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School Improvement Plan: Updating Curriculum, Technology and Classrooms for Education 4.0

David Carter
Northwestern College - Orange City

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Capstone Project: A School Improvement Plan

Northwestern College, Orange City, Iowa

Abstract

This school improvement plan describes Education 4.0 and elucidates the critical need for updating school curriculum and teaching methods. Our education system is largely outdated and ill prepares students for their future. The following improvement plan seeks to transform pedagogy into that which is student centered. To do this, schools must update their curriculum and teaching methods, implement the latest technology, and redesign the classroom setting. Through this project, I will identify the reasons for needed change in schools and explain Education 4.0.

Keywords: Education 4.0, Technology, Curriculum, Classroom Design.

Table of Contents

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Many schools today are finding it increasingly difficult to keep students' attention. Today, students have a plethora of other activities and distractions that are far more important in the student's mind than school; from extracurricular activities to family gatherings, cell phones, games, friends, family dynamics, sickness and the uncertainty of an increasingly unstable world, students often do not regard school as an important part of their lives. These students have access to all the information in the world at their fingertips and are both competent and interested in anything involving technology. These students find that information is not best obtained from an adult, but by technology. "…evolving at an exponential rate…This has led to shifts in the way people communicate, collaborate, solve problems, create projects and consume content." (Sheninger, 2019, p. xi). Many students find it increasingly difficult to focus and the age-old question of "when are we ever going to use this" seems to be asked more and more. Unfortunately, this question is increasing because many schools are becoming out of date. Schools' resources, curriculum and even the layout of the classrooms themselves are often not designed for the current learner, but for the past learner. From technology to content and format, many schools are becoming very detached from what is needed for tomorrow's workforce needs. Tomorrow's workforce will need to have high levels of interpersonal and creativity skills that can be easily adaptable (Bakhshi, Downing, Osborne, & Schneider, 2017). Therefore, it is vitally important to update the curriculum, classroom design, and resources at our schools. Each of these three parts help teachers and students have the tools to be current and able to actively embrace this new education need known as Education 4.0

The purpose of this school improvement plan is to form a 5-year plan of updating curriculum, classrooms, and resources at the school. Having a 5-year plan will give a good starting point to updating the school district and being able to analyze the results and make the necessary changes before moving

onto the next stage. The three parts of this plan are updating the curriculum, school building and expanding/updating the school resources. These three elements are all important factors to increasing the school's performance. The school will use teacher and administrator surveys and the results of the Iowa Standardized Assessment of Student Progress (ISASP), to monitor the success of this plan. The research questions this school improvement plan hopes to answer is: Does changing/updating the curriculum, technology, and classroom design increase both student achievement and engagement? In creating this implementation plan we hope to be able to update our school, improve our ISASP scores and most importantly, better prepare our students for the future.

Articles for this literature review were taken primarily from the Google Scholar and the Dewitt Library at Northwestern College. My inclusion criteria was that it must have been within the last 10 years and be studies pertaining to including Education 4.0, technology in education, Classroom design, curriculum updating, and prominent teaching methods such as STEM, and Flipped classroom. 20 sources were used to identify the progression of education, the current and future needs of education, and obstacles and solutions for schools to prepare students for the future.

Changing the curriculum, classroom design, and resources for the school will allow the school to give the resources to the teachers and students alike to better prepare the students for the future. By creating a 5-year implementation plan and analyzing student performance on the ISASP and teacher surveys, the school can make the appropriate adjustments to the implementation plan.

The following literature review sections are based on the aspects of Education 4.0 such as Technology, curriculum to support the technology and the environment to support the technology, curriculum, and creativity. To that end the sections are the history of education leading up to and including Education 4.0 movement, Technology needed in the classroom, Classroom design, and

curriculum updating. Each of these sections end with a summary of the sections and major takeaways from that section.

Review of the Literature

History of Education and Education 4.0

As previously touched upon, a longstanding goal of our education system has been the preparation of students for the real world and workforce. When making advancements in education we must take into special consideration our end goal. As the workforce and our world evolve, the education system must follow suit in order to best serve the modern learner and our working communities. A mixed-methods, qualitative and quantitative, study by Bakhshi, Downing, Osborne, & Schneider (2017) dove into this topic by examining predictions surrounding job type and skills which would be of increased demand by 2030. The researchers polled a panel of experts by having them investigate current job and industry trends. These experts subsequently categorized identified trends and created an algorithm predicting both future jobs and required skills reaching beyond the year 2030. Surprisingly, 71.7% of current U.S. careers were deemed to have an uncertain future. 18.7% of current careers were predicted to be in decline due to the involved skills becoming obsolete. Only 9.6% of the examined career paths were predicted to increase. Important findings in regard to needed future skills was proficiency in higher order thinking with an emphasis on good interpersonal skills, and increased need for a mixed and adaptable skill set. One of the main themes that emerged from this study was the high need for adaptability and quick learning of new concepts and skills. Despite the large scale of this study, it is important to point out many of their findings were inconclusive. However, it is important to include in spite of this weakness as it draws attention to the value of flexibility and creating lifelong learners. The study found that intrapersonal and cognitive skills were highly valued skills moving forward. Furthermore, knowledge in the fields of Biology, the English Language, and Administration were seen to be highly important fields of study

To enter on the path of progress, we must identify our present strengths and weaknesses. We need to be able to objectively assess our current status but also review and respect the progress we have made. In an evaluative report by Salmon (2019), a brief overview of education is laid out and predictions are made regarding the characteristics of the future education system (Education 4.0). For the last 1000 years education and the quest for knowledge was achieved by a select group, mainly those students privileged enough to attend University. During this time, knowledge and education were seen as a tangible entity transferred from Professor to student. This changed around 60 years ago when education started to become increasingly accessible to individuals worldwide. Due to the increased demand for education systems across the nation, the need for instructors, financing, and number of institutions soared. As a result of this shift, large textbook companies began to publish specialized and specific curriculum and subject focused schoolbooks. However, the teaching model remained the same, you attended class and learned through the instructor. With the arrival of computers and the internet, people were given the ability to seek out a plethora of information and communicate across the globe. Cut to modern day and we live in a time where information and knowledge can be obtained from a single search engine on a phone, tablet, television screen, computer, voice activated home device, or a multitude of other tech gadgets with ease. Education 4.0 takes into consideration this massive shift in technology advances and information accessibility.

The second part of the evaluative report by Salmon (2019) focuses on Education 4.0 and the future of education. Education 4.0 is the blending of technology and human interaction. It is taking the best of both aspects and combining them. Education 4.0 is very future oriented, to that end, it focuses on having students use technology frequently. Students can guide their studies

and be able to access information at a moment's notice. The teacher is no longer the focal point of knowledge, they are only the guide. School is not where you obtain knowledge, it is where you learn how to think and what you are interested in.

In the later portions of Salmon's article, she explains how Artificial Intelligence (AI) will be a big factor in not only Education but industry. The ability to adapt and interface with AI will be a critical component of progress. Salmon concludes that schools and universities will need to focus on technology related progress and curriculum objectives to prepare their students for the future or risk them being left behind. By constantly looking at the trends of industry, schools can stay relevant. Salmon's report is a good overview of the history of our education system and through its review terminates in well-founded predictions regarding the content of Education 4.0. By comparing the trends of the history of education and industry, we can begin to see the change gravely needed in our education system. Never before has humanity had AI, automations, and the information highways of the web to contend with. These new technologies and the technologies they will create cannot be prepared for in the same manner that people prepared for the agrarian and industrial revolutions of the past. This requires a revolutionary shift in how we view the education system, teach, and learn. This shift is Education 4.0.

In the qualitative study by Hussin (2018) 9 trends of Education 4.0 are presented. To summarize these 9 trends, Education 4.0 involves students working collaboratively with one another while using readily available technology to complete inquiry-based projects with teachers as the facilitators and students with free reign to use creativity and resources to achieve a common end goal. These trends are based on the model of Industry 4.0 which is the outlook of where industry is both presently and, in the future, advancing through AI and automation. Hussin designed a class project using several different apps and resources for online

content to guide 23 students to better understand themselves, their skills, and which jobs would be best suited for their interests and talents. After the multi-step assignment, Hussin had the students take a survey to collect their thoughts and takeaways from the assignment. Students overall found the use of technology including multiple apps and web-based systems engaging and enjoyed learning more about themselves. Over 90% found the content and presentation either very interesting or interesting while less than 9% found it average. The learners also found it helpful to use technology to collaborate with one another. Another important result of this study was the students' belief that other courses would benefit from the same structure. The largest limitation was the bandwidth required for all learners to be online. The study did a good job of illustrating Education 4.0 through the practical example of a project-based assignment using technology. Weaknesses present in this study were a small ***n*** of only 23 students and no background shared on the socio-economic demographics of the group or school. By knowing this information, one could have a better understanding of the significance and applicability of the findings.

A similar study was conducted by Oliveira & Souza (2022) in which they created their own model for teaching Environmental Studies. Their methods focused on enhancing the skills Education 4.0 seeks to develop in learners (cognitive, social, interpersonal, and technical skills) through student application and use of digital technologies. This was done using digital transformation. For digital transformation to occur, there must be technological drivers (IoT, AI, VR, Digital games etc.), organizational drivers (developing EDU4.0 strategy, update and adapt curriculum, etc.), digital teaching competence, soft skill student, hard skill student, and pedagogy. In this study they applied the use of such technologies, strategies, and implementations in elementary-higher education classes to foster an understanding of climate

change in learners. Their course content sought to have students exercise hard and soft skills required by 21st century work to solve problems caused by anthropogenic action.

Oliveira and Souza found their methods had very positive responses. Students exiting the project had expanded their ability to think critically, empathetically, collaboratively, and in a timely manner. Students become better at organizing their thoughts and conveying their knowledge to others. The authors suggested that their methods could be used in more areas than just climate change. With slight alterations, it could be used in most if not all subject areas to help shift schools toward a model of creating lifelong learners. This study was a very good example of how to take an idea (Education 4.0) and apply it successfully in the classroom. Using various technologies, the authors created assignments focused on higher order thinking to refine adaptive and multi-faceted, collaborative skills in their students. While not without extensive planning and preparation, this model with specificity for each class/subject matter appears to be a successful method for preparing students for an ever-evolving real world and workforce.

Butt, Siddiqui, Raheel, & Muhammad (2020) conducted a study in Pakistan on the impact of Industrial Revolution and the implementation of Education 4.0. In their study 84 articles were reviewed looking at needs and barriers facilitating and impeding the implementation of Education 4.0. Their work identified several barriers to Industry and Education 4.0 in their region. The primary barrier to implementation was the culture in Pakistan is historically one of manual labor where the use of computers and technology is not widely accepted. Despite the lack of cultural acceptance, the government in the region seeks advancement specifically regarding Information Communication Technology (ICT). ICT is very important to education and advancement because it allows communication and instant knowledge acquisition. ICTs

allow for advancement and acquisition of current advanced information. The way forward and into Education 4.0 is through the use of ICTs, however, there is more than just having the technology. TPACK or technological, pedagogical, and content knowledge, is the other component to a successful program. TPACK is meant for the teachers, this is what they must have to be successful with technology integration. Butt et al. conclude policies supported by the government, teachers, and community are needed for the region to begin embracing the change necessary to obtain and enhance ICT; this would require a huge shift in industry and the classroom. This study draws attention to the multiple levels of large-scale change needed to foster the tensegrity of an inter-connected system.

Education 4.0 is the future of education. It has many different aspects and will continue to shift and change as time moves forward. An important takeaway from the aforementioned studies is Education 4.0 is not a fad like so many other education initiatives are. It is the idea of what the future holds and is based primarily on Industry 4.0. In summary, as an education system, we must monitor industry and world progress to best guide our students. The workforce of the future places high value on professional adaptability.

Technology for Education 4.0

In the following section, I will review current literature focused on the implementation and use of technology in the classroom. As previously discussed, this is a critical component of Education 4.0. Technology influences not only modern-day industry but will greatly influence future industry. Education 4.0 anticipates this shift and places technology at the forefront of classroom learning.

In the first article by Wu, Guo, Huang, Liu & Xiang (2018) an analysis was conducted of the United Nations' Sustainable Development Goals (SDGs?) and the use of information communication technologies (ICTs) to attain these goals. Wu et al. performed a literature review of the SDGs and found ICTs were commonly underutilized lending to poor progress toward the intended goals. The link between SDGs and Education 4.0 are the shared, common goals desiring to address current urbanization, climate, and equity issues. Education 4.0 works toward these goals through encouraging student use of digital devices and technology (such as ICTs) for communication, collaboration, and efficient problem solving in the classroom and beyond. By using ICTs in schools, schools can help prepare students for future jobs and by fostering learner adaptation in an environment of ever-changing technology Despite this noted benefit, the unfortunate reality as identified in the review by Wu et al. is that many schools use ICTs at a low rate. With this knowledge, the ownness is on us as an education system to incorporate the required tools to enhance real world skills in our students.

ICTs could be more frequently used to help students with asynchronous projects in order to achieve SDGs. Several of the articles examined by Wu et al. discussed the opportunities available to educators to access information and promote project-based learning via ICTs and web-based materials. These opportunities would allow schools, especially those in small/rural areas, access to resources otherwise unavailable to them and allow learning of novel content not offered by an on-site instructor. ICTs also increase accessibility by offering content free of charge or at a reduced price. Through the use of ICTs in schools, students can become an active part of problem solving. A key takeaway from this review is: ICTs allow for simulation of real-world scenarios in the classroom setting and improve learner engagement allowing for enhanced skill mastery. Rugeiro & Mong (2015) conducted a mixed methods study of 1,048 midwestern

elementary, middle, and high school teachers and their current levels of technology integration in the classroom. In this study, data was obtained through surveys, in-person interviews, and online interviews of all subjects. Researchers found many teachers felt uncomfortable and unfamiliar with current technology but despite this had attempted integrating new technology into their existing curriculum. The most used technology was video at 90% in middle and high school settings whereas use of games ranked the highest for the elementary school setting. The surveys revealed most teachers used several different display types to share technology in the classroom ranging from computers to LCD projectors and smart boards, however, many were resistant to including technology in assignments.

Technologies that are frequently used in society and can be used for asynchronous education, communication, and collaboration i.e., social networking sites, were the most common for teachers to list as never using. Furthermore, many teachers used technology to enhance their previous teaching methods vs. advancing them in an effort to remain current. The surveys conducted by Rugeiro & Mong, analyzed both new and experienced teachers and did not distinguish between the two groups. The researchers felt this was a weakness of the current study and would be a good direction for future studies on this topic. They hypothesize that new graduates would be more likely to use technology in new and integrated ways when compared with more experienced instructors to whom current technology and its capacity may be unfamiliar. Their current study concludes by drawing attention to the need for focused professional development (PD) to aid teachers in not only learning the use of current technologies but methods for using this medium to enhance their existing teaching plans and student course work. Rugeiro et al. point out an important disconnect between new and experienced instructors and through this highlight the importance of PD. They end by stating,

"…authentic and current professional development for teachers should use blended learning, collaborative learning, and engage in the challenges of the current context (Gilchrist, Carpenter, Bowles, & Gray-Bottle, 2012, as cited in Rugeiro & Mong, 2015). I found this to be a thought-provoking article as institutions currently spend large sums of money on technology but often fail to provide the needed training for all teachers to maximize its use. Without adequate and proper training on use, technology merely takes what was a physical paper, textbook, etc. and changes it to a digital version which often lacks the interactive and engaging environment this medium is capable of and falls flat in the goal of enhancing student learning.

Qureshi, Khan, Raza, Imran, & Ismail (2021) found similar results in their research. They performed a quantitative search of articles focused on digital technologies used in education and related to the topic of Education 4.0. They retrieved 105 articles focused on these topics and determined the appropriate and successful use of digital technology to be a critical component of Education 4.0. Despite this finding, few school districts have demonstrated transformational change via use of technology in the classroom. In examining the articles, Qureshi et al. found that the vast majority of studies indicated that students responded very positively to digital technology integration and were on average more engaged.

Qureshi et al. emphasize digitalization and technology as the center of the next industry revolution (Industry 4.0) and therefore argue it should be the central focus of Education 4.0. Topics such as internet of things (IoT), virtual reality, augmented reality, and automation such as 3-D printers are all present and will be tools of future industry. Current research reveals students respond well to technology integration and it is needed for their future employment. The article further identifies several obstacles such as the traditional teaching model (teacher as source of knowledge), teacher's lack of knowledge regarding how to

incorporate technology, and an unwillingness to learn as are the biggest barriers to successful change. Professional development aimed at learning the tech, learning how to specifically apply it to each subject area, and most importantly strategies for school restructuring to shift focus to the student learner is of utmost importance. [Qureshi et al. emphasizes that technology ranging from 3-D printers to smartphones and the internet should be at the center of education and present in every class to engage and prepare students.]

Delgado, Wardlow, Mcknight & O'Malley (2015) found similarities and differences to the aforementioned research findings in their review of articles examining technology integration and effectiveness in the classroom. Surprisingly, researchers found some studies demonstrated little or no performance improvement with integration of technology into the curriculum. It is important to note that many of these classes that they studied were not 1:1 for technology. Delgado and colleagues hypothesized reasons for these varying results including lack of 1:1 integration and varying views of pedagogy within educational institutions. Furthermore, some of the studies suffered flaws in their methodology and therefore the issue of validity regarding the authors' interpretation of results was in question.

Delgado et al. draw attention to instances where despite PD focused on technology and its use, instructors often remained ineffective at incorporating it in ways which enhanced learning. These researchers surmised the most likely problem was the content of the PD. In support of this, a survey conducted by SRI international revealed 80% of teachers shared they were more comfortable, and their attitudes greatly increased regarding teaching with technology upon going to a workshop on proper integration. Their conclusion was that workshops leading teachers through different pedagogical methodologies for incorporating technology would be an effective launching point.

Workshops that help to change and form teaching pedagogies can lead to enhanced education through effective technology integration. There are several methods of integrating technology such as: online education, project-based learning, bring your own device, and flipped classrooms. Flipped classrooms however, had the biggest success increasing student engagement by 80% in two surveys. This increase may be due to the emphasis of the teacher as a facilitator, present to help students with the difficult concepts while leaving them to problem solve easier challenges using self-selected means and technology resources.

One of the main goals of Education 4.0 is to foster student creativity. The literature review completed by Henriksen et al (2018) examined the relationship between technology, creativity, and policy. Henriksen et al. found that increasing digital technology on average increases creativity. However, they did find discrepancies between the amount of money spent on education and the creativity students of each country exhibited. A challenge to studying this topic across various countries is each region uniquely defines and interprets the concept of creativity. Of note is the fact that the U.S. does not include creativity as part of the national, Common Core standards. Interestingly Henriksen et al. spoke on the fact that the U.S. seemed to stress standardized testing and the Common Core, yet in their findings they found the common core to not have students enhancing or demonstrating their creativity. This makes it difficult to compare how much technology can lend to enhancing creativity in certain countries as places like the U.S. spend a lot of money on technology integration but do not have a means of assessing the impact of integration on creativity. Education and Industry 4.0 will require creativity, curiosity, and adaptability among other skills. This means it is vital for our institutions to think beyond current standards and discover ways, as well as resources for fostering these necessary skills especially if current methods do not exist. What this may mean is that if a

teacher in the U.S. is preparing students for the future as they should, they may need to think beyond the standards. Adopting resources such as the International Society for Technology in Education (ISTE) is great for not only integrating technology, but also integrating and elevating the classroom in creative ways.

Artyushina, & Sheypak, (2018) conducted a multiple year project in which they taught Russian speaking students English using podcasts. The students began by listening to podcasts on their mobile phones and transitioned to making their own podcasts as they became fluent. Artyushina et al. found that varying the words per minute (WPM) of the podcasts led to improved language comprehension. With the increase in smartphone usage and student ability, desire to work on their podcasts amplified through the course of the project. Artyushina et al. found students having access to more resources at all hours via their smartphones led to high interest in the coursework due to enhanced proficiency with the medium and increased desire to utilize it. The smartphone, which most students have now, allows students to access endless resources to accomplish specific course goals. Artyushina et al. saw great improvement in student comprehension of the English language by using their own devices to listen and speak on topics of interest to each individual. Use of an accessible and familiar platform fostered increased engagement, knowledge derivation (from the podcasts), and creativity leading to improved comprehension and mastery of the subject matter. The use of smartphones is bold in this study as the majority of teachers have spent the past several years attempting to eliminate this device type in the classroom for decreased distraction(s). These findings may indicate our need to do the opposite.

These studies illustrate technology as an integral part of the classroom and argue we should invest in its resources to best help prepare students for the future. However, the

acquisition of technology is not the only thing which schools need to do and in fact, this can create a problem in itself. The correct technology for each specific class needs to be obtained and more importantly PD must be done. Teachers need to know not only how to use the technology, but how to use it in a way that goes beyond what a textbook can teach. In other words, if you are using the SAMR model (Substitution, Augmentation, Modification, Redefinition) of technology integration, you want teachers to have the capacity to move past the Substitution stage/stage 1 and progress to the last stage of integration which is Redefinition. Redefinition is using technology to accomplish tasks which would be impossible without this medium, whereas Substitution is merely transforming content into a digital format and requires no interaction with the medium. As mentioned above, an interesting take away from this study is the use of mobile devices. This study reveals smartphone use, if done properly, has the potential to greatly increase the successful integration of technology in the classroom and markedly improve student engagement.

Education 4.0, Curriculum and Teaching Models

Khuriyah, Naim, & Umamah (2020) performed a qualitative case study on school curriculum in Indonesia. Through an examination of teacher and student textbooks, Khuriyah et al. found the current curriculum did not meet required standards. Investigating these findings revealed inconsistencies amongst various schools regarding curriculum which contributed to poor preparation of students for a career determining exam. Many of the courses were found to contain outdated and incorrect information due to not remaining current. Challenges including low budgets contributed to this problem. Researchers in this study encouraged a new and updated curriculum but acknowledged budget issues presented a challenge. Considering decreased funding, Khuriyah et al., proposed careful use of internet resources to update existing

texts, curriculum, and assignments to enhance learning of necessary skills and encourage adequate student preparation for their careers. The solution to low budgets and lack of knowledge of what to teach was to update and acquire teacher handbooks. Khuriyah and colleagues explained that if all the teachers used the same updated teacher edition handbook which was aligned with the basic skills test, they could use the internet to locate engaging and differentiated material to help meet the necessary standards. By having an updated handbook, they would be better able to discern helpful and hindering resources on the internet and help their students prepare for the test. Khuriyah et al. make a great case for keeping curriculum up-to-date and overcome cost barriers by recommending the use of differentiated and free internet resources.

In order to update curriculum in a meaningful way, a school must first identify their current instructional model. There are many current teaching models which embrace the challenge of Education 4.0 and seek to put students in charge of their learning. One such model is "Science, Technology, Engineering, Art, and Math" or STEAM. In the article by Connor, Karmokar, & Whittington (2015), they explain ways to increase the creativity in engineering classes by using this model. Many engineering teachers take a more traditional teaching approach; however, Connor et al. explain that this is not necessarily the best approach. Engineering classes are most often lecture and project based despite this doing little to prepare students for the real-world problem solving and innovation required by current industry. The project-based portion of these classes are often not student centric, nor inquiry driven. Connor et al. found that by taking the STEM format which is incorporating science, technology, engineering and mathematics into your course and projects, students can obtain those skills; however, Connor et al. explains that including the arts and making it STEAM is a

better model. By incorporating the arts, Connor et al. believe creativity can be maximized. Addition of the arts also enhances adaptability and ingenuity which are important skills of the modern-day engineer. Through creation of STEAM based units within each of their courses, Connor et al. found students flourished in the system due in part to the transformation of instructors from "textbook," like to facilitators. flourished in this system and it helped increase their creativity while at the same time made the teacher more of a facilitator rather than the center of the knowledge. STEM and STEAM curriculum are ever more present in schools and aiding teachers in the transition to a more student-centered teaching model.

In a similar study on updating and changing curriculum and teaching style, Eglash, Lachney, Babbitt, Bennett, Reinhardt, & Davis, (2020) examined the traditional teaching of Anishanaabe arcs (methods of building and specifically bending wood for different Native American tribes) and the application of mathematical, computer and scientific concepts to it. Eglash et al. found mixed results in a similar study group of Navajo students when it came to introducing STEM. The students in this study found the STEM research uninteresting and the surveys on engagement and content knowledge reflected this. Researchers hypothesized learners felt forced to interact with course material in specific ways leading to the mixed success using the method.

To combat the mixed success of the other study, Eglash et al. modified their approach to broaden the subject matter allowing students to view the content in an individualized manner and take ownership over their learning. Eglash et al. took 48 students through a two-day workshop in which they built their own structures through chosen and self-guided learning regarding: cultural/tribe background, videos on building techniques, and the viewing of design simulations. The results were very positive with pre-surveys indicating students understood approximately

30% of the math, science and cultural concepts presented and post surveys indicating 80-90% comprehension. An interesting finding uncovered that students with a Native American background gave more in-depth and passionate responses compared to those who self-identified as Caucasian, perhaps drawing attention to the importance of personal applicability. Through these findings, one could propose STEAM may be more useful than STEM methods in the presentation of more complex topics. Through the addition of art, learners can gain more context regarding the presented material. This study also demonstrates the benefit of beginning with a broad topic view and allowing students to narrow their individual scope. Allowing for individualization in learning leads to improved engagement and in turn fosters enhanced subject and skill mastery. It emphasizes the idea that we can reach a common end goal with a variety of approaches and points out the gross inadequacies of a "one size fits all," approach to education.

Due to the varying needs of each learner, adopting a new curriculum often requires the ability to conduct class and learning in various mediums ranging from online to in class. McGee & Reis (2012) conducted a qualitative meta-analysis examining the needs of a blended class. A blended class is one that has in person learning, online teacher and student interaction learning and independent student learning. Given the current climate and recent events, the need for adaptability learned best through blended and hybrid learning environments is of paramount importance.

McGee et al. reviewed the effectiveness of courses using a blended model through analyzing current literature. Through their review, they identified 5 key steps instructors must take when creating a blended learning model. The first step is variations in design: "instructional design considers the learner, learning outcomes, the content of what is to be learned, instructional strategies, and results of instructional interventions" (McGee et al.

2012). Step two is matching which requires restructuring curriculum and pedagogy to fit within the blended learning model. The third step is clear expectations and check-in points; this step emphasizes the teacher as the guide. The second to last step, step four, is proper use of technology. The final step is continual support and redesign. All five steps are necessary for the successful updating of curriculum, especially in an ever changing and technology-based world.

Cheng, Ritzhaupt, & Antonenko (2019) performed a meta-analysis on the effects of a flipped classroom. They reviewed 55 publications and analyzed the results of a flipped compared to a traditional classroom. Cheng and colleagues looked at the age of students, specific course subjects, and the duration of each study to determine effectiveness of a flipped classroom in specific populations. They discovered 41/55 positive results indicating success with a flipped classroom model. However, only 14/41 positive results had a significant *p*-value. Despite the lack of a significant p-value, it is worth mentioning that the flipped classroom outperformed the traditional for grades K-12. The subjects which benefited the most from the flipped classroom design were arts and humanities, with social studies experiencing moderate benefit, and math and science the least but still responding positively. Implementation of the flipped classroom demonstrated a negative impact on learning in the Engineering field. These results draw attention to the importance of a flipped classroom in curriculum design for certain subjects, mainly arts and humanities. Overall, the aforementioned studies emphasize the importance of considering multiple factors in the redesign and updating of curriculum. Not all course work, student learning styles, regions of the country, etc. will benefit from the same approach.

School and classroom design for Education 4.0

When planning for classroom design and structure one must consider the method of teaching desired. Along these lines, Ford examines components of classroom design, project-based learning, and blended learning models in her 2016 study. She determines structuring classroom redesign requires consideration of learning audience, location, and current culture. Despite the identified need for blended and hybrid classrooms to encourage optimal skill advancement and industry preparation, Ford, like the other authors above, found many classrooms to be dated and lecture based. Ford identified classrooms without a technology focus led to a decrease in student engagement, project-based learning, and remained more instructor focused; these findings are similar to those of many researchers mentioned above. It can be noted from all the research discussed that redesigning curriculum and updating our education system is a lengthy process which takes time and dedication to produce desired results.

A qualitative study conducted by Willis (2014) demonstrates this reality. Willis examined a primary class and followed its course of redesign over a 2-year span. The plan involved the collaboration of students and teachers to update their classroom setting. Through students being active participants in the design process, increased engagement was facilitated with ease. This method improved ownership and pride of all participants and led to improved buy-in regarding the new curriculum. Students through the process also learned valuable real-world skills including the importance of collaboration and delegation.

Barrett, Davies, Zhang, & Barrett (2015) conducted a large-scale study of classroom design in primary schools in the U.K... Barrett et al. measured three areas, naturalness (temperature, light, sound), individualization, and stimulation. Once researchers identified their three main categories, they began to break them down into ten subcategories for obtaining

further detail(s). Out of the three main categories mentioned above, Barrett et al. found the most significant to be naturalness. For example, learners completing activities at a comfortable ambient temperature and experiencing the right amount of natural light, had the highest positive effect regarding overall engagement and skills mastered.

Regarding stimulation, researchers found that students in classes which were moderately complex in decorations had the highest positive outcome, but classes with high or low complexity of décor and color had negative outcomes. Classrooms with the most pleasant and least overwhelming aesthetics produced the greatest student results. In the individualization category, both flexibility and ownership had the greatest positive effects.

The final study I desire to draw attention to is one by Imms & Byers (2017). These researchers had instructors and learners undergo pre- and post-project surveys to compare and contrast student and instructor experiences in both lecture and technology driven classroom settings. They rotated the students having them experience each classroom type granting researchers both quantitative and qualitative data. The more technology used and dynamic the space was, the more positively students responded. Technology was found to be the largest factor contributing to student engagement and comprehension and it was far more effective when coupled with a dynamic and interactive workspace. These results indicated that design of a classroom can have a profound and lasting impact on the education experience for students and teachers alike.

School Profile

The Moravia community has 611 people, 99% Caucasian, a median household income of $45,357 and 13.6% of families below the poverty line (Data USA, 2019). Moravia school

district is 95% Caucasian and 5% minority (Public School Review, 2022). The main industry is farming followed by construction. Moravia is in Appanoose County which has a median income of $39,693 and a poverty rate of 14.6%. 90.5% of adults graduated high school and 18.6% have a bachelor's degree (U.S. Census, 2020).

Parents are moderately involved in academics as demonstrated by their participation and fundraising during Fall and Spring Festival events. Athletic programs are highly supported by the community with car parades including the fire department to celebrate achievements including bids to state championships, etc. The community identity is centered around the High School with the local paper focusing on school events and student/faculty achievements.

Moravia middle and high school serves grades 6-12. There are 195 students total with 54% male and 46% female. Half of the students receive free breakfast and lunches. The district in total has 391 students (Public School Review, 2022). Moravia Community School District (CSD) has one campus housing pre-k through high school students. Roughly 20% of the school was built and/or updated in the early 2000s, 40% between 1970 and 1999 and roughly 40% built before 1970 (NCES, 2019). The new and original parts of the building were designed for traditional classroom models. The current administration has made a commitment to updating the school and have taken significant strides in rebranding the exterior including new graphics for windows, and a commitment to update one classroom a year.

The Moravia school motto is “Excellence in education – Preschool through Graduation: Cultivating academic excellence in every student to achieve success in a global community.” (Moravia handbook, 2022, p. 3). The school’s vision is to “…provide[s] opportunity for active,

participatory learning, and stress[es] responsibility and initiative" (Moravia handbook, 2022, p. 3). Moravia CSD seeks to prepare students for the 21st century through aligning with the Iowa Common Core.

Within Moravia CSD most teachers adhere to a traditional teaching model. The school system has gone through several administrative changes in the past few years and a clear path and model for the curriculum have not been established. The goal this year is to establish such a path and form a professional development team to implement PD that will be relevant and help establish norms. Currently the school is updating their handbook which was last updated in the 90s. The district has a 12:1 average student per teacher ratio. Due to several factors, the district has a low retention rate for instructors making it difficult to establish schoolwide practice norms and consistency.

Beginning in the 2022-23 school year there will be a climate and culture team which will be planning comradery activities and starting a teacher mentoring program for new instructors. The PD and climate/culture teams will be meeting to discuss plans for schoolwide selection and adoption of grading policies, district PD needs, and several other issues. PD will be conducted every Wednesday for 1.5 hours. To-date we have not yet selected our initial topic.

Needs Assessment

Moravia CSD needs the most improvement in curriculum and instruction. Moravia is currently behind the educational trend and lacks student-centric learning infused with technology. This shortcoming is despite CSD goals 3,4, and 5 for students to become lifelong

learners, academically well rounded, and function effectively in society (Moravia handbook, 2022, p.3)

To properly transition the district from the traditional model of teaching to a more student and technology centric modern model, the school will need to have leadership. This leadership must be grounded in standards and have the resources and knowledge to help lead the district in the transition. The International Center of Leadership in Education (ICLE) argues that there are 7 pillars of a digital leader. The pillars are student engagement and learning, learning spaces and environment, professional learning and growth, communication, public relations, branding and opportunity.

To achieve these 7 pillars, you must be able to identify student interests. Modern students are very comfortable and excited to learn using digital tools. Furthermore, students enjoy the freedom of learning on an independent schedule and about things that matter to them (Sheninger, 2019, p. 6,19). To best prepare students for the future like Moravia CSD seeks, the school must prepare students to interact effectively with digital tools. This can only be done through extensive school restructuring and planning. Having technology is one aspect of engagement and helps prepare students for the future. To achieve engagement and preparedness, the teacher must learn how to best use technology to engage their students.

To use technology effectively, a school must create the right environment for the medium. The classroom environment must become more dynamic. Examples include makerspaces, blended classrooms, project-based assignments, virtual learning, and bring your own device. (Sheninger, 2019, p. xxi). To best use technology one must have the proper

facilities to encourage students' natural born curiosity, enable the use of technology, and foster proper training.

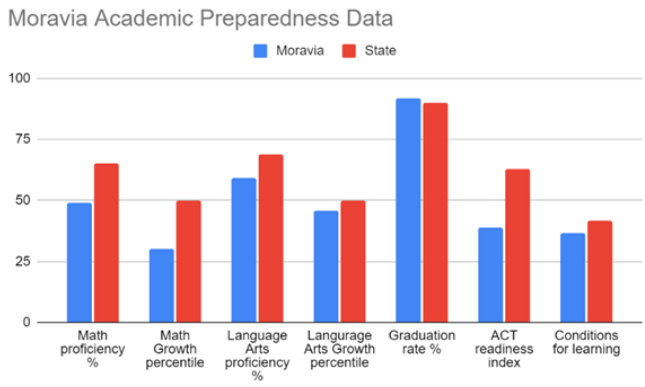
Studies indicate having a more dynamic and diverse classroom geared towards inquiry and technology increases student comprehension and ownership. The integration of technology effectively has also been shown in studies to greatly increase student engagement and preparedness for the future. Lastly, proper curriculum and corresponding pedagogy have been shown to greatly increase student engagement and comprehension. However, neither of these can be successful without the other. To best meet future industry needs students must have the proper facilities, technology, environment, curriculum, and pedagogy geared toward refinement of real-world skills. This can only be achieved by precise planning and analyzing. Through creation of a multi-year implementation plan, schools can shift from the antiquated traditional teaching model that served the past centuries well to a more student-centric technology-based model that will serve this century best.

Data Analysis

The middle (MS) and high school (HS) academic preparedness data (see figure 1) was obtained from IA School Performance (2021). The average math proficiency was 49% and Language Arts (LA) proficiency was 59% compared to the state average of 65% and 69%, respectively. Graduation rate was 92% compared to a state average of 90%. ACT readiness index was reported at 39 for Moravia vs. 63 statewide. LA growth (average of student improvement upon previous scores) was in the 46th percentile and Math growth was in the 30th percentile. The Conditions for Learning assessment is an anonymous online survey that students

answer based upon perceptions of school climate. Moravia received a 36.36 compared to the statewide average of 41.67 (IA School Performance, 2021).

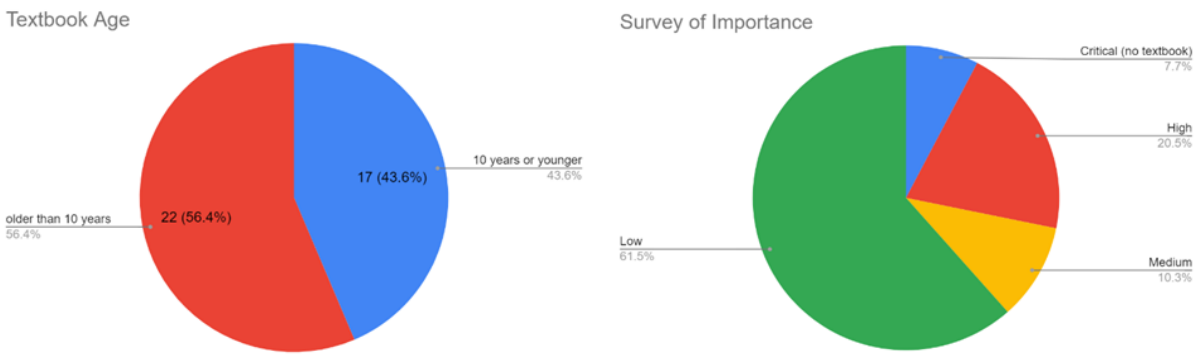
Figure 1



Data was collected in May of 2022 at Moravia MS and HS. Data for textbooks were collected in-person and via online surveys and observations. The school administration has the goal of transitioning all textbooks and curriculum to no greater than 10 years old. A survey was conducted both in person and online to document the age of all textbooks. It was found that 22 of the 39 textbooks for MS and HS were older than 10 years with 2 being printed in the 90's (See Figure 2).

Figure 2

Figure 3



The survey (both in person and online) inquired as to the importance of replacing the textbooks. There were four levels of importance: low, medium, high, and critical (See figure 3). The low, medium, and high were based on the teachers' opinions and the critical rating was an option for classes without curriculum. Most teachers (61.5%) felt that it was a low priority to replace the classroom textbooks. Whereas 20.5% of the textbooks were thought to be in high need of replacement and 7.7% (3 classes) did not have curriculum standards.

The data was compiled into a graph to compare teachers' rating of importance in regard to a text being older or younger than 10 years of age (See figure 4).

Figure 4

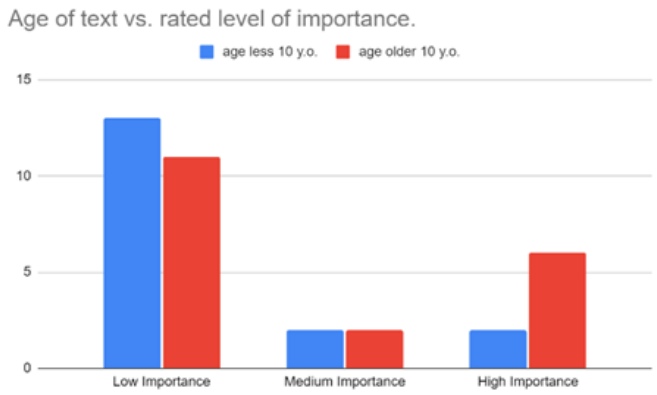
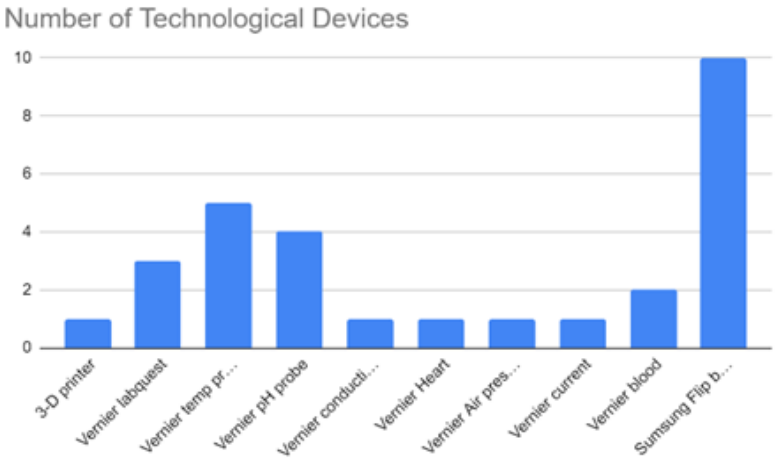


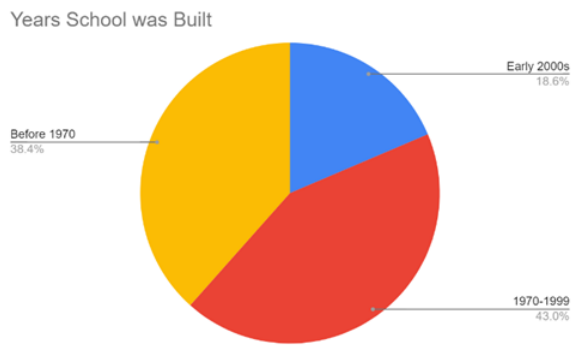
Figure 5



The availability and utilization of technology in the classroom was analyzed and included if content was digital and could be seen as a part of Education 4.0 (See figure 5). The 3-D printer is in the shop, over half of the MS and HS classrooms have the Samsung flipboards and all of the vernier equipment was found in the HS science classroom. Items that were not included were Chromebooks (every student has their own) and items of industrial nature (such as table saw, bandsaw etc.) due to their continued functionality and not being an integral part of Education 4.0. It should be noted that Samsung Flip boards are an alternative to smartboards.

Data for age of school building was obtained from NCES, 2019. Upon receiving the information, a visual inspection of the building was conducted, and the data was determined to be accurate. Figure 6 shows the age of the building.

Figure 6



Classrooms with a less traditional set-up (i.e. not all desks facing a front board and instructor's desk) were observed and their design differences listed (See figure 7). No class was found to have special seating or varied workstations. The workstations listed are lab tables and two separate tables on the side of the Art room for student prep. Only three classrooms had more than student desks for workstations, not including Shop, Agriculture and Band.

Figure 7

	Workstations	Gas	Sink	Kiln
MS Science	1	1	1	0
HS Science	6	6	6	0
Art	8	0	1	1

Analysis

The data obtained from the Iowa School Performance (Figure 1) site indicates a great need for reform in Moravia CSD. The Math, Reading, and ACT scores were well below state averages in addition to student growth. Looking at the results of the Conditions for Learning survey, the score is a low score but not significantly lower than the state average. This could indicate a general need to reassess how they are performing the art of education. The only data point that was higher than the statewide average was the graduation rate. This is puzzling considering all of the individual categories rated below average. The low assessment and growth vs. the high graduation rate suggests the school is teaching and assessing different content and areas than those assessed through state standards/testing. The data could also suggest that the standards for graduation are not where they should be. Regardless of graduation rate, this data indicates a great need for school transformation and reform.

The survey for textbook and curriculum age (figure 2) demonstrates the majority of the materials are older than 10 years old. The administration has made it a goal to have all curriculum and textbooks updated within 10 years. Many teachers argue a weakness of this goal is the possibility that standards, methodologies, and texts dramatically change over the next 10-year span.

The survey for level of importance indicated that 7.7% or 3 classes had no textbooks or curriculum and only 20.5% (8 classes) had textbooks teachers desired to replace. The most common reason reported for textbooks needing to be replaced was that they were falling apart; however, one textbook (printed in 2014) was put on the high importance list due to it "not being aligned with Common Core." The majority of textbooks and curriculum (61.5%) were deemed "low importance," in regard to needing to be upgraded by the teachers. This indicates that the

teachers overall are content with the materials they have, which is perplexing when considering the statewide assessment results.

The survey examining Age of Text vs. Level of Importance (figure 4) yielded mixed results. Teachers did not completely agree that the individual textbooks needed to be replaced. In fact, the 2nd – 4th oldest textbooks (along with many others) were all deemed low importance with some teachers emphatically making a case not to update.

There were two main reasons teachers gave when arguing to not update the textbooks. The first and most common reason was the text was sufficient for the content and the money could be used better elsewhere. This is understandable for some of the classes such as the woodshop class where the teacher gave the explanation of limited advancement and brief use of the textbook prior to transition to hands-on practice and experience. Not all classes had this set-up, however and it is unknown why higher value was not placed on updating the texts; this would be a great subject for further investigation. Another interesting topic for future study would be teachers not wishing to update the classroom texts due to a belief that new materials contain false and misleading information.

In reference to the use of technology data, the number of devices present in classrooms is high and gives hope for further development of this important tool. Moravia CSD has gone 1:1 as far as Chromebook to students. Each student is issued a Chromebook at the beginning of the year and turns it in at the end of the year. The students take a computer class and learn basic coding. The school has also obtained Samsung flip boards in nearly half of the classrooms and has purchased more for the remainder of the rooms (should arrive at the beginning of the school year). The school has additionally obtained a 3-D printer and has Vernier probeware for the

sciences. Continued advancement will be easier to encourage and implement in this category given these findings.

Despite this ease, however, there are some shortcomings with current technology being used; for example, the probeware obtained is often inaccurate. It is suspected the technology is at least 10 years old with the main platform for the equipment being discontinued in 2012. Perhaps the biggest obstacle to consistent technology enhancement in the classroom is that teachers have not received training on how to use these devices to increase engagement. Teachers commonly use technology to maintain a traditional teaching model vs. redefine it.

In regard to the learning environment, the age of building data (figure 6) indicates the school was mainly built during a time when the function of the structure would have catered to the traditional teaching model. It should be noted that the 20% built after the year 2000 was the gymnasium which does not contain any classrooms. The emphasis on a traditional teaching method is further demonstrated by Figure 7 which draws attention to the limited number of classes containing workspaces other than front facing desks. The HS science classroom displayed the most diversity with ample lab stations and student desks, however, this is still a traditional set-up for a science classroom. The MS science classroom only contained 1 lab desk emphasizing demonstration and passive learning. These findings suggest a need for classroom restructuring and design to accommodate a student and technology-centric model.

Action Plan

Strategies

Technology is at the forefront of Education 4.0. It is what drives industry; it is what many future jobs will be reliant on and therefore it should be at the forefront of every teaching model and classroom. Advances in technology, such as 3D printing are anticipated to be at the forefront of industry moving forward and thus will be important additions to curriculum enhancement projects. Augmented and virtual reality devices, social networking and collaboration sites, internet of things (IoT), and ICTs such as mobile devices (Qureshi et al., 2021) will also be extremely important. Artyushina et al. (2018) illustrated the diverse application and ability of ICTs and mobile devices further lending to the argument for their effective use in the classroom. Another advantage to the use of mobile devices in school, particularly mobile phones, is the low cost to schools as most students or families own at least one device and maintain it as current. Qureshi et al. emphasize teaching alone is no longer sufficient for enhancing learner engagement and skill acquisition; incorporating technology is crucial for nurturing certain skills necessary for current and changing industry. Qureshi et al. conclude by saying implementation of the above forms of technology and PD concerning their capabilities are necessary to help teachers learn how to best use this tool set.

Delgado et al. (2015) support the conclusions of Qureshi et al. article and further suggest ideas for practical application. Delgado proposes implementation of technology with necessary changes to pedagogy and classroom dynamics as the best path for success. Advancements such as a flipped or blended classroom help instructors to move away from a traditional teaching model. Delgado et al. also found the practice of, "bring your own device," (BYOD) to be a useful tool assisting school districts in navigating the seemingly insurmountable obstacle of high cost associated with this shift in paradigm. . Through BYOD, schools save money, students have access to current technology, and it fosters an increased sense of responsibility through ownership and caring for their personal device. A disadvantage to this could be that students may have different levels of technology contributing to equity problems.

As previously stated, many schools struggle when it comes to implementing technology due to the financial burden and teacher lack of knowledge concerning its use. Hussin (2018) discusses the need for technology and points out the ready availability within school systems via IoT. Through IoT one can access a plethora of digital resources to help support the Education 4.0 model. A resource Hussin points to is Educational Technology and Mobile Learning website. This website provides access to many different tech resources as well as infographics to help implement these resources. One such infographic (See figure 8) is a great resource to be posted and promoted by schools. The infographic depicts 9 digital skills and gives examples/resources on ways you perform and enhance the skills.

Willis (2014) conducted a study on the effects of classroom redesign. Willis describes a series of steps focused on the redesign process with an emphasis on the importance of student and teacher collaboration (see figure 9). Ford (2016) also emphasized the great need for classroom redesign but pointed out financial constraints may bar the desired and necessary changes. Ford suggests redecorating and reconfiguration of seating to encourage a more hands on and active classroom with minimal-no budget. Imms et al. (2017) similarly found low-cost items such as creating an inviting environment via increased natural light (when possible) and maintaining a good room temperature had the greatest impact on student engagement and project quality.

Figure 8

Table 1: Nine fundamental digital skills for instructors

Digital skills	Tools		
Record and edit audio clips	Soundcloud audioboo	Vocaroo clyp	
Create annotated, interactive and engaging video content	Blubbr Magisto Teachem	TED Ed Edpuzzle Wevideo	Videonotes YouTube video editor
Create visually engaging content	Piktochart Canva	Glogster Thinglink	Google draw
Use social networking websites to create PLNs, connect, discover new content, and grow professionally	Twitter Facebook	Google Plus LinkedIn	
Use blogs and wikis to create participatory spaces for students	Blogger WordPress	Kidblog Wikispaces	Edublog Weebly
Use social bookmarking websites curate and share resources with your class	Diigo Scoop.it	Edshelf Educlipper	Pinterest Symbaloo
Create engaging presentations	Prezi Haiku Deck	Google Slides Zoho Presentation	
Create digital portfolios	SeeSaw Pathbrite	Silk Weebly	Google sites
Create non-traditional quizzes	Testmoz Quizalize	Riddle QuizBean	Flipquiz

Figure 9

Leading the collaborative design process:

1. Creating cultural readiness.
2. Creating a practical vision.
3. Supporting the translation of the vision to a strategic curriculum plan.
4. Collaborating with the teacher and students as designers by creating opportunities for:
    a. Cognitive engagement.
    b. Emotional engagement.
    c. Behavioural engagement.
5. Sustaining change through reflecting, reframing and responding.
6. Ongoing brokering of construction processes.

Curriculum selection needs to be planned based on teaching style desired and alignment of standards. Moravia CSD specifically requires curriculum aligned with Common Core standards from MS to HS. Khuriyah et al. confirmed this need when updating curriculum in Pakistani schools in their 2020

study. Khuriyah et al. found discontinuity in curriculum standards led to inadequate preparation of students for the future.

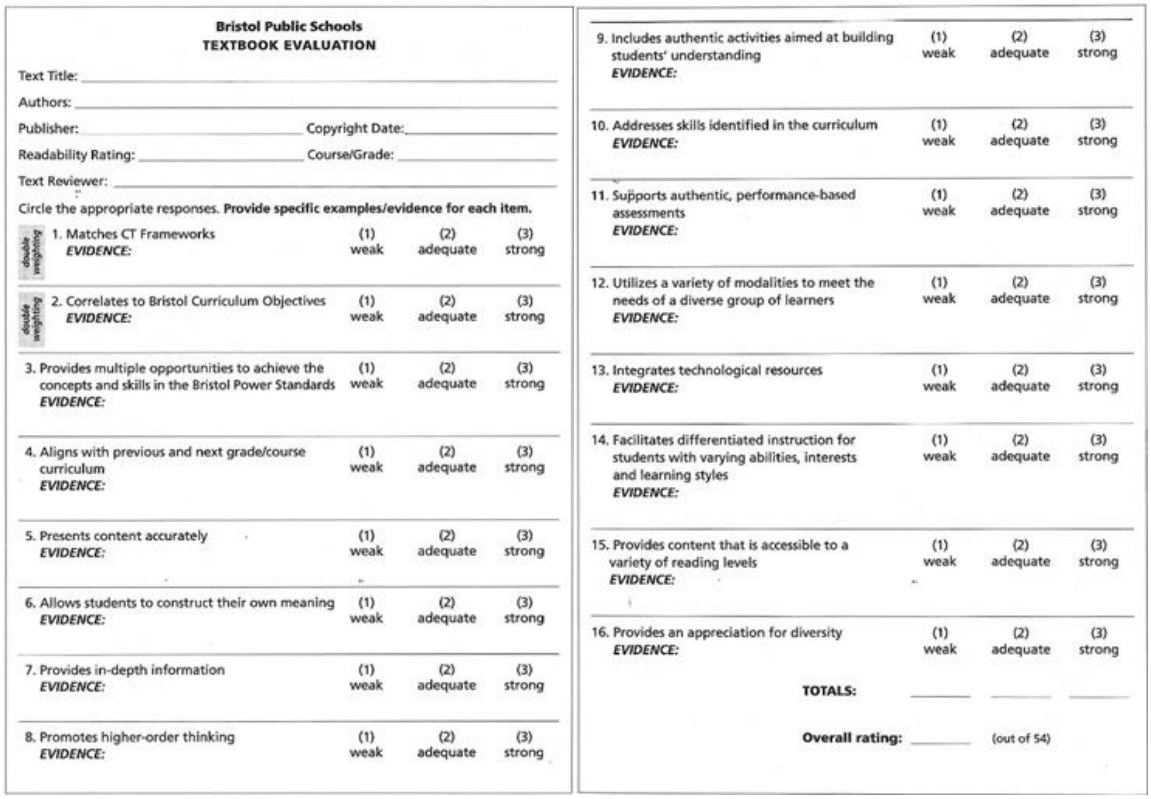
Steps for implementation

Curriculum adoption:

The following steps are for curriculum adoption across Moravia CSD beginning September 2022. This adoption plan must first be viewed by the administration for approval. These steps will help guide the process of curriculum selection while maintaining objective, goal driven, and equitable practices. The administration and school board will need to make a goal concerning how many class curriculum updates we will implement per year.

1. Form a curriculum adoption committee for the different content areas with priority given to the critical need classes and next the high need classes.
2. Select goals, objectives and priorities based on desired classroom model (i.e., STEAM, flipped, blended etc.) and curricula path desired for optimal student growth.
3. Based on the goals objectives and priorities, create a textbook adoption worksheet to work through the selection process such as the one in figure 10.
4. Reach out to companies and have them send samples (textbooks, resources, etc.).
5. Committee views samples and narrows down selection to 3 textbooks.
6. Using the Textbook adoption worksheet, the committee works through and then votes on the top textbook that best meets criteria selected.
7. Repeat for next highest-level classes.
8. The Committee will change based on the content area. The goal is to have all classrooms updated and current to within 10 years by year 5 of updating.

Figure 10 (Ainsworth, 2010)



Bristol Public Schools
TEXTBOOK EVALUATION

Text Title: _____

Authors: _____

Publisher: _____ Copyright Date: _____

Readability Rating: _____ Course/Grade: _____

Text Reviewer: _____

Circle the appropriate responses. **Provide specific examples/evidence for each item.**

double weighting 1. Matches CT Frameworks *EVIDENCE:*	(1) weak	(2) adequate	(3) strong
double weighting 2. Correlates to Bristol Curriculum Objectives *EVIDENCE:*	(1) weak	(2) adequate	(3) strong
3. Provides multiple opportunities to achieve the concepts and skills in the Bristol Power Standards *EVIDENCE:*	(1) weak	(2) adequate	(3) strong
4. Aligns with previous and next grade/course curriculum *EVIDENCE:*	(1) weak	(2) adequate	(3) strong
5. Presents content accurately *EVIDENCE:*	(1) weak	(2) adequate	(3) strong
6. Allows students to construct their own meaning *EVIDENCE:*	(1) weak	(2) adequate	(3) strong
7. Provides in-depth information *EVIDENCE:*	(1) weak	(2) adequate	(3) strong
8. Promotes higher-order thinking *EVIDENCE:*	(1) weak	(2) adequate	(3) strong
9. Includes authentic activities aimed at building students' understanding *EVIDENCE:*	(1) weak	(2) adequate	(3) strong
10. Addresses skills identified in the curriculum *EVIDENCE:*	(1) weak	(2) adequate	(3) strong
11. Supports authentic, performance-based assessments *EVIDENCE:*	(1) weak	(2) adequate	(3) strong
12. Utilizes a variety of modalities to meet the needs of a diverse group of learners *EVIDENCE:*	(1) weak	(2) adequate	(3) strong
13. Integrates technological resources *EVIDENCE:*	(1) weak	(2) adequate	(3) strong
14. Facilitates differentiated instruction for students with varying abilities, interests and learning styles *EVIDENCE:*	(1) weak	(2) adequate	(3) strong
15. Provides content that is accessible to a variety of reading levels *EVIDENCE:*	(1) weak	(2) adequate	(3) strong
16. Provides an appreciation for diversity *EVIDENCE:*	(1) weak	(2) adequate	(3) strong
TOTALS:	_____	_____	_____
Overall rating: _____ (out of 54)			

Technology acquisition steps:

The following steps outline resource acquisition, specifically that which is technology based. These steps will help update the classes of Moravia CSD and project the district into a 21st century school model. The most important aspect is the PD, needed to provide current and future training and resources, such as in Figure 8, for existing and new technologies.

1. Create/establish a committee to select the technology.
2. Committee suggests individuals to become part-time teachers on special assignment (TOSA) to research and apply for grants to improve technology access and use in the classroom.
3. Committee creates the goal and vision of technology acquisition. Decide which types of technology will have the greatest impact and longevity.

4. Determine the usefulness of the technology: Will the technology be used frequently, or will it only be used on occasion? Will technology allow the class to access/do things they otherwise could not? Or will it simply be a substitute for an existing method?
5. Committee will need to determine what form of technology will integrate well with the curriculum. This will mean a close collaboration between the technology and curriculum selection teams and require selecting curriculum which will stand up to the evolving industry.
6. Committee will need to determine if the school has the proper infrastructure for selecting technology components, such as bandwidth of the internet.
7. Committee presents technology suggestion and implementation plan to administration. Administration input, acceptance and or redesign commences.
8. Committee along with the administration, creates a budget and rotation plan in order to analyze and revamp technology tools when needed.
9. Committee to plan and orchestrate proper PD on technology usage.
10. Committee will continue to monitor and make technology implementation plans and acquisitions for the following year.

Classroom design steps:

The classroom design process will be determined by the administration and the individual teacher. The emphasis will be on moving from a traditional model of teaching to that of a flipped or blended classroom with an emphasis on technology use and hands-on learning.

1. Teacher and administrator together define the goals and objectives of the classroom renovation. Administration should lead by following the design process in Figure 9.
2. Teacher seeks and involves student input on classroom design.
3. Teacher and administrator brainstorm and research models and methods of infusing goals and objectives into classroom design. Together they create the best-case scenario for the classroom.

4. Administration determines the budget for the classroom.
5. Teacher and administration establish ideal classroom and prioritize changes based upon the decided budget.
6. Administration purchases and/or redesigns classrooms with chosen equipment.
7. After 1 class has been updated and gone through a year, the administration will assess and decide the best course of action for future classroom designs.

Implementation of School Improvement Plan

For successful implementation of updating curriculum, classroom design, and technology, separate timelines will be needed and will be subject to administrative approval. For curriculum acquisition a committee will need to be formed immediately during in-service week (August 15-19) for the 3 classes currently without textbooks or curriculum. This committee will fast track the selection process to obtain needed resources; teachers have been looking at textbooks over the summer and should have a recommendation. Upon approval of further curriculum acquisition from the administration, committees will be formed (based on content area) and follow the steps listed above. There will be a committee for every content area chosen each September. The committee will meet at least twice per month after school to proceed through the steps. For classes other than the critically listed, the Committee should have their goals and objectives determined by the end of October and the next three courses to update selected by the end of November. This will allow companies to send sample curriculum for each chosen subject by the beginning of 2nd semester. The committee will need to make their

recommendation to administration and the board at the end of March to allow ample deliberation time and ensure a new curriculum by the following year.

A great resource for the committee to base their curricular design path on is detailed in the book: Rigorous Curriculum Design by Larry Ainsworth (2010). This resource will be important for assisting in the determination of design objectives and establishing reverse design structure to optimize curriculum updates and student growth.

To determine the success or failure of the curriculum design, teachers and students will be given surveys at the end of the year asking their opinions on its implementation. The overall success of the curriculum, classroom design and the technology integration will be demonstrated by the state testing scores. This will be monitored on a yearly basis and immediate results may not be observed, however, the growth of the students' scores should be seen after 2 years with significant results within 5 years to demonstrate success.

The technology acquisition committee will need to be selected by the end of September and the team will meet at least twice a month. The committee will create a proposal for the district to have a part-time TOSA or other individual, if need be, to research and apply for grants to gain technology. By the end of October, the technology team will need to have selected their goals, objectives, and vision. The committee will determine which technology tools will integrate well and determine their usefulness and longevity by Christmas break. In January the committee will examine if the proper school infrastructure exists and if it does, will plan for PD to commence in February. By the end of March, the committee should have their suggestions and implementation plan ready for administrative approval and begin a budget and rotation plan for incoming technology the following year. In April and May, the committee will focus on PD and training for the technology that will be purchased for the 2023-24 school year.

To determine the success or failure of the technology acquisition, the school will survey both students and teachers pre-, mid-, and post- year of acquisition. The surveys will have questions related to

how the students feel about the new technology, if they are more engaged, and suggestions that they may have. The school will also be monitoring the ISASP scores to determine overall growth of student performance.

There are three well-established resources which will be used in technology acquisition with the first being the book, Digital Leadership by Eric Sheninger (2019). This will be a great resource because not only does it make technology suggestions, but it also recommends teaching models and classroom design resources. Another resource will be the International Society for Technology Education (ISTE) which provides an array of resources for PD, use of the latest technology, and lesson plan ideas. The last resource will be the SAMR model. This model which I spoke of earlier, will help teachers to implement technology in meaningful ways. Appropriate PD sessions will be required to best utilize this resource.

For classroom design, the administration and individual teacher will collaborate on vision, goals, and teaching style to determine redesign needs. In September the teacher will assess student suggestions via a survey and in-person inquiry. The students will need to justify how their suggested change will enhance the classroom and improve academic performance. The teacher and administrator will meet at the end of September to discuss findings and brainstorm ideas. They will combine student suggestions with their own in order to create the optimal classroom. The administration will review and create a budget in October/November. Optimally, the classroom resources will arrive before the end of the year and be able to be implemented. The teacher will then conduct a survey and make formative assessments regarding the impact of the redesign on the student learning experience. Finally, the teacher and administrator will examine these results and discuss them at the end of the school year; this will lead to brainstorming of adjustments and/or changes as needed for the next year.

Barriers

There are several barriers that could impede progress with any or all of these action plans. The first and perhaps most obvious obstacle is the financial burden. This is a very small school district, and it

is located in an impoverished area. Without adequate grant funding, the district will struggle to find sufficient finances to bring all parts of Education 4.0 to fruition.

Another barrier is buy-in as this applies to several involved parties: community members, students, parents, the school board, the administration, and teachers. In regard to the general public, many perceive technology to have a negative impact on the youth today. Due to this common perception, even technology in the classroom can be seen as negative. It will take time and dedication to change this narrative.

A third barrier will be teachers' technological knowledge and proficiency. Many teachers do not know ways to enhance their classes with technology. Technology changes so frequently that even recent teaching graduates can find themselves in the dark. PD as mentioned before, will therefore be critical in fostering the success of these plans.

The fourth barrier that will be touched upon is the design of this implementation plan. It is often considered improper to have multiple variables that you change, and this plan has three. Manipulating three variables makes it difficult to monitor and assess whether the implementation of technology, curriculum, and/or classroom design has the biggest impact. Due to this, each of these three variables will be surveyed and assessed separately. The ultimate test of the entire plan will be the ISASP assessment results.

A fifth barrier which relates to budgets will be the use of the TOSA to apply for grants. Due to a low budget and nationwide budget cuts, everyone at this small district holds multiple roles and takes on extra assignments. The district may not be able to afford filling this role due to budget and staffing constraints. A possible solution to this could be that the teachers desiring technology upgrades apply independently and help others to do so once they discover an optimal and successful route of funding. This would also focus the technology acquisition on individuals more motivated and therefore more likely to implement technology successfully.

Conclusion

Schools have an increasingly difficult job of maintaining students' attention. Students prefer being able to find the information they seek instantly. Further contributing to this problem is complacency by teachers and a tendency to abstain from the technology which would best engage and enhance student learning (Sheninger, 2019). Students perceive to have access to better knowledge and resources online vs. the classroom and even in well technologically equipped schools, teachers can default to a traditional teaching model and risk leaving students un-inspired (Couros, 2015). Schools today too often resemble those of 100 years ago with all students being seated quietly, facing front, and listening to the teacher. With the advent of technology, this model of teaching is no longer relevant or beneficial.

What is needed is a more modern, student-centered approach that focuses on the learners' interests and desired educational tools. Schools should honor the history of education and the evolution to best advance the system. Modern schools should acknowledge various learning styles and focus on the needs of students in each class. Instructional methods which have worked historically may not emphasize the independent learning and skills in collaboration needed for the world today (Lehman, & Chase, 2015).

Through the use of technology, updated curriculum/pedagogy, and classroom redesign, schools can better meet the needs of students through inspired and student centric learning. Technology on its own will not increase student engagement. In fact, the most important aspect of Education 4.0 is change in pedagogy (Sheninger, 2019). Pedagogy is the most important aspect of school and should be the primary focus of every teacher, however,

having the right tools, space, and resources are necessary to adequately inspire change. To have pedagogy that aligns with the curriculum, technology, and content, proper PD is needed to help teachers create relevant curriculum.

Through upgrading curriculum, classroom redesign, technology, and obtaining relevant PD, schools can become a part of the Education 4.0 movement which seeks to prepare students for the future jobs they will occupy. Striving to remain current will allow schools to become relevant again and it is only in doing this that we can breed success in our system.

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