principles, supported by research, were verified through Q methodology model (Brown, 1980; McKeown & Thomas, 1988). Three panels of experts in 1) multimedia theory, 2) design/development of online instruction for all K-12, and 3) design/ development of online instruction for students with learning disabilities rated the importance of each principle. The Q-sort involved sorting along the dimensions of a quasi-normal distribution scale. This prevented the experts from placing a disproportionate number of

principles in any single category. The response rate for experts was 81.1%. An Analysis of Variance was carried out to ascertain differences among the rating of expert by group and in combination and followed by a Post-Hoc Test. The result showed that only one principle had the p value= .042 between Group 1 Multimedia and Group 2 All K -12 Learners at the $p < .05$ significant level. The implications are that there was little differentiation between the focus on all students and the focus on students with learning disabilities. A correlation analysis was conducted with the correlation matrix indicating only six observed relationships were very strong. There were three principles with the most positive correlation coefficients ranging from $r = .529$ to $r = .554$. In contrast, there were iv three negative correlations coefficient between principles, ranging from $r = .462$ to $r = .503$. These results imply that there was considerable independence among the principles. The factor analysis resulted in five factors being identified i.e., Factor1: Learner variability, Factor 2: Cognitive strategies, Factor 3: prerequisites for teaching/learning, Factor 4: Context for learning, and Factor 5: Media presentation.

Curtis, H., & Werth, L. (2015). Fostering student success and engagement in a K-12 online school. *Journal of Online Learning Research*, 1(2), 163-190. Association for the Advancement of Computing in Education (AACE). Retrieved from <https://files.eric.ed.gov/fulltext/EJ1148836.pdf>

[Author-provided abstract] Although questions exist about the effectiveness of online education, it is a growing part of the pantheon of educational choices available to students in America today. Online education first gained popularity for advanced learners, but at-risk populations are increasingly enrolling in online learning environments. This study explored student achievement in a K-12, full-time, online learning environment and the effect parents had on student success. Themes from semi-structured interviews found that parents of current or former students in a full-time, online school perceived multiple facets of student success in the online environment. Online K-12 schools can provide support to families by communicating, being transparent with tools, and individualizing instruction. Students must be self-motivated, engaged and participating, and accountable for their own learning. Parents should be available to monitor, mentor, and motivate students.

Czerkawski, B. C., & Lyman, E. W. (2016). An instructional design framework for fostering student engagement in online learning environments. *Techtrends: Linking Research and Practice to Improve Learning: A Publication of the Association for Educational Communications & Technology*, 60(6), 532-539.

[Author-provided abstract] Many approaches, models and frameworks exist when designing quality online learning environments. These approaches assist and guide instructional designers through the process of analysis, design, development, implementation and evaluation of instructional processes. Some of these frameworks are concerned with student participation, some with motivation and some with student success. All these variables affect active participation and engagement of the student to some degree but the main concern is how to design

online instruction conducive to high level of engagement. Therefore, this paper presents an instructional design framework along with a set of strategies that could be used to foster learner engagement in online learning. This framework is the result of an extensive literature review on student engagement and is aimed at summarizing the results in a cohesive way for online instructors. For e-learning design and development to be successful online designers and instructors need better approaches to increasing student engagement and its authors hope that proposed framework provides such an approach.

Dawson, K., & Dana, N. F. (2018). Professional development for K-12 online teachers. In Handbook of research on K-12 online and blended learning (243-266). Retrieved from <http://repository.cmu.edu/cgi/viewcontent.cgi?article=1029&context=etcpress>

[Author provided abstract] This chapter provides a survey of what is known about professional development for both brick and mortar and online teachers and uses this knowledge as a springboard to suggest policy and research implications for the professional development of K-12 online teachers. While research is currently limited, opportunities abound for practitioners, policymakers, and researchers to make important contributions to the professional development of K-12 online teachers.

[QM Reviewer's note] Authors' provide a summary of K-12 professional development research. They "examine literature on professional development for K-12 online teachers through the lens of Desimone's (2009) five core features of professional development (discussed earlier) in an effort to build on what is already known about quality professional development and consider similarities and differences for K-12 online teachers" (p. 251). Those core features are (1) content focus, (2) active learning, (3) coherence, (4) duration, & (5) collective participation. [See Table 1 on p. 257 of the chapter]

Darabi, A., Liang, X, Suryavanski, R., & Yurekli, H. (2013). Effectiveness of online discussion strategies: A meta-analysis. *The American Journal of Distance Education*, 27, 228-241. Doi: 10.1080/08923647.2013.837651

[From author-provided abstract] A meta-analysis of empirical studies that examined the effectiveness of discussion strategies in online learning. (p. 228). [from summary] despite rather expansive search only 80 studies on online discussion and only 8 met inclusion criteria such as being empirical, having a control group, and reporting a set of descriptive statistics necessary for calculating effect size. This is revealing and supported argument for the scarcity of rigorous empirical studies examining the question. Finding: (1) depending on the conditions, learners perform better if they are engaged in a purposefully structured and strategic online discussion; (2) found college students, rather than high school learners, performed better in asynchronous courses that used strategic discussion, better performance for students in arts, rather than sciences, scenarios prompted productive discussion; (3) findings showed that the more use of instructional and pedagogical features, the better effect

sizes of the strategies and thus the higher the learners' performance...underline the importance of using structured and well-designed strategies in online discussion, findings document the effectiveness of pedagogically rich strategies that include the instructor's involvement and participation, monitoring and moderating, regular interaction and facilitating learners' interaction, collaboration, and teamwork (p. 239)

De la Varre, C., Irvin, M. J., Jordan, A. W., Hannum, W. H., & Farmer, T. W. (2014). Reasons for student dropout in an online course in a rural K–12 setting. *Distance Education*, 35(3). doi:10.1080/01587919.2015.955259.

[Author Article Abstract] - Rural schools in the USA use online courses to overcome problems such as attracting and retaining teachers, geographic isolation, low student enrollment, and financial constraints. This paper reports on the reasons that 39% of rural high school students who enrolled in an online Advanced Placement course subsequently dropped the course. Students who dropped the course were asked to provide an email statement detailing their reasons for doing so. On-site facilitators—local staff members situated in the small rural schools where students were enrolled—also provided reasons whenever one of their students dropped the course. Results indicate that the reasons given by students and on-site facilitators for dropping the course often agreed, and tended to fall within the following five categories: scheduling and time constraints, academic rigor and motivation, technology problems, problems with online medium and lack of teacher immediacy, and parental influences.

Doering, A., & Henrickson, J. (2015). Fostering Creativity through Inquiry and Adventure in Informal Learning Environment Design. *Journal of Technology and Teacher Education*, 23(3), 387-410. Chesapeake, VA: Society for Information Technology & Teacher Education.

[From abstract] Self-directed, inquiry-based learning opportunities focused on transdisciplinary real-world problem solving have been shown to foster creativity in learners. What tools might we provide classroom teachers to scaffold them and their students through this creative process? This study examines an online informal learning environment and the role the learning environment design and teacher pedagogy and practice played in influencing creativity in the classroom. Data were gathered via interviews, direct observation, and focus groups as 95 high school students guided by 1 teacher worked in small groups to collaboratively design and present geography research using the WeExplore adventure learning environment. Findings indicate that teacher and student creativity were impacted by the unique learning environment design, the opportunity to define self-identified driving questions, the process of collaborative group work, and the opportunity to combine more traditional research approaches with more creative arts-influenced ones.

Duncan, H. E., & Barnett, J. (2009). Learning to teach online: What works for pre-service teachers. *Journal of Educational Computing Research*, 40(3), 357-376. Doi:10.2190/EC.40.3.f

While opportunities for online learning are increasing in K-12 education, few teacher education programs include courses on online teaching and learning. Using Garrison and Anderson's (2003) Community of Inquiry framework, this qualitative study explored the educational experiences of pre-service teachers in an experiential online course designed to teach about online teaching. Students explored aspects of online education and created a multi-media teaching module. The study highlighted the need for pre-service teacher education programs to design learning experiences that equip the next generation of teachers with the skills required to teach 21st century students in a variety of media that accommodate a diversity of learning styles.

Learning to Teach Online: What Works for Pre-service Teachers (PDF Download Available). Available from:

https://www.researchgate.net/publication/250144956_Learning_to_Teach_Online_What_Works_for_Pre-service_Teachers [accessed Feb 01 2018].

Eseryel, D., Law, V., Ifenthaler, D., Ge, X., & Miller, R. (2014). An Investigation of the Interrelationships between Motivation, Engagement, and Complex Problem Solving in Game-based Learning. *Educational Technology & Society*, 17 (1), 42–53. Retrieved from http://www.ifets.info/journals/17_1/5.pdf

[Author supplied abstract] The purpose of this empirical investigation is to examine the complex interplay between learners' motivation, engagement, and complex problem-solving outcomes during game based learning. A theoretical model is offered that explicates the dynamic interrelationships among learners' problem representation, motivation (i.e., interest, competence, autonomy, relatedness, self-determination, and self-efficacy), and engagement. Findings of this study suggest that learners' motivation determine their engagement during gameplay, which in turn determines their development of complex problem-solving competencies. Findings also suggest that learner's motivation, engagement, and problem-solving performance are greatly impacted by the nature and the design of game tasks. The implications of this study are discussed in detail for designing effective game-based learning environments to facilitate learner engagement and complex problem-solving competencies. [K-12; n=88, mean age = 14.6 years old]

Ferdig, R. E., & Kennedy, K. (Ed.). (2014). *Handbook of research on K-12 online and blended learning*. Retrieved from <http://repository.cmu.edu/cgi/viewcontent.cgi?article=1029&context=etcpress>

[QM Reviewer Note] This free, downloadable book contains 20 chapters re to K-12 online learning. As the authors' noted, "This book is not intended to be a collection of opinions on the field. Nor is it meant to be a compendium of the top research articles for this past year. It is not a

list of what is currently trending in K-12 online and blended schools. And, it is not a list of 'best pieces' from leading researchers in the field. Rather, this handbook is a collection of what we currently know about research in the field" (p. 10).

Invited experts in the K-12 field provided chapters that are categorized into an organizational framework of (1) a background and historical perspective, (2) research on learning and learners, (3) K-12 learning in the content domains, (4) research on teaching, (5) research on the role of the other, (6) and research on technological innovations. Each chapter contains (1) and introduction, (2) research synthesis, (3) implications for policy and practice, (4) implications for research, (5) conclusion, (6) and references.

Gaytan, J., & McEwen, B. C. (2007). Effective online instructional and assessment strategies. *The American Journal of Distance Education*, 21(3), 117-132. Retrieved from <http://onlinelearningassessment.pbworks.com/f/gaytan.pdf>

[Author-provided abstract] The purpose of this study was to better understand the instructional and assessment strategies that are most effective in the online learning environment. Faculty and students identified several strategies for maintaining instructional quality in the online environment, including the importance of using a variety of instructional methods to appeal to various learning styles and building an interactive and cohesive learning environment that includes group work. Online assessment strategies include having a wide variety of clearly explained assignments on a regular basis and providing meaningful and timely feedback to students regarding the quality of their work. Effective assessment techniques include projects, portfolios, self-assessments, peer evaluations, and weekly assignments with immediate feedback. The role of meaningful feedback cannot be overemphasized.

Geer, D., Rice, M., & Dykman, B. (2014). Reviewing a decade (2004-2014) of published, peer-reviewed research on online learning and students with disabilities. In R. E. Ferdig & K. Kennedy (Eds.), *Handbook of Research on K-12 Online and Blended Learning* (pp. 135-162). Retrieved February 13, 2016, from http://press.etc.cmu.edu/files/Handbook-Blended-Learning_Ferdig-Kennedyetal_web.pdf

[Author article abstract] This chapter reviews published, peer-reviewed research from the most recent decade at the nexus or intersection of K12 online learning and students with disabilities. Previous reviews of research on this topic are summarized. These reviews assert that there is not enough research on the topic. The authors of this chapter employed a multifaceted coding process on articles that were located for review. This process included reading for broad topics, multiple readings by each author, and a negotiated process for final designations. Research in online learning for students with disabilities in K12 settings in the last decade focuses on (1) curriculum evaluation, (2) student achievement (as broadly defined) (3) stakeholder perceptions and (4) policy structures presently in place for online learning for this special population. Blended learning studies that fit the goals of this review were practically non-existent. Several tables capture the major findings of these studies from

which implications are drawn about the ever-present need for more research in this area, but also for research that is more rigorous, and is made available in published, peer-reviewed journals. Implications are also offered for practitioners and policy makers” (p. 135). [QM Reviewer’s Note] - The chapter provides summary charts from a review of the research literature. Topics include policy and practice, online strategy instruction (for example, a simple course design and accessible technology), academic performance in a specific content area (for example, importance of teacher interaction and feedback), content based e-learning environments (importance of learner support), information technology and transition skills, social competence intervention (for example, learning support and scaffolding activities). Many of those studies, specifically those related to online course design, are documented in the QM Research Library. The chapter is in the book.

Golden, S. (2014). Impact of communication modes on discussion in K-12 online education. Retrieved November 2, 2016, from https://etd.ohiolink.edu/letd.send_file?accession=kent1405679223&disposition-online

[From abstract] With the growth of online education, decision makers inside and outside of academia raise questions about the methodologies involved with this approach to learning. This study explores the views of high school students who attend a K–12 school regarding the effect of communication and delivery modes in problem-solving discussions. Participants are given scenarios to discuss in a peer-group environment in a face-to-face setting, synchronous audio conferencing, and asynchronous discussion forums. From student surveys, individual interviews, researcher evaluation, and transcription analysis a deeper understanding of how the different modes influence interaction among students were explored. With a greater awareness of the characteristics of the different communication approaches, educators, parents, and others interested in online education will better comprehend how students interact in this environment.

Harris-Packer, J. D., & Ségol, G. (2015). An empirical evaluation of distance learning’s effectiveness in the K–12 setting. *American Journal of Distance Education*, 29(1), 4-17. DOI:10.1080/08923647.2015.990768

[Author article abstract] This study evaluated the effect of online instruction on the academic achievement of K–12 students in ten states as measured by the percentage of proficient students in reading and mathematics at the school level. We used publicly available data provided by the Department of Education in Florida, Michigan, Minnesota, Nevada, Ohio, Pennsylvania, South Carolina, Utah, Washington, and Wisconsin. Although the online schools do not appear to perform better than the traditional schools, on the average, their performance is not homogeneous. Some schools appear to perform as well as or better than traditional schools (p. 4). [QM Researcher’s Note] - The researchers added in their conclusions that two states in the study the “Florida and Michigan are front-runners in initiating online alternatives and have had a longer period of time to develop best practices of instructional delivery in the online setting” they continued, that “Because online education

has significant practical advantages, identifying the instructional methods that prove to be effective is an obvious topic for future research” (p. 15).

Hattie, J. A. (2011). Visible learning for teachers: Maximizing impact on learning. ISBN 0-415-69015-3.

From a summary of the book: This book is about the attributes of schooling that will truly make a difference for student learning. It is based on evidence from John Hattie’s book Visible Learning. The ‘visible’ refers to a few things. First, it refers to making student learning visible to teachers so they can know whether they are having an impact on this learning. Further, it also refers to making teaching visible to the student as well so that students learn to become their own teachers, an important component of becoming lifelong learners – something we want students to value. The ‘learning’ part of visible learning -- and a common theme throughout the book -- is the need to think of teaching with learning in the forefront and with the idea that we should consider teaching primarily in terms of its impact on student learning.

Hattie, J. A. (2008). Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement. ISBN 0-415-47618-6

[From description] This unique and ground-breaking book is the result of 15 years’ research and synthesises over 800 meta-analyses on the influences on achievement in school-aged students. It builds a story about the power of teachers, feedback, and a model of learning and understanding. The research involves many millions of students and represents the largest ever evidence based research into what actually works in schools to improve learning. Areas covered include the influence of the student, home, school, curricula, teacher, and teaching strategies. A model of teaching and learning is developed based on the notion of visible teaching and visible learning. A major message is that what works best for students is similar to what works best for teachers – an attention to setting challenging learning intentions, being clear about what success means, and an attention to learning strategies for developing conceptual understanding about what teachers and students know and understand. Although the current evidence based fad has turned into a debate about test scores, this book is about using evidence to build and defend a model of teaching and learning. A major contribution is a fascinating benchmark/dashboard for comparing many innovations in teaching and schools.

Hattie J. A. (2003). Teachers make a difference: What is the research evidence? Paper presented at the Australian Council for Educational Research Annual Conference. University of Auckland. Retrieved from [https://cdn.auckland.ac.nz/assets/education/hattie/docs/teachers-make-a-difference-ACER-\(2003\).pdf](https://cdn.auckland.ac.nz/assets/education/hattie/docs/teachers-make-a-difference-ACER-(2003).pdf).

Variables effect on learning: Distinguishing Expert Teachers from Novice and Experienced Teachers. There have been many studies over the past

few years that have asked this question about wherein lies the variance. Most have been conducted using Hierarchical Linear Modelling, which decomposes the variance of many influences such as what the student brings to the task, the curricula, the policy, the principal, the school climate, the teacher, the various teaching strategies, and the home. Ignoring the interaction effects, which are too often, minor, then the major sources of variance are six-fold. Students which account for about 50% of the variance of achievement. It is what students brings to the table that predicts achievement more than any other variable. The correlation between ability and achievement is high, so it is no surprise that bright students have steeper trajectories of learning than their less bright students. Our role in schools is to improve the trajectory of all these students, and I note the recent PIRLS and TIMMS studies which have shown that our trajectory for the not so bright students is one of the fattest in the OECD worlds. Home - which accounts for about 5-10% of the variance – considering that the major effects of the home are already accounted for by the attributes of the student. The home effects are more related to the levels of expectation and encouragement, and certainly not a function of the involvement of the parents or caregivers in the management of schools. Schools - which account for about 5-10% of the variance. Schools barely make a difference to achievement. The discussion on the attributes of schools – the finances, the school size, the class size. The buildings are important as they must be there in some form for a school to exist, but that is about it. Given NZ schools are well resourced with more uniformity in the minimum standards than most countries, it should be less surprising that in NZ the school effects are probably even lower than in other countries. Principals are already accounted for in the variance attributed to schools and mainly, I would argue, because of their influence on the climate of the school. Principals who create a school with high student responsiveness rather than bureaucratic control (i.e., more like a primary school atmosphere than an Intermediate and unlike so many NZ secondary schools), who create a climate of psychological safety to learn, who create a focus of discussion on student learning have the influence. The effect on learning is trickled through these attributes rather than directly on learning. Peer effects - which accounts for about 5-10% of the variance. It does not matter too much who you go to school with, and when students are taken from one school and put in another the influence of peers is minimal (of course, there are exceptions, but they do not make the norm). My colleagues, led by Ian Wilkinson, completed a major study on peer influences and perhaps we are more surprised by the under utilisation of peers as co-teachers in classrooms, and the dominance of the adult in the room to the diminution of the power of the peer. Certainly peers can have a positive effect on learning, but the discussion is too quickly moving to the negative powers with the recent increase in discussion on bullying (which is too real), and on the manner students create reputations around almost anything other than pride in learning. Teachers who account for about 30% of the variance. It is what teachers know, do, and care about which is very powerful in this learning equation.

Hechter, R. & Vermette, L.A. (2014). Tech-savvy science education? Understanding teacher pedagogical practices for integrating technology in K-12 classrooms. *Journal of Computers in Mathematics and Science Teaching*, 33(1), 27-47. Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

[From abstract] This paper examines the technology integration practices of Manitoban K-12 in-service science educators based on the Technological, Pedagogical, and Content knowledge (TPACK) framework. Science teachers (n= 433) completed a 10-item online survey regarding pedagogical beliefs about technology integration, types of technology used, and how often each of these technologies was utilized in pedagogical practices. Results indicate that technology is integrated to promote student engagement, teach 21st century skills, as best teaching practice, to stay current, and for hands-on interactive learning. Through quantitative descriptive statistics, results identified that interactive whiteboards and digital communication programs are frequently integrated; while podcasting, digital hand-held data collection sources, online discussion boards, and simulation software are almost never integrated in Manitoban science classrooms. In addition, data indicates that teachers over-report how often classroom technology is actually placed in student hands. Implications of this study inform school division technology purchases, preservice teacher education, and professional development opportunities.

Hensberry, K., Moore, E. & Perkins, K. (2015). Effective Student Learning of Fractions with an Interactive Simulation. *Journal of Computers in Mathematics and Science Teaching*, 34(3), 273-298. Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

[From abstract] Computer technology, when coupled with reform-based teaching practices, has been shown to be an effective way to support student learning of mathematics. The quality of the technology itself, as well as how it is used, impacts how much students learn. Interactive simulations are dynamic virtual environments similar to virtual manipulatives that also make use of implicit scaffolding, targeted feedback, and concept-focused games. This study examines the effect of teaching mathematics with an interactive simulation on student attitudes and achievement. The intervention involved two classes of fourth-grade students using the interactive simulation over the course of four days to learn early fraction concepts. Data sources included pretests and posttests, a student attitude survey, and student focus group interviews. Significant changes were found from pretest to posttest on overall fraction knowledge, as well as on procedural and conceptual knowledge. Student attitudes toward learning fractions with the interactive simulation were overwhelmingly positive, and these findings were supported by the focus group interview data. These results suggest that interactive simulations, when paired with effective teaching, can be highly effective tools for supporting both procedural and conceptual understanding.

Jackson, L.C., Jackson, A. C., & Chambers, D. (2013). Establishing an online community of inquiry at the Distance Education Centre, Victoria. *Distance Education*, 34(3), 353-367. DOI: 410.1080/01587919.2013.835774

[Author article abstract] This pilot intervention focused on three courses that were redesigned to utilize the online environment to establish an online community of inquiry (CoI). The setting for this research study was the Distance Education Centre, Victoria, (DECV), an Australian co-educational school with approximately 3000 students who, for a variety of reasons, are studying one or more subjects via distance education.

Despite the availability of information and communications technology, many students at the DECV remain socially isolated from their peers. The DECV recognizes that online student collaboration has the potential to bridge this divide. Results of this study suggest that the adaptation of these courses had led to improvements in students' perception of their educational experience. These findings may be of use to other P-12 education providers who are attempting to promote online collaboration and student connectedness (p. 353).

Jennings, A. B. (2013). Searching for success: Implementing immediacy in online courses. (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3571831)

[QM Reviewer's note] This quantitative quasi-experimental intervention study looked at how immediacy affected student success and engagement. The hypothesis was that if the students received immediacy from the instructor, engagement would increase and thus student success would increase. Student success was defined by total of points. Immediacy was defined by the "friendliness of the course instructional materials, approachability and accessibility of the course instructors, and interaction between the students and faculty..."(p. 79). Engagement was measured by "...student's comfort level, communication and connection to the course content, and student's self-reported participation" (p.79). Instructor presence was also a variable and was defined by the way the instructor made the student feel. Results of this study show a relationship between immediacy and engagement but no statistically significant differences between group comparisons of immediacy, engagement, and student success. There might be something here to study regarding engagement and immediacy. What was interesting was low immediacy correlated with student engagement even without the instructor which shows students not really requiring instructor presence and that perhaps other variables encouraged engagement.

Jiang, L., & Elen, J. (2011). Why do learning goals (not) work: a reexamination of the hypothesized effectiveness of learning goals based on students' behavior and cognitive processes. *Education Technology Research & Development*. 59, 553-573. doi:10.1007/s11423-011-9200-y

Article contains excellent discussion of research supporting view that learning objectives are important for students to make connects between a list of learning goals and better knowing what to focus on in a course/unit of study which will allow development of "strategies for reading, attention allocation" (p. 554). Study investigated 72 students' reading behaviors and cognitive processes. Of particular interest to QM is the importance that learning goals need to be interpreted by students for them to be useful in guiding their learning: The current study suggests that this goal characteristic may affect students' task understanding and goal setting, thus influencing subsequent information processes (e.g., monitoring), which, in turn, has an impact on learning outcomes. It is of vital importance that the provided learning goals should not only specify what exactly students were expected to learn, but also clarify which cognitive activities students should [be] carried out (e.g., memorize, apply

or synthesize) in a specific context. (p. 566)

Kennedy, K., & Ferdig, R. E. (Eds.). (2018). Handbook of research on K-12 online and blended learning (second edition). Retrieved from <http://repository.cmu.edu/cgi/viewcontent.cgi?article=1081&context=etcpress>

[QM Reviewer Note] This free, downloadable book contains 50 chapters re to K-12 online learning.

As the editors' noted, "this handbook is a collection of what we currently know about research in the field [of K-12 research]" (p. xi).

Invited experts in the K-12 field provided chapters that are categorized into an organizational framework of (1) a background and historical perspective, (2) research on learning and learners, (3) research on teaching, (4) K-12 online & blended learning in the content domains, (5) research on student support structures, (6) research on instructional design, (7) research on learning environments, (8) K-12 online learning around the world, (9) and emerging issues. Each chapter contains (1) and introduction, (2) research synthesis, (3) implications for policy and practice, (4) implications for research, (5) conclusion, (6) and references.

Kim, C., Park, S. W., Cozart, J., & Lee, H. (2015). From Motivation to Engagement: The Role of Effort Regulation of Virtual High School Students in Mathematics Courses. *Educational Technology & Society*, 18(4), 261–272.

[From abstract] Engagement and motivation are not one and the same, but motivation can be transformed into engagement with proper design of support. In this study, we examined the differences between high performers and low performers with regard to changes in their motivation, regulation, and engagement throughout the semester. Participants were 100 students enrolled in online self-paced asynchronous mathematics courses offered at a virtual high school in the United States. A survey was administered to participants at three times throughout the semester. Data were analyzed using repeated measures MANOVAs. Overall, high performers and low performers differed with regard to their changes in motivation and regulation throughout the course, specifically, in self-efficacy and effort regulation. The study findings offer implications for teaching and research on creating potentially effective support for virtual learning.

Kong, S. C., Chan, T.-W., Griffin, P., et al. (2014). E-learning in School Education in the Coming 10 Years for Developing 21st Century Skills: Critical Research Issues and Policy Implications. *Educational Technology & Society*, 17(1), 70–78.

[Author-Provided Abstract] One of the curriculum goals of e-learning in school education is to develop learners for 21st century skills through their daily learning activities. This paper aims to discuss the research issues and policy implications critical for achieving such a curriculum goal. A review of literature in the related fields indicates that K-12 schools should take advantage of e-learning to maximize learning opportunities of

learners for the development of 21st century skills. We identify six research issues critical for e-learning in school education, namely the realization of developing 21st century skills of learners; the bridging of the gap between curriculum in school and situations in society; the maximization of learning opportunities in the learning process; the collection of evidence of improvement and building awareness of progress; the assessment of 21st century skills; and the provision of teacher development for enculturating learners to develop 21st century skills. We recommend the relevant stakeholders across different countries/regions to consider policies on the goal-setting of curriculum addressing 21st century skills development and bridging gap between school and society; on the availability of digital technology for school education; on the privacy/legal issues of learning data in e-learning process; and on the teacher development for pre-service and in-service teachers. [This article provides international support for the importance of quality online courses that promote development of 21st century skills.]

Kuo, F.-R., & Hwang, G.-J. (2014). A Five-Phase Learning Cycle Approach to Improving the Web based Problem-Solving Performance of Students. *Educational Technology & Society*, 17(1), 169– 184. Retrieved from http://www.ifets.info/journals/17_1/15.pdf

[Partial author-supplied abstract] In this study, a five-phase learning cycle approach is proposed to conduct web-based problem-solving activities. From the experimental results, it was found that the students' web-based problem-solving performance was improved after participating in the learning activities. Moreover, based on the analysis of 170 elementary school students' web information searching portfolios as well as their feedback to the assessments, questionnaires and interviews, it was found that the students' problem-solving ability and their web-based problem-solving performance were highly correlated, implying that the five-phase learning cycle approach could be able to improve not only the students' web-based problem-solving performance, but also their general problem solving ability.

Kuo, Y.-C., Belland, B. R., Schroder, K. E. E., & Walker, A. E. (2014). K-12 teachers' perceptions of and their satisfaction with interaction type in blended learning environments. *Distance Education*, 35(3).

[Author article abstract] Blended learning is an effective approach to instruction that combines features of face-to-face learning and computer-mediated learning. This study investigated the relationship between student perceptions of three types of interaction and blended learning course satisfaction. The participants included K-12 teachers enrolled in a graduate-level course. Results indicate that students (a) perceived interaction as important to their learning experiences and (b) were moderately satisfied in their blended learning course. The predictive model of student satisfaction including three types of interaction was reliable. Of the three types of interaction, learner–content interaction was the strongest predictor of student satisfaction when the course design involved a low amount of collaborative activities. Additionally, student personality was found to be a vital factor for interaction and satisfaction in this type of course design. Students who reported having an

extroverted personality noted more interaction and a higher level of student satisfaction than those who self-reported as introverted.

Lawrence, A. D. (2017). Toward culturally responsive online pedagogy: Practices of selected secondary online teachers (Order No. 10618276). Available from ProQuest Dissertations & Theses A&I. (1957414178).

[Author-provided abstract] Proponents of K-12 online learning claim that it can provide more equitable learning opportunities by offering access to courses that might not otherwise be available to students, and by providing personalized learning experiences. Despite the growth of online learning in K-12 public schools, very little is known about what constitutes good online teaching. The purpose of this interpretivist investigation was to learn about some of the ways in which culturally responsive teaching can occur online. This study focused on the practices of four full-time online high school teachers. Using the methods of grounded theory research, I analyzed data generated through observations of online courses, interviews with teachers, and teacher-written narratives in order to learn how four instructors practiced culturally responsive online pedagogy in one state-supported online program. Results indicated that the teachers engaged in frequent and ongoing dialogue with their students. The teachers used multiple strategies to get to know their students, to build class community, to adapt instruction to students' learning needs and preferences, and to make learning relevant. Teachers also discussed contextual factors (e.g., program structure and student enrollment) that impacted their practice. However, some characteristics of culturally responsive pedagogy, including infusing students' cultures into the curriculum and helping students to challenge power and hegemony, did not emerge. A discussion of these results includes potential implications for educational leaders at the state, district, and program levels, as well as recommendations for future research on culturally responsive online pedagogy.

Louwrens, N., & Hartnett, M. (2015). Student and teacher perceptions of online student engagement in an online middle school. *Journal of Open, Flexible, and Distance Learning*, 19(1), 27-44. Distance Education Association of New Zealand.

“While our understanding of student engagement in the compulsory schooling sector is well developed in face-to-face contexts, the same cannot be said for online and distance learning environments” (p. 27) in introducing their study of middle schoolers who benefitted by designed and facilitated activities requiring behavioral, cognitive, and emotional engagement.

Luo, T., Murray, A., & Crompton, H. (2017). Designing authentic learning activities to train pre-service teachers about teaching online. *International Review of Research in Open and Distributed Learning*, 18(7). Retrieved from <http://www.irrodl.org/index.php/irrodl/article/view/3037/4440>

[Abstract] Online learning is increasingly being used in K-12 learning environments. A concomitant trend is found towards learning becoming authentic as students learn with tasks that are connected to real-world occupations. In this study, 48 pre-service teachers use an online environment to engage in authentic practice as they developed online learning experiences for their future students. Using a design-based research methodology, the researchers were involved in planning, designing, implementing, and evaluating the higher education class across two macro cycles. An authentic learning framework was utilized in the development of the class. Findings explicate the design of the course and how it aligned to the authentic learning framework. It appears that web-based tools were beneficial as the pre-service teachers designed their own K-12 online classes. Findings show that the pre-service teachers' comfort increased when using the using online web building applications in the authentic environment. Furthermore, a high level of engagement in reflective and collaborative learning was uncovered during the activities. This research acts as a springboard for educators who are interested in designing online higher education courses incorporating authentic learning experiences.

McAllister, L. & Graham, C. (2016). An analysis of the curriculum requirements for K-12 online teaching endorsements in the U.S. *Journal of Online Learning Research*, 2(3), 247-282. Waynesville, NC USA: Association for the Advancement of Computing in Education (AACE). Retrieved from <http://files.eric.ed.gov/fulltext/EJ1148412.pdf>

[Author-provided abstract] This study examined existing K-12 online teacher preparation programs in the United States to ascertain the degree to which teachers are prepared to function in online/blended classroom learning environments. This study used a content analysis approach. Research specifically targeted online teacher preparation programs implemented in institutions of higher education. The researcher collected data from state offices of education and institution deans through email surveys inquiring about the existence and capacity of K-12 online teaching endorsements, course descriptions and other course documents. [Quotes from conclusion] State and institution online teacher preparation programs are expanding but not at a comparable rate to the rapid increase of K-12 online student enrollments. Only nine of fifty states presently offer online teaching endorsements. In two of the nine, no institution offers the online teaching endorsement.... If teaching in an online learning environment is a different skill set than teaching in a face-to-face learning environment, which we believe it is, and if endorsement programs are few, which we know them to be, then administrators are in a tight spot when choosing preparation programs for online teaching. These administrators will have to decide whether preparation will come through pre-service courses, an endorsement, or professional development. The institutional data gathered and analyzed here indicate that current programs focus on online/blended pedagogy, instructional design, and the foundations of online/blended learning. ... Not enough programs include curriculum for online privacy, acceptable use policies, safety, and legal issues. Safety is an important aspect of the online/blended classroom because it is different than face-to-face classrooms. Additionally, there does not appear to be widely used or accepted resources for preparing online teachers. A variety of texts

and resources supplement the courses that this study examined. (pp. 278-279)

Miller, N. B. (2013). Student access of supplemental multimedia and success in an online course. *American Journal of Distance Education*, 27(4), 242-252.

[Author-provided abstract] Institutions are developing online courses that contain rich multimedia, but research shows there is little difference in student achievement when these types of materials are included. However, many studies report the results of the presence, not the access, of multimedia learning objects. In addition, they do not categorize the multimedia as supplemental or required. To better understand the relationship between multimedia inclusion and student success, this study investigates student access of three categories of supplemental multimedia in an online course and uses access data as a filter for comparing student final grades. A summary of statistically significant differences in mean final grades at four levels of supplemental multimedia access is included. Student Access of Supplemental Multimedia and Success in an Online Course | Request PDF. Available from: https://www.researchgate.net/publication/271822635_Student_Access_of_Supplemental_Multimedia_and_Success_in_an_Online_Course [accessed Jan 31 2018].

Nordstrom, L. (2015). The Impact of Written Text and Narration on Learning in an Online Middle School Math Lesson. Retrieved from ProQuest Dissertations and Theses Database. (UMI No. 3714750).

[From abstract] The use of computer-based and online lessons in K-12 math classrooms has increased dramatically in the last decade. However, there is a lack of research on whether the theories developed to support the design of such lessons, such as the cognitive theory of multimedia learning, apply equally to adults and younger learners. Based on the redundancy principle of the cognitive theory of multimedia learning, which focuses on the selection of media elements in the design of instruction, this study explored the effect of presenting only narration, only text, or both in a commercially available online math lesson to a group of 112 sixth grade students. In order to increase the relevance and importance of the lesson to the participants, the lesson on a required topic in the curriculum took place in a school computer lab during regular math class. To measure learning, participants took a paper and pencil pre-test, an immediate post-test, and a delayed post-test three weeks later. Results revealed that mode of presentation did not significantly impact either immediate or delayed quiz score, meaning there was no positive or negative effect of redundancy for students at any achievement level. However, math achievement did have a significant, curvilinear relationship with quiz score growth from the pretest to the immediate posttest, indicating that participants with the highest math achievement gained the most from the lesson while those who were approaching proficiency learned the least. Participants with the lowest math achievement and those considered proficient showed approximately equal gains that were midway between the groups with the highest and lowest gains. This

relationship held for all modes of presentation. While there was no significant effect of redundancy, the results point to the importance of considering prior knowledge, in this case math achievement, when deciding to use self-paced online math instruction.

Oberg, A. M. (2015). Active Learning Manifested within a Synchronous Online Classroom. ProQuest Dissertations and Theses Database. (UMI No. 3725687)

[Introductory paragraph] The size and scope of online K-12 education is increasing rapidly. Research to develop a deeper understanding of the benefits of and barriers to delivering instruction via the Internet is limited. Traditionally research has shown that strategies of active learning, which when applied properly in K-12 classrooms, contribute to positive student attitudes towards self and learning and increase academic achievement. From a review of the literature, it was clear that there is limited research on synchronous online classrooms and on the indicators of active learning as they are manifested in synchronous online classrooms. Consequently, the aim of this study was to portray the perspectives of synchronous online teachers towards indicators of active learning. Participants for this study were teachers from a single cyber charter school. The participants responded to an online survey designed to elicit perceptions of important indicators of active learning, barriers to implementation of active learning, and strategies used to engage students in active learning strategies in synchronous online classrooms. A simple descriptive research design was applied to analyze the data. The data show that the most important indicator of effective instruction was teacher preparation required to create engaging learning activities.

Oviatt, D., Graham, C. R., Borup, J., & Davies, R. S. (2016). Online student perceptions of the need for a proximate community of engagement at an independent study program. *Journal of Online Learning Research*, 2(4), 333–365. [Draft version of an article accepted to the *Journal of Online Learning Research* retrieved from Academia.edu Weekly Digest Final article manuscript will be accessible online at: <http://www.learntechlib.org/p/173649>]

[Author-provided abstract] "Research suggests that collaborative learning designs, which require interaction with teachers and peers, can promote engagement and learning for online courses. Many K-12 students seek supplemental online courses to meet graduation requirements and desire flexibility, which often conflicts with required interactions. This paper asserts that online independent study learners may create a proximate community of engagement (PCE) to provide the benefits of collaboration and interactions. Using the adolescent community of engagement (ACE) framework as a lens for identifying interactions, this study surveyed K-12 independent study students to assess their perception of the need for interaction with a support community while completing an online course. Results showed that students perceive the benefits of such a community and plan to receive support from parents, teachers, and counselors proximate to their location. The perception of the need was significantly greater for students taking a course for credit recovery than those taking the course for the first time. Course

providers can coach independent study students and family on how to create a proximate community of engagement" (p.2). "The ACE framework (Borup et al., 2014) proposed three different community roles external to the student: teacher, parent, and peer. From literature studying effective online instruction, framework elements were identified: roles, tasks, functions, and activities. The activities (actions or interactions) lead to increased engagement and learning. For example, the elements defined for the teacher role include the following: • Three different functions (facilitating interaction, organizing and designing course materials, and instructing students) • Ten different tasks, such as nurturing student relationships, monitoring and motivating student engagement, and providing intellectual and scholarly leadership • Thirty-two actions or interactions, such as facilitating parent-instructor interactions, asking questions, or providing constructive feedback" (p. 11). [QM Reviewer's comment] Helpful graphic showing relationship among student, peer, parent, and teacher engagement in the adolescent community of engagement presented in Figure 1 of "ACE framework from Borup et al. (2014, p. 111)" (p. 12).

Rector-Aranda, A., & Raider-Roth, M. (2015). 'I finally felt like I had power': student agency and voice in an online and classroom-based role-play simulation. *Research In Learning Technology*, 23. doi:<http://dx.doi.org/10.3402/rlt.v23.25569> Retrieved from <http://www.researchinlearningtechnology.net/index.php/rlt/article/view/25569>

[Author-provided abstract] - This article presents an educational action research study examining how one online, classroom-based role-play simulation offers middle school students the opportunity to strengthen their agency and voice. The Jewish Court of All Time (JCAT) is a web-mediated simulation designed for middle school classrooms where students take on roles of various characters throughout the world, history and literature to address an imaginary court case. JCAT is meant to develop students' skills in writing, critical thinking, perspective-taking, historical empathy and communication, as well as subject literacy in social, historical and cultural contexts. Our research question focuses on how JCAT further encourages and supports the middle school students' agency and voice. We examine how students exercise their agency and voice both in the online environment and in accompanying classroom activities. As an educational action research study, we focus on simulations in which at least one of the authors was a participant, and also pay special attention to how our findings can enhance future simulations. Findings suggest that students constructed knowledge of democratic ideals and were able to exercise their agency and voice specifically, both in the online environment and in accompanying classroom activities. [QM RC comments] - Although this study is one case study focused on an online in a middle school, the findings suggest the importance of learner interaction in an online environment. Online course design has a large role to play in providing interactive learning environments for students.

Repetto, J. B., & Spitler, C. J. (2014). Research on at-risk learners in K-12 online learning. In R. E. Ferdig & K. Kennedy (Eds.), *Handbook of Research on K-12 Online and Blended Learning* (pp. 107-134). Retrieved February 13, 2016, from http://press.etc.cmu.edu/files/Handbook-BlendedLearning_Ferdig-Kennedy-etal_web.pdf

[Author-provided abstract] - "Students who fail to graduate high school with a diploma or its equivalent set in motion a pattern of low wages, poor health, and risk of incarceration that will impact their future quality of life. This pattern negatively impacts society with fewer wage earners, lower taxes, and less spending, along with a strong potential of needing to support these students through some form of welfare. Due to its flexible scheduling, individual mentoring, safe communities in which to learn, and varied methods of teaching, online learning has shown promise as a conduit to engage at-risk students in learning so that they stay in school and earn a diploma. In this chapter, research along with essential strategies that allow online programs to meet the needs of at-risk learners to improve their educational outcomes are presented. Additionally, implications for policy, practice, and future research are discussed" (p. 107). [QM Reviewer's Note] - The authors in a chapter in the book Ferdig, R. E., & Kennedy, K. (Eds.) (2014). Handbook of Research on K-12 Online and Blended Learning. Retrieved from <http://press.etc.cmu.edu/content/handbook-research-k-12-online-and-blended-learning-0> Reported on concept of 5 Cs that is suggested from triangulating the special education, general education, and distance education literatures to impact practice and improve educational outcomes (p. 115). The 5 Cs of student engagement framework include: curriculum, caring community, control, climate, and connect. While approaching from a macro-Cyber School perspective, rather than a micro-course design level, the authors pointed out the importance of at-risk students being able "to see that there is a connection" between their current concerns and/or learning objectives (p. 116) and that there is "ample amount of time to master specific learning objectives (p. 120), in a safe and supporting climate with a sense of community (p. 118), with students receiving instruction on targeted academic, social, and behavioral interventions" (p. 118), as well as engaging learning activities. Related to course design, the authors suggest employing the principles of UDL (p. 123).

Roblyer, M., Davis, L., Mills, S., Marshall, J., & Page, L. (2008). Toward practical procedures for predicting and promoting success in virtual school students. *The American Journal of Distance Education*, 22(2), 90.

[QM Reviewer's Note] - Student access to technology is important for student success. No course design details but research results indicate that student support in course is a factor in student success.

Roe, M., & Cavanaugh, C. (2018). Developing pedagogy and course design skills in novice virtual school teachers. Retrieved April 26, 2018, from <https://leadinglights.cewa.edu.au/wp-content/uploads/2018/02/novice-teachers-abstract.pdf>

[Abstract] - Ten secondary schools in a large statewide education system initiated a virtual school network to address the lack of upper secondary school courses for university entry in smaller high schools. This article highlights the yearlong professional learning program designed to prepare a cohort of classroom teachers, who were novices to teaching online, for developing and teaching fully online courses. In accordance

with program goals, data include pre/post measures of teachers' capabilities in the iNACOL National Standards for Quality Online Teaching, and external course reviews using the iNACOL National Standards for Quality Online Courses. Results show that teachers grew in all standards their self-reported online teaching skills, and reviewers rated two-thirds of the 21 course quality items as being Very Satisfactory and Satisfactory for a majority of the courses prior to teachers beginning to teach students. Findings indicate areas of emphasis for the ongoing work of the cohort's professional learning community.

Rozitis, C. P. (2014). Instructional design competencies for online high school designers-by-assignment: A Delphi study. Retrieved from ProQuest Dissertations and Theses Database. (UMI No. 3645854)

[From abstract] This study is situated within the field of instructional design and sought to identify competencies specific to online designers-by-assignment in high school learning environments. Since existing instructional design standards currently available to guide designers-by-assignment differ from one another, a lack of clarity remains about which specific standards actually benefit this emerging professional group in the process of developing and revising courses they eventually teach. The purpose of this qualitative Delphi study was to identify, through expert agreement, instructional design competencies that can benefit high school online designers-by-assignment and the instructional design profession. This study employed the qualitative Delphi design to achieve consensus among experts in five fields (high school online practitioners, instructional design academics, university pre-service instructors, online high school administrators and high school online instructional designers). The Delphi design enables experts in related fields and separated by physical distance to make and refine judgments without stress and with anonymity to achieve consensus. Based on a majority (75+ %) vote, experts went through three rounds of the Delphi technique to reduce 116 competencies from seven organizations (American Educational Communication and Technology Standard; International Board of Standards for Training, Performance and Instruction - Instructional Design Competencies; International Association for K-12 Online Learning; Standards for Digital Learning Content in British Columbia; Wilson; National Education Association; and Southern Regional Education Board) to 10. The 10 competencies were reworded for uniformity and sorted into the following five categories: communication, content, assessment, technology, and professionalism. Experts, theories of distance education, models of instructional design and learning theories support the final competencies. Based on the outcomes of the study, professionals with the responsibility for training and hiring online high school educators have a clearly defined set of instructional design competencies that will support professional development of online high school designers-by-assignment.

Sailors, K. M. (2014). Advance organizers in an online social studies unit to promote self-regulation in middle school students. ProQuest, UMI Dissertations. Retrieved from <http://search.proquest.com/docview/1618233273>

[From abstract] As the popularity and enrollment in online courses continues to expand, researchers have investigated strategies and methods to support student learning. Little attention has been focused on what instructional supports are needed for students enrolled in an online K-12 environment. The current research study investigated the effects of adding advance organizers in an online setting on middle school students' self-regulation. This quasi-experimental study was designed using a repeated-measures counter-balanced method. During the study, 106 middle school students, living in the Midwest, participated in two online social studies units. The study included two online instructional units designed to include a treatment (inclusion of an advance organizer) and a control. Students were placed into two groups, based on their school (TC: treatment-control; CT: control-treatment). Each group was exposed to both the treatment and control but in opposite order. Students were asked to complete the self-regulation survey at the beginning of the study, as a baseline, and at the end of each instructional unit to determine if the advance organizer changed the student perception about self-regulation. Additional data collected during this study recorded how students interacted with the online materials and the frequency to which they viewed the content. At the conclusion of the data collection process, 45 students had completed the online required elements, fewer than estimated for adequate power, therefore limiting the results of the study. The analyses of student perception of self-regulation revealed no statistically significant effect for the advance organizer. Results indicated on average students (TC group) who received the advance organizer first viewed the online content more frequently than those in the CT group. This evidence could be interpreted that the TC group were exposed to the advance organizer first actually changed their learning behaviors in the control unit and therefore recorded greater activity than the CT group. At the conclusion of the study students completed a feedback survey about the online unit. The majority of respondents were positive towards the advance organizer and the online units. Results from this study are encouraging and may be used by others to further investigate the implications for advance organizers on middle school student self-regulation.

Shattuck, K., Zimmerman, W. A., & Adair, D. (2014). Continuous improvement of the QM Rubric and review processes: Scholarship of integration and application. *Internet Learning* 3(1). Retrieved August 16, 2015, from http://www.ipsonet.org/images/Westphalia_Press/Internet_Learning_Journal_2-2/3-1/3.%20Shattuck%20ILJ%203-1.pdf

[Author-provided abstract] Quality Matters (QM) is a faculty-centered, peer review process that is designed to certify the quality of online and blended courses. QM is a leader in quality assurance for online education and has received national recognition for its scalable, peer-based approach and continuous improvement in online education and student learning. Regular, robust review and refreshment of the QM Rubric and processes keep them current, practical, and applicable across academic disciplines and academic levels. The review ensures validity in the set of quality standards that make up the Rubric. An overview of the regular review of the QM Rubric and process, as well as examples of the use of data to continuously improve the Rubric and process are presented. The guiding principles of QM – a process that is continuously improved upon and that is collegial and collaborative – are discussed in relationship to Boyer's scholarship of application and scholarship of integration. Glassick (2000) noted that Boyer's scholarship of overlapping discovery, integration, application, and teaching is "a hard but worthwhile task" (p.

880). This article outlines how the dynamic and rigorous processes adopted by QM continue to take on that worthwhile task” (p. 25). [QM RC comments] - This article summarizes analyses done on 2008-2010 data and found no significant difference between QM- and subscriber-managed course reviews (n=434). Analysis of 2011-July 1013 (n=1,494) revealed 70.5% courses met standards in the initial review; 26.6% did so after amendment, and 2.8% were pending amendment. Analysis of most frequently met and missed standards revealed standards 6.1 and 7.2 were met in 95% of the reviews, while standards 8.2 and 3.5 were not met in 58.9% and 65.3% of the course reviews respectively. These data informed the work of the 2014 Rubric Review Committee in efforts of continuous improvement as informed by evidence of application of QM standards during the formal peer review process.

Shubilla, L., & Sturgis, C. (2012). The learning edge: Supporting student success in a competency-based learning environment. A CompetencyWorks Issue Brief, International Association for K-12 Online Learning. Retrieved from http://www.competencyworks.org/wp-content/uploads/2012/12/iNACOL_CW_IssueBrief_LearningEdge_full.pdf From the Michigan Virtual Learning Research Institute: <http://k12onlineresearch.org/>

[Summary] This paper is just a first step toward understanding the dynamics of building a learning-edge culture. Innovators across the country are rapidly learning from their experiences what works and what doesn't work to help students. They are learning from each other about how to best embed supports into the very core of teaching and learning, school culture, and district operations.

Smistad, K. E. (2013). Student feedback in elementary online learning: A phenomenological study using person-centered instruction. ProQuest Dissertations and Theses Database. (UMI 3559881)

[From abstract] Online learning is becoming increasingly attractive as an option for learning at the K-12 level. However, most research in online learning is done with adults or university participants - a population with a different developmental level and different reasons for learning than those still in compulsory schooling. This study examined the phenomenon of peer feedback among elementary school participants learning online using the Person-Centered Instruction (PCI) instructional design model created by Miller and Mazur (2001). Ten-year-old participants participated in a four-week online course in the subject of health utilizing the PCI instructional design model. Using the model, students in groups collaborated with the instructor to design a student-centered learning experience taking into consideration interest, ability, prior knowledge and need while adhering to state learning standards. The project plans were then carried out in collaboration with group members. Data collected included online participant discussion, reflective journals, and interviews. Participant interviews and reflective journals were analyzed using a phenomenological methodology. Online participant discussion was analyzed using the qualitative content analysis instrument: Interaction Analysis Model for Examining Social Construction of Knowledge in Computer Conferencing authored by Gunawardena, Lowe, and

Anderson (1997). It was found that feedback was perceived as either good or bad according to the emotions engendered by the receiver, the nature of student feedback within the course was isolating for the participants, and feedback was mediated by student relationships. Recommendations for practice resulting from the study include providing developmentally appropriate scaffolding for the implementation of effective student feedback, implementing voice or video recording capabilities within the design of the courseroom, increased instructor presence, and the implementation of student facilitators within courseroom groups. [The dissertation citations contained here are published with the permission of ProQuest LLC. Further reproduction is prohibited without permission. Copies of dissertations may be obtained by Telephone (800) 1-800-521-0600. Web page: [http:// www.proquest.com/en-US/products/dissertations/individuals.shtml](http://www.proquest.com/en-US/products/dissertations/individuals.shtml).]

Smith, S. J., & Harvey, E. E. (2014). K-12 online lesson alignment to the principles of universal design for learning: The Khan Academy. *Open Learning*, 29(3), 222-242. <http://dx.doi.org/10.1080/02680513.2014.992402>

[Author-provided abstract] "The field of K-12 education is being transformed, with an influx of students, including those with identified disabilities, engaging in blended and fully online learning. While online learning shows promise for students with disabilities through flexible content and personalised instruction, concerns regarding accessibility and appropriateness of online learning for this population still exist. In order to examine this concern, researchers developed and used a Universal Design for Learning (UDL) Scan Tool to measure lesson content and alignment with UDL principles, guidelines and checkpoints. Four hundred and seventy-eight math, science and world history Khan Academy lessons were randomly selected and evaluated for this study. The paper highlights the results of the study, in terms of the lessons' alignment with UDL principles and guidelines, as well as a discussion on limitations and future research" (p. 222.) [QM Researcher's Note] - The UDL scan tool was not included in the article, however, some basic info on UDL was provided: "UDL is based on research within the neurosciences, developmental psychology and learning differences (Rose & Gravel, 2012) that suggests teachers should consider how to integrate three principles into their instruction and assessment practices that are based on three interrelated types of brain networks (recognition, strategic and affective networks). The principles are the following: multiple means of representation, multiple means of action and expression, and multiple means of engagement. These three principles are further expanded and clarified through nine unique guidelines, three per principle and various checkpoints that should be considered, if not followed, for instructional planning and when determining whether practice is truly aligned to UDL" (p. 225). [Readers might want to investigate the Universal Design for Learning guidelines from CAST at <http://www.cast.org/our-work/about-udl.html#.VI8yL781YZw>]. Topical areas include: providing multiple means of representation; multiple means of action and expression; and multiple means of engagement (p.12).

Spinks, K. (2007). Predictors of success in asynchronous learning with a focus on the role of sense of classroom community. (Walden University). ProQuest Dissertations and Theses, Document ID 30476919.

[QM Reviewer's Note] - This dissertation looks at student success related to building community in an online program and recommends that designers build in opportunities to create community and academic self-efficacy.

Staker, H., & Horn, M. B. (2012). Classifying K-12 blended learning. Retrieved from <https://eric.ed.gov/?id=ED535180>

[Author-provided abstract] The growth of online learning in the K-12 sector is occurring both remotely through virtual schools and on campuses through blended learning. In emerging fields, definitions are important because they create a shared language that enables people to talk about the new phenomena. The blended-learning taxonomy and definitions presented in this paper expand upon and refine the authors' previous work in helping to create a shared language for the K-12 blended-learning sector. In their report titled, "The rise of K-12 blended learning," the authors observed that there were six main blended-learning models emerging in the sector from the perspective of the student. This paper introduces a number of changes to that taxonomy based on feedback from the field and the need to update the research to keep pace with new innovations that are occurring in blended learning. Most importantly, the paper eliminates two of the six blended-learning models--Face-to-Face Driver and Online Lab--because they appear to duplicate other models and make the categorization scheme too rigid to accommodate the diversity of blended-learning models in practice. By moving from six to four overarching models, they have created more breathing room in the definitions. They hope these new models will better describe the majority of programs so that nearly all blended-learning programs will fit comfortably within one of the four. Notes about how this taxonomy differs from the taxonomy in "The rise of K-12 blended learning," January 2011 are appended.

Tseng, S.-C., Liang, J.-C., & Tsai, C.-C. (2014). Students' self-regulated learning, online information evaluative standards and online academic searching strategies. *Australasian Journal of Educational Technology*, 30(1), 106-121. Retrieved from <http://ascilite.org.au/ajet/submission/index.php/AJET/article/view/242>

[Partial author-supplied abstract] Online information searching strategies (OISS) used by students can be viewed as a key indicator in online learning environments. Therefore, developments in their OISS may also involve variables such as self-regulated learning (SRL) and online information evaluative standards (OIES). Three instruments, an OISS, a SRL and an OIES were used to investigate the roles of SRL (including basic and advanced SRL) and OIES (including naive and advanced standards) in the OISS of 307 high school students in Taiwan. The results of a structural equation model confirmed that both students' SRL and OIES have positive predictions on their OISS. In addition, students' advanced OIES mediated the relationships between basic SRL and OISS. However, when the students took advantage of the advanced SRL in employing

OISS, the significance of the OIES was not shown. This study contributes to the understanding of students' online academic information searching strategies.

[QM Reviewer note] Study of 307 high school students in Taiwan.

U.S. Department of Education, Office of Educational Technology (2016). 2016 National Education Technology Plan: Future Ready Learning- Reimagining the Role of Technology in Education. Retrieved from <http://tech.ed.gov/>

Introduction Paragraph: The National Education Technology Plan is the flagship educational technology policy document for the United States. The 2016 Plan, Future Ready Learning: Reimagining the Role of Technology in Education, articulates a vision of equity, active use, and collaborative leadership to make everywhere, all-the-time learning possible. While acknowledging the continuing need to provide greater equity of access to technology itself, the plan goes further to call upon all involved in American education to ensure equity of access to transformational learning experiences enabled by technology. The principles and examples provided in this document align to the Activities to Support the Effective Use of Technology (Title IV A) of Every Student Succeeds Act as authorized by Congress in December 2015.

Wayer, N. M. (2013). From design to enactment: A case study of blended learning across the content areas in a K-12 school. ProQuest Dissertations and Theses Database. Retrieved from <http://search.proquest.com/docview/1547360014>

[From abstract] This study investigated the ways in which four K-12 teachers designed their content area courses using a blended learning approach and how those courses were ultimately enacted with students. All four teachers were part of a blended learning pilot in its first year at a K-12 school in the southeastern United States. Through the lens of constructivism, this study paid particular attention to: (1) the ways teachers enacted blended teaching practices and standards following online professional development on blended learning; (2) the kinds of resources or activities teachers selected and used in the online portion of their blended course; (3) what student activity within the LMS could indicate about the purpose of the instructional materials; and (4) how the design and enactment of blended learning courses differed across the content areas. Findings from this study revealed that the four courses varied along four continuums. They varied in how much of the course was enacted as designed; levels of student activity; the amount of control students had over time, place, path, and/or pace versus how much of online portion of the course was used in the face-to-face classroom under teacher direction – referred to here as degrees of blendedness; and whether the course was oriented towards learning from technology or learning with technology. The more experience that a teacher had with teaching in a blended format, the more likely they were to enact their course as designed, have higher levels of student activity, exhibit a greater degree of blendedness, and take an instructional approach of learning with technology rather than from it. Recommendations are made for future

professional development in blended learning, for blended teaching practice, and specifically for the profiled school. Additionally, recommendations are made for future research on standards and best practices for blended teaching and learning, the four continuums used in this study to describe blended courses, and models of blended learning as they occur in K-12 settings. This study contributes to the literature on how blended learning models are being implemented in an actual K-12 setting.

Wiggins, G. (2015, February). What works in education - Hattie's list of the greatest effects and why it matters [Web blog post]. Retrieved from <https://grantwiggins.wordpress.com/2012/01/07/what-works-in-education-hatties-list-of-the-greatest-effects-and-why-it-matters/>

[Select paragraphs] I have been a fan of John Hattie's work ever since I encountered Visible Learning. Hattie has done the most exhaustive meta-analysis in education. Thanks to him, we can gauge not only the relative effectiveness of almost every educational intervention under the sun but we can compare these interventions on an absolute scale of effect size. Perhaps most importantly, Hattie was able to identify a 'hinge point' (as he calls it) from exhaustively comparing everything: the effect size of .40. Anything above such an effect size has more of an impact than just a typical year of academic experience and student growth. And an effect size of 1.0 or better is equivalent to advancing the student's achievement level by approximately a full grade.

Yang, Y-T. C., & Chang, C-H. (2013). Empowering students through digital game authorship: Enhancing concentration, critical thinking, and academic achievement. *Computers & Education*, 68, 334-344.

[Author Article Abstract] - Digital game-based learning is a popular strategy for engaging students by making learning fun. Actively involving students as designers and producers of digital games may have even greater potential for student empowerment through enhancing concentration and engagement, fostering higher order thinking, and improving learning outcomes. Thus, this study empirically investigated the impact of digital game authoring on students' concentration, critical thinking skills, and academic achievement. A total of 67 students in two seventh-grade classes participated in this 19-week-long experiment, and were divided into an experimental group (32 students designing digital games) and a comparison group (35 students designing Flash animations). The interdisciplinary approach involved integrating biology and computer programming classes. Students in the experimental group designed digital games based upon biology course content, while the comparison group collaboratively produced Flash animations based upon the same course content. The experimental results, using MANCOVA for pretest, posttest, and delayed posttest scores, demonstrate significant improvements in critical thinking skills, and academic achievement, with increased retention of both course content and critical thinking skills observed for the delayed posttest. For concentration, a relative advantage for the experimental group as compared with the comparison group was noted, but did not reach statistical significance. Based on the results of this study, implications for practitioners and researchers are provided, including the integration of programming or computer

science with other courses for digital game authoring and the evaluation of other learning outcomes such as creative thinking, problem solving, and flow. [QM Reviewer's Note] study reported from National Cheng Jung University in Taiwan]

Zheng, B., & Zhang, Y. (2016). Interactions and learning outcomes in online language courses. *British Journal of Educational Technology*, 48(3), 730-748.

[Author provided abstract] Interactions are the central emphasis in language learning. An increasing number of K-12 students take courses online, leading some critics to comment that reduced opportunities for interaction may affect learning outcomes. This study examined the relationship between online interactions and learning outcomes for 466 students who were taking high-school level online language courses in a Midwestern virtual school. Regression analysis was employed to examine how three broad types of interactions, learner-instructor, learner-learner and learner-content (Moore, 1989), affected students' perceived progress and satisfaction. After controlling for demographic information, motivation and learning strategies, the results of multiple regression showed that learner-instructor and learner-content interactions had significantly positive effects on satisfaction, whereas learner-learner interaction did not affect satisfaction. Learner-content interaction was the only factor that affected perceived progress. [QM Reviewer's note] Article transfers known Moore online learning into a k-12 study/application. Survey for middle- and high-school student at virtual school while taking language course. Results from 92% high school students. [From discussion]: "Among the three types of interaction we studied, both learner-instructor and learner-content interactions had significantly positive effects on students' perceived satisfaction, whereas learner-learner interaction did not affect it" (p. 741)...The significance of the impact of learner-content interaction on student satisfaction was consistently reported in previous studies conducted in postsecondary contexts (Chejlyk, 2006; Keeler, 2006; Kuo et al., 2014). Our research tends to confirm these previous findings in the case of online K-12 learning" (p. 742). [From conclusion] This study provides empirical evidence for the extent to which each of Moore's (1989) three main types of interaction predicts students' perceived progress and satisfaction. Interactions increase the variances explained by our models by 11% in the case of satisfaction, and 1% in the case of perceived progress, after controlling for the variances explicable by motivational variables and learning strategies. This study contributes to the body of research on the role of interaction in online higher education, and extends it to cover high-school level online language courses. Our results suggest that improvements in learner-content interaction may help to increase learner satisfaction and perceived progress, and an increase in learner-instructor interaction may benefit student satisfaction" [includes reference of design focus] "A study of virtual schools (DiPietro et al.,2008) has identified several best practices that may increase students' engagement with the content. These are (1) building components that reflect students' interests, (2) utilizing student-centered practices, (3) clearly organizing and structuring content, (4) embedding deadlines within the content structures and (5) delivering content using different media" (p. 744.)

Zweig, J., & Stafford, E. (2016). Training for Online Teachers to Support Student Success: Themes from a Survey Administered to Teachers in Four Online Learning Programs. *Journal of Online Learning Research*, 2(4), 399-418. Waynesville, NC USA: Association for the Advancement of Computing in Education (AACE). Retrieved January 31, 2018 from <https://www.learntechlib.org/p/172573/>. From the Michigan Virtual Learning Research Institute: <http://k12onlineresearch.org/>

[Author-provided abstract] In addition to teaching the subject matter, online teachers are tasked with supporting students' understanding of the online environment as well as students' progress, engagement, and interactions within the course. Yet only four states and the District of Columbia require teachers to receive training in online instruction prior to teaching a K–12 online course (Watson et al., 2014). Directors of three supplemental online learning programs and one consortium in the Midwest administered a survey to their teachers to gather information about teachers' preservice education and professional development, the challenges they encountered while teaching and supporting students online, and their perceived needs for additional professional development. Online teachers reported that they primarily received training while teaching online rather than during preservice education. The most commonly reported challenges were related to supporting student engagement and perseverance. The results from this survey suggest that online teachers may need additional training in multiple areas in order to best support their students. Further, the results highlight that more rigorous research is needed to determine the online instructional practices that improve student engagement, perseverance, and performance.