Literature Review

Introduction

There are many demands that modern educators are facing, such as large class sizes, gaps in knowledge, varied student achievement levels, varied student populations, and many other factors that make effective teaching more and more complex. As class sizes increase many teachers are unable to keep up with individualized instructional guidance and support of their students. Small group instruction is also starting to become a challenge in the classroom due to large class sizes and off task behaviors. This struggle with off task behaviors can be attributed to many factors, but the most important factor in the middle school setting is due to frustration and differentiation issues with the content and learning activities that are offered (some students are not able to keep up with the pacing while others are bored because they are already masters of the content). With all these issues, it is becoming increasingly necessary for a change in the way educators present and share knowledge and skills. The most effective way to differentiate is blended learning with a variety of content choices and modalities, so that students may choose what works best for them in each situation or unit. The most effective blended learning plan, included compiling a wealth of resources including case studies, literature reviews, and more sources with great research and theoretical information. Focusing on recent research from 2010 to present and only included peer reviewed sources for the basis of this review,he station rotation model with an emphasis on project based learning seemed the most natural solution to the current differentiation crisis, Ceating a blended learning program that not only gives a variety of choices for learning and learning activities, blended learning can also group students by level of interest and academic readiness while differentiating for each group and student. Choosing to include project based learning into this model because I have seen how impactful it can be in a science classroom and it provides the best opportunity for student choice and allows for

differentiation in a more natural way. In order to effectively prepare for this type of blended learning program, this review is developed from various journal articles and studies that focused on station rotation blended learning effectiveness, project based learning benefits effectiveness, best practice for using online instruction, models of blended project based rotational learning, and even the best method for changing traditional instruction to blended online learning.

Transitioning from Traditional to Blended Learning

The first thing I needed to wrap my head around as I began my research was how you could take all the information we currently teach and format it into a digital unit or source that could effectively impart the knowledge and skills to students. Dalsgaard and Godsk, 2007) found in order to be effective, blended learning modules and units must have the learning outcomes and objectives reframed as guiding questions throughout the learning process with varied resources to support the learners throughout the learning process. This process showed relative success, but resources and activities need to be adjusted for higher rigor and relevance in order to see the levels of success that we know can occur with these types of blended learning programs (Dalsgaard and Godsk, 2007).

This report followed the transition of university courses from traditional to blended styles by breaking the process down into three major components. The first component simply required the educator to make the regularly utilized slides available online and then adding a variety of supplemental information that students could learn and review at their own pace (Dalsgaard and Godsk, 2007). Second, students were encouraged to continually access and utilize the information throughout the course as students were required to complete their coursework to better understand and remember the information (Dalsgaard and Godsk, 2007). Finally, this study found that effective transition relied on freeing up the teacher to create

discussion opportunities on individual or small-group levels to provide quality guidance and help with the student's specific learning needs as they complete their work and projects (Dalsgaard and Godsk, 2007).

Advanced Learners Online Differentiation

During the transitional period, thinking about the resources that are already available that can be used as the basis for core digital content for blended learning. While taking inventory of my resources, I realized that I did not have many options for advanced high achieving learners, especially when it came to meaningful lesson extensions. If I am going to implement a blended learning program that is effective I need various options for students at all levels of academic readiness, so I started researching possible resources. That is where McKoy and Merry (2023) came to the rescue with their article about finding the best online resources for advanced learners to show their stuff (mastery of the content).

The top sites included Frame VR, Tinkercad and instructables, and Google arts and culture (McKoy and Merry, 2023). All of these sites are free to use and allow students to create and collaborate with each other as they work on their creations. Each site allows students to make connections to the world around them and witness that science really does apply to everything around them, especially in today's digital age. It is helpful to have a small bank of resources that can be used to enhance learning as it is very hard to find quality content that will challenge even the most advanced and gifted learners in a room. With this as a basis I will be able to add more quality resources to build up my resource library for all the blended learning units that I will be using in my classroom soon.

Time To Know Program Model

This study caught my attention because it was conducted to test the effectiveness of a blended learning program that is very similar to one I designed in a rough draft of my disruptive innovation plan. The program is called "Time to Know" and it consists of a highly interactive core content in a digital platform for math and ELAR with plans to expand to science and social

studies (Rosen and Beck-Hill, 2012). The test groups were fourth and fifth grade students in Grand Prairie ISD near Dallas, so a very local district with very similar demographics to the demographics at my current school (Rosen and Beck-Hill, 2012). The platform delivered learning materials and independent learning content in a variety of modalities and gave students exposure to multiple modalities of learning such as games, collaborative chat boards, discovery based learning environments, and many other resources (Rosen and Beck-Hill, 2012). Teachers shifted from the givers of knowledge to the leaders of learning. The students were able to take central resources and apply them as they saw fit based on their understanding of the content. Differentiation and student choice was built into the program so teachers could focus on initiating one-on-one interactions with students and provide guidance and enrichment as needed. The quality of interactions and teaching increased (Rosen and Beck-Hill, 2012).

With that increase these students showed more interest in their learning and their efforts were rewarded by significant growth reflected in substantially higher test scores when compared to control group students within the same district (Rosen and Beck-Hill, 2012). This program also demonstrated that when students are actively engaged in their learning their attendance in school will increase, which was true in this study (Rosen and Beck-Hill, 2012). Students in the program had an almost 30% reduction in absences and negative behaviors were also significantly lower when compared to control groups (Rosen and Beck-Hill, 2012).

Blended Learning and ELL Students

The whole point of considering a blended learning course set up is to allow for true effective differentiation of content for all learners, so it is important to evaluate all the needs of every student learner group I will be working with in my classroom. My district has a large number of students who speak English as a second language so the efficacy of blended learning for their specific needs must be considered. Mahalli et al (2019) answered this call with their study on blended learning in EFL Language Arts classes. This study found that the station

rotational blended learning model was helpful in this setting as students were grouped based on their skills and background knowledge going into the unit and progressed at their own pace with teacher guidance (Mahalli, Nurkamto, Mujiyanto, Yuliasri, 2019). This preview of content and learning in a student centered way allowed for deeper discussions of the content within the small student groups and allowed the students to create more meaningful connections between what they were learning and their daily lives. All students benefit from small group learning opportunities, but EL students benefit greatly from this type of instruction as the discussions and explanations can be slowed down and repeated as needed, while that just isn't possible during whole group instruction. Freeing the teacher up to make these interactions possible creates remarkable growth in student performance as demonstrated by the study's findings, which showed that the students increased their levels by at least 10% with many attaining a 40% growth in their skills and knowledge (Mahalli, Nurkamto, Mujiyanto, Yuliasri, 2019).

Rotational Blended Learning Efficacy

This study showed the effect of using a rotational blended learning model in a college computer course. E-learning, mini projects, and seminars were the three major components of this course's blended learning model with utilization of both face-to-face and online modalities of learning to make the most efficient use of the time in the course (Yang, Member, IEEE, Newman, 2019). The e-learning component was the core material that was posted at the beginning of the course and remained accessible long after the course was over so that information could be accessed as the students needed the materials even if they needed to review the resources multiple times (Yang, Member, IEEE, Newman, 2019). The resources as outlined by Yang and colleagues (2019) were varied formats such as articles, journal entries, videos, and even relevant discussion boards and forums so that students could rely on the resources that made the most sense to them.

All learning was framed as a means to an end of an academic goal or problem, so students were engaging in what they were learning more deeply so that the face-to-face time could be spent with the teacher guiding the students as they were working through their mini projects that had real world applications instead of just imparting some knowledge to the students (Yang, Member, IEEE, Newman, 2019). Seminars were attended based on the student's interests and understanding of the content they learned during the e-learning modules. The questions posed in the seminars were questions that the students would encounter in their careers and lead to deeper discussions and more creative problem solving than when compared to their cohorts in the traditional setting course (Yang, Member, IEEE, Newman, 2019). In fact this blended learning program showed that students were scoring very similarly on the tests and quizzes throughout the program, which shows that no harm is coming from this, while the overall passing rate of the course was 100% compared to only 75% of the traditional format students (Yang, Member, IEEE, Newman, 2019). This fact alone proves that blended learning when structured right, can increase student achievement significantly.

Station Rotation Perceptions

Truitt and Ku (2018) conducted a study that focused on elementary school students' perception of their own growth and the effectiveness of blended learning units. This study reported both positive and negative perceptions that were reported by the students during the study. The positive concepts that were shared were increased student voice in the presentation of information and various learning opportunity modalities, students also reported satisfaction with utilizing more digital and technology driven resources, and most importantly students reported feeling that not only did they feel they are learning a lot more, it seems that the information is actually important and relevant to their lives and futures as adults (Truitt and Ku, 2018). Students also reported that they had fun while learning and felt supported in their efforts

because there were many sources to turn to for help such as peer groups, online discussion boards, and even initiating a discussion with the educator (Truitt and Ku, 2018).

Negatives in this study were surprisingly limited to only student perception of the coursework being too hard and frustrations associated with using technology such as computer freezing, glitches in programs, etc. (Truitt and Ku, 2018). While neither of these issues can be solved completely, as public school educators do not have a choice in what they teach and technology issues are just a part of life, we can limit the negative effects that students experience. To limit frustrations with the rigor of content students should exercise critical thinking more often and having growth mindset lessons embedded into their school day may be incredibly helpful. Having quick critical thinking or social based games or learning activities that students can participate in while they are waiting for the technology to catch up can also lower the amount of frustration that was reported in this study. Overall, this study showed that students are onboard with blended learning and that using technology for education can be successful to a generation that is obsessed with technology (Truitt and Ku, 2018).

Failed Blended Learning Program

Most studies and case reviews show positive results of blended learning, however there were some that showed negative feedback when the data was analyzed. Upon further investigation of these studies by Haftador, Tehranineshat, Keshtkaran, and Mohebbi (2023), it became clear that blended learning programs only seemed to fail when the facilitation and physical tools (like computer access, internet access etc) was not taken into account during the planning phase of the design process. Luckily enough, my campus is at a one-to-one student to chrome book ratio for all core classes so every student will have ample opportunity to complete the digital learning assignments and units while in class. A majority of my students at my school take a computer class in which they learn to type properly as well as how to effectively use several computer programs, so my eighth grade students will even have some background

knowledge of educational technology in order to help them be successful in these differentiated online units.

Project Based Learning in Chemistry

Zhao and Wang (2022) conducted a study on the learning outcomes after a project based learning chemistry unit when compared to a control group with a more traditional style of learning. Each unit began with a central or guiding question that students were tasked to answer by the end of the unit (Zhao and Wang, 2022). Each question bridged the learning in the lessons with real world applications, so the learning was interesting, relevant, and differentiated slightly based on how the student groups chose to frame and attack the problem (Zhao and Wang, 2022). The project parameters and guidelines were then presented. Finally, students were expected to work through a series of lessons with central problems and questions that had to be solved by each group before they could continue on. By the end of the lessons the students were able to construct their own solutions and answers to the central unit questions that were posed and they could choose to demonstrate their knowledge in whichever modality they felt was the most appropriate (Zhao and Wang, 2022).

Zhao and Wang's (2022) qualitative analysis found that students involved in this project based learning unit were not only more motivated to learn chemistry, they were infinitely more capable collaborators and creative problem solvers by the end of the school year when compared to their cohorts in traditional learning settings. Based on these results, I believe project based learning in science is clearly impactful for a number of reasons and should be embraced because of its ability to produce more well-rounded students. Students are set up to be more successful adults because they are going to have more of the soft skills like collaboration, creative problem solving, application of best scientific practices, and more confidence in their own learning, which are needed in the current job markets and those of the future.

Middle School Math Blended Learning

Many teachers know that middle school is a whole different ball game in K-12 than you will find at any other level. Students are very unique and their needs even more so, which can make teaching and differentiating a battle of epic proportions. To ease this battle a qualitative study comparing traditional style units to blended learning units in middle school math was conducted by Fazal and Bryant (2019). The traditional style is what we all think of with a math class, the teacher goes over some notes, does some example problems with the whole class, and then releases students to work on the math problems independently. The blended learning units began with individualized learning, followed by small group instruction, and ending with a project or collaborative problem solving situation.

When looking just at the growth of students as individuals the data supported the current theories that blended learning when designed correctly can positively impact student learning (Fazal and Bryant, 2019). Students that were in the blended learning math classes outperformed the traditional students on MAP testing significantly (Fazal and Bryant, 2019). However, there were mixed results on the STAAR test, which made the data inconclusive on the effectiveness of blended learning with TEKS (Fazal and Bryant, 2019). I think the STAAR test results were skewed due to the nature of the test and I personally do not believe that STAAR tests accurately demonstrate student ability or academic achievement. It definitely does not properly measure the growth of the students as it is a once a year high stakes test (I do not have definitive data on this as this is just my opinion based on what this study found). I think this study effectively proves that blended learning models like this one work and encourage much higher levels of achievement than could be expected using traditional teaching methods.

STEM Standards-focused Project Based Learning

This study is interesting because it was a longitudinal study comparing academic science achievement and growth between a school that embraced project based learning versus a public school with more traditional teaching models (Sahin and Top, 2015). It turns out

that project based learning students consistently outperform students that are taught using traditional methods both in the short term and over time (Sahin and Top, 2015). I liked that the authors mentioned this fact, because I currently teach at a lower performing middle school and administrators are very reluctant to allow for more freedom and seem to go the complete opposite way and just teach strategies and skills geared towards the STAAR test entirely. We keep teaching to the test and doing the same exact things and it is not boosting scores much at all. I think it is high time to change things around here and make student growth and learning a priority and the increase in scores will come naturally. This program has proven to be pivotal in teaching skills such as collaboration, creative problem solving, increased self-efficacy, increasing future professional skills (like making presentations and creating materials using digital sources) as well (Sahin and Top, 2015). With these skills, not only will our students be better prepared for the almighty STAAR test, they will also be better citizens when they enter college and/or the workforce.

The STEM program in this study utilized a blended learning model called the SOS Model. This model is set up with a brief teacher lead introduction of the topic with teacher led questioning to ensure basic understanding (Sahin and Top, 2015). After the direct instruction, students are given space to complete a variety of virtual experiments, demos, videos about the content, and honestly the sky's the limit here (Sahin and Top, 2015). Once students have demonstrated understanding of the topic they must research an experiment, demo, or other lesson activity that they can use to teach the class about an assigned topic.

Project Based Blended Learning Lab Model

Project based learning was combined with a rotational blending learning model to create the ultimate learning experience. Project based learning creates an atmosphere of creativity, collaborative spirit, and high levels of engagement as students work together to solve real problems. While the rotational blended learning model allows students to access a variety of resources and materials to learn the necessary skills and knowledge within the unit allowing for

maximum student choice and differentiation. Dewi and her colleagues (2023) created a program that should produce noteworthy results in collaboration, academic growth, and self-efficacy, however, this study was unable to successfully produce proof of collaborative growth throughout the course of this study.

While there are no definitive answers as to the growth of students' collaborative skills solely attributable to this program I believe there is promising evidence to support further study of this model's efficacy, especially since I am most interested in student's academic growth outcomes (Dewi, Listiaji, Akhlis, Kurniawan, Siswanto, Widyaningrum, 2023). I think that combining the two modes of learning will produce the most authentic learning environment because it gives students full responsibility and voice in their learning. The first step to growing learners academically is engaging their interests and making them believe in their own ability to learn.

Middle School Students' Perceptions of Choice

Demink-Carthew and Netcoh (2019) not only created an important study that delves into the complex issues surrounding middle schoolers "buy in" to their own learning, but also wrote and organized their paper in a way that made me feel so seen as a middle school educator. The study they created evaluated the perceptions and opinions middle schoolers had in regards to a specific type of project based learning in which students are introduced to a topic and inquiry questions are developed, then students research these questions and prepare to share their research and applications to the topic, finally students present all their research and information to their peers (Demink-Carthew and Netcoh, 2019). Many studies seem to conveniently forget that students at the middle school level have unique social and emotional issues that significantly impacts not only their desire and motivation to learn, it also impacts the way they are willing to learn and what works best for them. The authors noted "with its emphasis on student voice and choice in the learning process, personalized learning represents a promising pedagogy for responding to adolescents' developmental need for autonomy in school"

(Demink-Carthew and Netcoh, 2019, p 3) when explaining why this project based learning method can be so beneficial to the learning process in middle grades.

The project was designed with systems in place to allow the educator to support each student in a small group or individual setting depending on their needs. The structured support throughout the project allowed students to move towards the end goal effectively while allowing students to work at their own place and make connections between the content and real world in a truly meaningful way. Demink-Carthew and Netcoh (2019) found “most students reported that they liked or loved making choices about how they learned during the HJL project and that they felt little to no stress associated with this choice” (Demink-Carthew and Netcoh, 2019, p 7), which anyone who has experience with this age group knows getting any type of positive consensus on a unit or activity is a great thing and demonstrates a huge pedagogical feat. The study did find that some students struggled with figuring out how to ask for help when there were so many different options and choices (Demink-Carthew and Netcoh, 2019), so teachers using this type of lesson will have to keep that in mind and teach students self-advocacy skills. I think using a structured Google Form activity throughout the project to check in on students and have them answer certain questions about where they are in their project could also help students that may not know exactly how to self-advocate effectively. Based on the responses in the Google Form, students could be grouped into small groups and given specific guidance about what they are unsure of or struggling with.

Effect of Choice on Performance

Learner centered teaching methods such as “cafeteria-style grading” as described in this study as a unit or course format that allows students to choose assignments off of a large list or menu of options outlined by Hanewicz, Platt, and Arendt’s range in modality and learning style preference showed increased student involvement and ownership of their learning (Hanewicz, Platt, and Arendt, 2017). The study design incorporated 64 total assignments for a total of 1,100 points that students could choose from based on their interest or learning style that works best

for them with the primary differences between assignments being to either “create” something versus just “completing” and activity with the create assignments being worth more points compared to complete assignments (Hanewicz, Platt, and Arendt, 2017). I like that this study differentiated between creative assignments with higher rigor and assignments that are lower rigor and easier to complete, because as a middle school teacher I know students will not always rise to a challenge unless they are motivated to. Students will be more willing to stick with challenges that arise with higher rigor assignments when they will have to complete less things overall, and if they decide to choose lower assignments they will do so knowing that they will have to do more assignments, which takes the argument out of getting work completed and turned in. In fact, Hanewicz, Platt, and Arendt (2017) stated “over one-third completed more assignments than were required for an A grade. Moreover, this additional coursework was generally found to be of high quality” (Hanewicz et al, 2017, p 283).

The ranking in popularity of the assignments completed was surprising because the study found the most completed assignment was discussion posts followed by the final exam jaw-droppingly shocking to me because who actually chooses to complete a final if they don’t have to, and finally was the course and instructor evaluation survey, which was overwhelmingly positive (Hanewicz, Platt, and Arendt, 2017). This demonstrates that when given choice and a sense of empowerment students are much more willing to work hard and enjoy what they are doing because their learning was driven by them and their own interests. It makes sense that this style of course set-up would show such a marked increase in student performance, because I know that I personally, do better on assignments that I feel are interesting or help build skills that I think will be important for me to have in the future and hate feeling like I am wasting time and effort. Many of my students have revealed similar feelings to me when I have spoken to them about their performance in my class or behavior issues. This study has made me even more excited to test out my innovation plan and try to develop a unit with a project aspect that would allow for increased student choice.

Student Choice to Create Learner-Centered Online Courses

Authors Pinchot and Paullet, stated that “cafeteria-style grading is especially appropriate in the online learning environment, where it can serve as an aid to motivate students to be active participants in virtual lessons” (Pinchot and Paullet, 2021, p 17). My innovation plan hinges on using digital online learning units to allow students differentiated learning opportunities and a choice in which multimedia format to utilize in order to learn the required information in the unit. In order for this learning model to be successful, I have to offer choices that actually motivate students while giving them the proper support to learn effectively. If students are not engaging with the content in meaningful ways then the virtual learning will not have an impact and I will most likely experience negative behaviors, which lowering behavior issues was a main point in the development of this plan. I like that students in this study were required to take quizzes on what they were learning every week giving the teacher valuable data on what students’ are struggling with or may need clarification on, but they were given a choice on what optional assignments they wanted to complete from a menu of assignment options.

Pinchot and Paullet (2021) indicated that the quality and quantity of assignments was high, with as many as 57% students completing more than the minimum requirement needed for an A grade in the class with significant decrease in quality of work submitted with an overall average in the course of a B grade. This data shows that not only were most students very engaged and motivated in their learning, but they were also very successful overall in this style of online course. I think that a lot of this has to do with students being able to choose what works best for them and they were able to play to their strengths resulting in better quality work and better grades. I think it was interesting that most students chose to complete a wide variety of assignments that ranged from writing assignments to video presentations and other creative design assignments (Pinchot and Paullet, 2021) instead of just completing the same type of

assignment that they were most comfortable with. I love that students are more willing to take chances and expand their horizons when it is their choice to do so and found this particularly encouraging as I begin planning how I will design my rotational blended learning units.

Conclusion

Throughout this research and literature review process I have focused on creating a rotational blended learning unit with a capstone project based learning assignment to effectively promote student engagement and responsibility of learning while providing necessary support to differentiate instruction for all learners to be successful in class. Through my research I have found that both rotational blended learning and project based learning are effective at increasing student engagement and giving students ownership of their learning opportunities. I believe that since I am lucky enough to have a one-to-one chromebook to student ratio, I will be able to create lessons with various multimedia content delivery choices (like podcasts, slides presentations, reading passages, videos, and even lab demonstrations) to introduce a topic to students. Then, students will be able to move at their own pace through a series of assignments from a choice menu, because I really liked the effectiveness of cafeteria-style grading not only for differentiation and personalization purposes but also for increased academic growth, which has been a proven effect of this style of course/unit. Finally, once students have shown mastery of the content, they will be required to research and answer a real-world guiding question or problem and present their findings and ideas to their peers.

I truly believe that through proper differentiation of instruction and personalization of the methods students can show mastery of the content in class, we will be able to increase student growth and achievement by increasing their ownership and willingness to persist against challenges because they feel that their efforts in class with further their success in the world as they become adults. Many of my students have told me that they don't care about what they are learning in school because they feel that it is not going to help prepare them for the real world

and it seems pointless to them. In all honesty, I get why learning about moon phases seems pointless to a middle school student, and having a cool project that connects this to something that matters or is at least really interesting would help so much. The built in enrichment into the lessons from project based learning is where real growth and critical thinking happens and by using rotational blended learning I will be able to differentiate initial instruction while balancing project guidance so that I will be available to all students instead of just running in circles trying to help everyone and not giving any student group the individualized quality attention I want to be able to provide. Overall, I think that with careful consideration, I can blend all these methods and strategies into a rotational blended learning environment that will effectively free me up to provide individualized help, instruction, and feedback to my students.

Resources

Alireza Mortezaei Haftador, Banafsheh Tehranineshat, Zahra Keshtkaran, & Zinat Mohebbi. (2023). A study of the effects of blended learning on university students' critical thinking: A systematic review. *Journal of Education and Health Promotion*, *12*(1), 95. https://doi-org.libproxy.lamar.edu/10.4103/jehp.jehp_665_22

Dalsgaard, C., & Godsk, M. (2007, January 1). Transforming traditional lectures into problem-based blended learning: challenges and experiences. *OpenLearning -Harlow-*, *22*(1), 29–42.

DeMink-Carthew, J. & Netcoh, S. (2019). Mixed Feelings about Choice: Exploring Variation in Middle School Student Experiences with Making Choices in a Personalized Learning Project. *RMLE Online: Research in Middle Level Education*, *42*(10), 1–20. https://doi-org.libproxy.lamar.edu/10.1080/19404476.2019.1693480

Dewi Novi Ratna, Listiaji Prasetyo, Akhlis Isa, Kurniawan Ismail Okta, Siswanto, & Ayu Widyaningrum Risti. (2023). Project-based Laboratory Rotation Blended Learning Model to Train Students' Critical Thinking and Collaboration in Physics Course. *E3S Web of Conferences*, *400*, 01023. https://doi-org.libproxy.lamar.edu/10.1051/e3sconf/202340001023

Fazal, M., & Bryant, M. (2019). Blended learning in middle school math: The Question of effectiveness. *Journal of Online Learning Research*, *5*(1), 49–64.

Hanewicz, C., Platt, A., & Arendt, A. (2017). Creating a learner-centered teaching environment using student choice in assignments. *Distance Education*, *38*(3), 273–287.

Mahalli, Nurkamto, J., Mujiyanto, J., & Yuliasri, I. (2019). The implementation of station rotation and flipped classroom models of blended learning in EFL learning. *English Language Teaching*, *12*(12), 23–29.

McKoy, S., & Merry, K. E. (2023, January 1). Engaging advanced learners with differentiated online learning. *Gifted Child Today*, *46*(1), 48–56.

Pinchot, J., & Paullet, K. (2021). Using student choice in assignments to create a learner-centered environment for online courses. *Information Systems Education Journal*, *19*(2), 15–24.

Rosen, Y., & Beck-Hill, D. (2012). Intertwining dgital content and a one-to-one laptop environment in teaching and Learning. *Journal of Research on Technology in Education*, *44*(3), 225–241.

Sahin, A., & Top, N. (2015). STEM students on the Stage (SOS): Promoting Student Voice and Choice in STEM Education Through an Interdisciplinary, Standards-focused, Project Based Learning Approach. *Journal of STEM Education: Innovations & Research*, *16*(3), 24–33.

Truitt, A. A., & Ku, H.-Y. (2018). A case study of third grade students' perceptions of the station rotation blended learning model in the United States. *Educational Media International*, *55*(2), 153–169. https://doi-org.libproxy.lamar.edu/10.1080/09523987.2018.1484042

Yang, S., & Newman, R. (2019). Rotational Blended Learning in Computer System Engineering Courses. *IEEE Transactions on Education, Education, IEEE Transactions on, IEEE Trans. Educ*, *62*(4), 264–269. https://doi-org.libproxy.lamar.edu/10.1109/TE.2019.2899095