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The Use of Technology in a FLIPPED Classroom

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by

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Chapter 1: Introduction

Twenty-two years ago, we were blessed to give birth to our second child. We soon learned that there were challenges that he was going to face because of a complicated medical condition. His compromised immune system was the most pressing issue that we faced and came to the decision that his care needed someone around the clock. That someone was me. I put my career as a teacher on hold and came home to care for our child and begin homeschooling our first born. It would not have been something I would have chosen, but it was in the cards that were dealt to us. Homeschooling was very challenging. Curriculum for home educators was limited, resources for help was scarce, and the use of technology at home was nonexistent. Resources had to be obtained at our local libraries and access to public curriculum, at that time, was prohibited. I began writing my own curriculum after pouring through hours of research in between tube feedings and I.V. bag changes. It was difficult but one of the most rewarding periods of time in my life. Stepping back into the classroom after this 20-year leave of absence has been shocking and exciting. When I left, we were barely sending emails and using command keystrokes to operate computers. The internet was just being introduced into public education and the access and search engines were limited.

Blending my experiences as a home educator with the new world of technology has motivated me to learn and try as many new technologies and devices as possible. What was once hard and even impossible at times, is now made easy with an app, a new tech device, and/or a software program. My desire to help students become lifelong learners, to be excited about learning at any stage of life, and to find ways to adapt in an ever-changing world is now my mission.

The focus on innovative curriculum that challenged students and excited me began with researching new technologies. Technology has opened new windows of opportunities to enhance skill development, personal growth, and the overall classroom experience for both the educator and student. It has also breathed new life into classrooms, schools, and districts and has saved them money and other resources. It is an exciting time to be back in the classroom, both personally and professionally. Personally, I am more energized and less burdened with tasks that seemed overwhelming. Newfound freedoms with the use of technology have offered flexibility and opportunities. Professionally, I am motivated to explore and incorporate more resources and opportunities for students, continue my education, obtain quick access to questions, and save valuable resources by utilizing a variety of technology.

My desire is to help students gain a wide variety of both global and workforce experiences, build their confidence when using technology, expose them to technical choices, and teach them how to use technology wisely. As a result, I hope to use a variety of technology, like a FLIPPED: "**F**lexible Environments, **L**earning Culture, **I**ntentional Content, and **P**rofessional Educators, **P**rogressive Activities, **E**ngaging Experiences and **D**iversified" classroom, to help present material and course work more efficiently and give students greater opportunities to apply, create, and explore concepts during classroom time (Chen, Wang, Kinshuk, & Chen, 2014). This classroom delivery method may offer greater opportunities for both student and educator, to differentiate the curriculum to meet the needs of a variety of learners and prepare them for an ever-changing workforce.

Purpose

The purpose of this study was to explore and evaluate the benefits of a FLIPPED classroom delivery mode and methods that may aid in student growth and achievement. Several new technologies developed over the past 20 years have made dreams come true. Dreams of helping students explore, apply, and expand on the concepts and skills being taught. Dreams of spending time on projects and less time in lectures. Dreams of new opportunities to see the world and all its uniqueness without the expense of travel. There are other teacher tasks that have been made easy as well. Many of the areas that used to be frustrating in the past, like hand calculating grades, looking up phone numbers, and sorting piles of student papers have all been but eliminated with the use of technical software or devices. This personal time warp has been both exciting and daunting at times; however, I am thrilled to explore the new freedom I have found in utilizing technology.

Significance

The significance of this study is to discover the FLIPPED classroom delivery methods that are useful in improving student achievement. According to Jou and Wang (2013), cloud-computing technology has matured and offers numerous advantages for data and software sharing. They also observed that, "Education quality and student competitiveness have been receiving more attention worldwide" (p. 364). Many studies have suggested that there are connections between the use of iPad's and other mobile devices to student achievement and the enhancement of the student learning experience.

According to Burden, Hopkins, Male, Martin, and Trala (2012):

> Students positive development in 'collaborative learning,' 'personalized and seamless learning,' motivation and engagement, stimulating simultaneous opportunities for face-to-face social interaction,' enhancing 'learning in easy that were previously not possible' it may 'make communication between teachers and students, and school and home easier and more routine' and devices also had the potential benefit combining 'with other technologies.' (pp. 1-2)

Studies have shown that there is a positive connection between students who use mobile devices in their classrooms and after school, with an increase in student achievement and interest in difficult subject matters (Hegedus, Dalton & Tapper, 2015; Zhai, Zhang, & Li, 2016). Further studies also indicated that rapidly changing curriculum focuses and technological advancements challenge educators to keep in step with meeting the fast-paced educational goals set before them. Francis (2017) indicated "Teachers adapting to this new lifestyle must find methods of incorporating and utilizing these new forms of technology in class, not only in a motivational level, but also on an instructional level too" (p. 1). Researchers Francis (2017) and Cukurbasi, and Kiyici (2018) have found several educators are using a FLIPPED classroom format to teach their materials to their students to help expand opportunities in their classrooms.

Research Question

Because of the need of educators to find innovative ways to transform student learning experiences, I asked myself to what degree does the FLIPPED classroom delivery method influence high school student achievement?

In order to answer this question, I reviewed the literature with the intention of exploring:

- Teaching strategies utilizing mobile devices
- Perspectives on FLIPPED classrooms from students, educators and administrators.
- Effectiveness of the FLIPPED classroom format in preparing students for in class activities.

Definitions

FLIPPED Classroom (FC)**:** an educational strategy that utilizes a type of blended learning that may reverse the classroom information delivery environment outside of the classroom. The outside classroom can be online in a location of the learner's choice. It then moves the activities and lab experiences into the classroom. "**F**lexible Environments, **L**earning Culture, **I**ntentional Content, and **P**rofessional Educators, **P**rogressive Activities, **E**ngaging Experiences and **D**iversified Platforms" (Chen, Wang, Kinshuk, & Chen, 2014, pp. 16-17).

Labs: opportunities for learners to interact directly with the materials, skills, and knowledge taught during a lesson. This utilizes higher level thinking skills, primarily at the application levels.

Chapter 2: Review of the Literature

As mentioned in my introduction, this study was conducted to discover technological modes and methods that are useful in improving student achievement. According to Jou and Wang (2013), cloud computing technology has matured and offers numerous advantages for data and software sharing. They also observed that "education quality and student competitiveness have been receiving more attention worldwide" (p. 364).

> Many studies have suggested that there are connections between the use of iPads, along with other mobile devices, and the students positive development in 'collaborative learning,' 'personalized and seamless learning,' motivation and engagement, stimulating 'simultaneous opportunities for face-to-face social interaction,' enhancing 'learning in easy that were previously not possible' it may 'make communication between teachers and students, and school and home easier and more routine,' and devices also had the potential benefit combining 'with other technologies.' (Burden et al., 2012, pp. 1-2)

Studies have also shown that there is a positive connection between mobile device use, in class and after school, and student achievement and interest in difficult subject matters like physics and algebra (Hegedus et al., 2015; Zhai et al., 2016). Rapidly changing curriculum focuses and technological advancements challenge educators to keep in step to meet the fast-paced educational goals set before them. Francis (2017) reported "Teachers adapting to this new lifestyle must find methods of incorporating and utilizing these new forms of technology in class, not only on a motivational level, but also on an instructional level too" (p. 1). Researchers Cukurbasi and Kiyici (2018) have found that several educators are using a FLIPPED classroom format to teach their materials to their students. They reported that the results indicate an

increase in student motivation and achievement using a FLIPPED classroom format. One student from this study reported, “they cooperated, exchanged ideas, shared tasks, took responsibility, and socialized with their friends” (p. 46) when given opportunities to utilize new technical software and devices. Students and teachers in this same study reported the atmosphere improved opportunities for the completion of challenging projects, assignments and teacher-student communications. What are some of the teaching strategies used and needed to make a FLIPPED classroom model work?

The first teaching strategy involves the utilization of some kind of mobile device that both the student and teacher have access to inside and outside of school. What is a mobile device? Traxler (2010) defined a mobile device as the following: “smart-phones, game consoles, digital cameras, media players, netbooks (electronic notebooks), in-car SATNAV (satellite navigation system), and handheld computers” (p. 1). Students and teachers are no longer limited by a traditional brick and mortar classroom or a systematic class schedule, their mobile devices offer new freedoms and opportunities for creative resources and ideas. It is with these new technologies that breaks have been made in the areas of time and space for both learners and educators (Traxler, 2010).

Mobile devices can also be used to transform classroom instructional methods and techniques to help differentiate the curriculum and meet the needs of their students. Just as Floyd and Judge (2012) indicated when they said that “teachers not only met the expectation to make appropriate accommodations, but planned lessons from the ground up through differentiation. Differentiating teaching styles and utilizing technology, teachers ensured that all students were not only able to access the lesson, but they were interested in doing do” (p. 52).

The addition of these student and teacher mobile devices has disrupted traditional classroom instruction methods (Zhai et al., 2016). Disruptions are not always negative. Mobile devices have given educators a unique opportunity to explore new and creative ways to deliver material. One can examine instructional methods, utilizing various technology modifications, by looking at one model called SAMR (Puentendura, 2006). SAMR stands for the four levels of instruction titled "substitution, augmentation, modification and redefinition" (p. 13). The SAMR model lays out the continuum of learning levels with various technology implementation techniques. There are two lower levels in SAMR considered enhancement and the two upper levels are considered transformation of classroom instruction (Puentendura, 2006). This model cites the various levels in which technology is used at each of the stated levels. At the enhancement level, technology is used as a tool and at the transformational level, technology can be redesigned and create new tasks that were previously inconceivable (Puentendura, 2006). In an article by Lai, Hwang, Liang, and Tsai (2016), researchers reported that "both the students and teachers considered that the ''anytime' and 'anywhere' support provided, via the mobile technology, played an important role during the learning activities, engaging them in searching for information, collecting data, interpreting data and summarizing findings" (p. 533).

One type of classroom that utilizes mobile devices to help address the "anytime" and "anywhere" concept of classroom support and curriculum delivery is called a FLIPPED classroom. As stated earlier, FLIPPED stands for "**F**lexible Environments, **L**earning Culture, **I**ntentional Content, and **P**rofessional Educators, **P**rogressive Activities, **E**ngaging Experiences and **D**iversified Platforms" (Chen et al., 2014, pp. 16-17). The FLIPPED Classroom model, "which is popular today and becoming more popular, enable the students to perform real-life

applications more actively in order to understand the subjects profoundly with project based or problem-based learning applications within the limited class hour" (Cukurbasi & Kiyici, 2018, p. 47). It is an instructional approach that uses a mobile device for viewing recorded instruction outside of the classroom (Chen et al., 2014). When the student returns to the classroom, after viewing the instruction prior, they are then expected to complete a project, homework and or practices utilizing the materials presented in the lecture materials previously viewed, with the guided assistance of the instructor if necessary.

Utilizing technology in the classroom and out of school, such as FLIPPED, students can access online resources, watch videos, prepare for classroom discussions and projects ahead of time, obtain results for submitted work, manage resources easier, and sort both new and old material more quickly (Zhai et al., 2016). The skills learned through a FLIPPED designed course curriculum empowers student learning and in managing their own learning target achievements.

Student achievement in a FLIPPED classroom can be measured through the evaluation of the students cognitive processing, skill acquisition and emotional nurturance (Jou & Wang, 2013). Cognitive processing includes these four areas, memory, understanding, application, and judgment. The skill acquisition area includes imitation, operation, mastery and transition. The emotional nurturance area, or emotional well-being of the student, explored results related to the individual's perception, self-identity, motivation, and attitude. Jou and Wang conducted a wide variety of studies to try to determine what effect technology had on student achievement. One study found that there was little difference in the cognitive processing and skill acquisition areas of students with or without technical skills. They did however find that those students that had

some prior technological experience started at a high vantage point and had a significantly higher score in the emotional nurturance areas than their peers with little technical training or exposure. A different study conducted with special education students and general education students had similar findings. Francis (2017) reported that giving students opportunities to utilize technology aids had a great impact on their achievement in all three areas. He indicated that "without the technology plan that was put into place, many of the accommodations seen would not have been possible to give to students" (p. 47) therefore making their chance for success very limited in the classroom setting observed. An argument for a FLIPPED classroom and access to curriculum teachings and material, "anytime" and "anywhere" can be found in this same study by Francis. In the study it was concluded that "a student who can access the curriculum on an individual basis, and is excited and motivated to learn, will learn better, leading to better engagement in learning activities" (p. 50). This conclusion draws upon two of the three areas of student achievement, cognitive processing, and emotional nurturance.

Technology can also enhance student learning in the cognitive and emotional domains through a peer review (Papadopoulos, Lagkas, & Demetriadis, 2017). Their study concluded that when students are given opportunities to share their own ideas and or critique and discuss each other's materials, projects or assignments, their learning reaches higher levels of understanding. Even though peer reviews can be conducted with or without technology, it was found that the use of technology and mobile devices, aided the teacher in using more complex instructional designs. This study also provided new evidence on "how student performance is affected by providing and receiving peer comments," and how "technology-enhanced learning environments" (p. 60) can support those peer reviews.

In a related study, Davis and Fullerton (2016) wanted to address the discrepancies found in educational achievement, among students from nondominant backgrounds. Their focus was on examining students from non-dominant backgrounds. They wanted to see if technology could possibly help these students and enhance their achievement in their schools. They reported that "networked technologies accounted for more than half (53%) of the 200 positive comments made about the openly networked nature of ELLs (students who do not communicate well in English are part of an after-school program for nondominant students)" (p. 105). These openly networked environments that utilized technologies to support student learning, gave the students a greater sense of "connection between learning contexts and institutions" (p. 105) which lead to the higher cognitive and skill achievement. Technology can also provide teachers the medium to provide opportunities for students to nurture the higher levels of thinking skills that are of critical importance in our 21st century global world (Ramma, Bholoa, Watts, & Nadal, 2018). These researchers discussed several aspects that are important to utilizing technology-based curriculum like FC, FLIPPED classrooms. The first was that web-platforms should give parents opportunities to participate in and contribute to their child's education as well as offer feedback to the educator. Second, the web-platforms offered, should provide students flexibility and opportunities to extend the application of the learning goals. Once these things were in place, the researchers, Ramma et al. were provided with "adequate evidence of a change in the attitude of students, as they claimed to be interested, motivated and better prepared to learn new concepts in class" (p. 231). In conclusion the three shared stakeholders, student, teacher, and parent(s), aided in the students' learning and success.

When addressing the emotional nurturance domain of student achievement, one can look to the study done by Jou and Wang (2013). They suggested that students with a background in technology from their vocational high school, had greater "motivation for achievement" (pp. 368-369). This greater personal push to achieve is called audient behavior and is commonly believed to motivate students to succeed. It is the audient behavior, or personal drive, that would add significantly to the student's overall success and achievement in the classroom (Ramma et al., 2013). This research would suggest that the use of technology aids in students desire to learn and help motivate them to succeed. Is there a connection between innovative curriculum that uses technology and a student's overall success and achievement in the classroom?

Since there is a rapid change in technology and with the growth of the digital native students in acquiring technology and processing information, educators are finding the need to make some significant changes in their teaching methods (Cukurbasi & Kiyici, 2018). It was interesting to find that even when working with the digitally progressive student, many of them relied on rote learning and surface approaches to learning, while still reporting a positive experience with an FC (Cronhjort & Weurlander, 2016). They also showed that the students preferred to have access to the online learning recordings however, they still desired to obtain confirmation, guidance and support, face to face with an instructor when a "heavy workload and a threatening examination system" (p. 1) seemed to be approaching. Students with learning disabilities also expressed a concern about FC, although they appreciated the opportunity to watch and learn at their own pace outside of the classroom. The evidence also suggested, in these articles, that a blended learning approach seemed to be most preferred by both the student and educator but also that the educator needed to avoid redundancy and implement strategies for

providing meaningful and personal feedback as well as methods of monitoring student achievement (van Wyk, 2018).

Future application of the FLIPPED classroom approach may be found in providing educational opportunities for remote learners who lack access to particular programs or resources (Ghavifekr & Rosdy, 2015). The 21st century workforce is demanding skilled works and they are relying on students obtaining a variety of technology skills in high school. They are not looking just for book smarts but critical thinking skills, teamwork capabilities, and a desire to be a self-directed learner. The FLIPPED Classroom can deliver these skills, but the learner must also be willing to enter these deep waters. This FC method can benefit global networking and training, the sharing of resources and knowledge that once was limited by a multitude of reasons. Computers now serve as learning tools and not as replacements for quality teachers, which has been most strongly advocated for by students in these studies (Ghavifekr & Rosdy, 2015).

Staff training is a trending approach to utilizing flipped classrooms. Many businesses have begun tapping into educational resources when it comes to staff training. Companies are giving employee training in front of a computer rather than face to face employees, which is much more expensive and ties up valuable human resources. Blattner Energy, an alternative energy company out of Avon, Minnesota, is one company that has adapted this approach. According to Korben Weidenborner, a mechanical drafting engineer at Blattner, he has completed several online module trainings. These modules have included topics used for staff orientation or to satisfy mandatory staff safety training to educational modules specific to an area of focus. The trainings are delivered remotely by people all over the country, since many of their locations are out of state, and even from experts around the globe, who may be forerunners in a

particular technical method or strategy. Blattner Energy is growing fast and they need employees to continually keep up with current energy trends and needs and technical strategies and devices without leaving the office. These remote training sessions can be used during times of need or during open times that cannot always be predicted. Employees like the flexibility, according to Weidenborner, and so do their superiors.

Other companies need to train and test their employees before they can safely allow them to operate specialized equipment. They need to have verifications and printed certifications of the tasks performed and the FC can offer this as well. This type of training requires higher order thinking skills, otherwise known as HOTS.

> Although all students had similar preferences on following either the traditional or the FLIPPED classroom approach in both subject domains, a significant difference in students' views related to the teachers' contribution to teaching approach, students' HOTS development and the choice of learning material was observed. (Limniou, Schermbrucker, & Lyons, 2018, p. 21)

The role of the student and educator is changing rapidly and offering both many challenges. It is an exciting time to be in education. There are more opportunities for teachers to expand student learning, challenge them at higher levels of thinking, and they have a large number of tools and resources at their disposal than ever before. With proper support, teachers can develop innovative curriculum, inspire their students and prepare the next generation to be competitive in a global market.

> Students' and teachers' roles have changed by allowing students to actively participate in their learning process by developing their autonomy and independence and for teachers to

> act as facilitators by promoting discussions between students, clarifying students' misconceptions and guiding students to obtain their own knowledge. (Benfield, Rainbolt, Bell, & Donovan, 2015, p. 798)

The classroom is to be a training ground for future employees and our future as a nation. Educators need to do their best to be innovators and help students become more comfortable to be self-directed lifelong learners, global minded citizens, and critical thinkers. FLIPPED classroom delivery methods could offer solutions to ease these growing pains.

Advantages or Opportunities

As stated previously, FLIPPED classrooms can offer a variety of opportunities to students, businesses, and educators that have not been available before, however, the personal connections between the student and educator, are still a necessary component for their success. Students ask for and need specific direction, easy to follow and find instruction, opportunities to explore and expand their knowledge and skills, connect with global learners that they might not ever meet in an isolated classroom, and exposure to higher order thinking skill challenges that they can get in an odd sized classroom (van Wyk, 2018).

Another unique advantage is that the student can take their learning to environments or surroundings that are most pleasing to them. "Viewing peaceful natural environments has shown to restore cognitive abilities and reduce physiological arousal" (Benfield et al., 2015). If this study is true, then by allowing students to choose their own learning environments might suggest an educational benefit to both the student and educator.

Students also stated advantages of a FC to be more flexible, reduced cheating, encouraged critical thinking, self-paced, easier to understand, more specific dates and deadlines,

faster communications, facilitate the asking of questions, fun, builds confidence, and the teacher was able to gather feedback from all of the students (Cronhjort & Weurlander, 2016).

Chapter 3: Methods, Findings, Conclusions, and Recommendations

The purpose of this paper was to evaluate the FLIPPED classroom instructional model, and the student and teacher perspectives related to the use of this model. Chapter 1 provided background information, and Chapter 2 presented a review of the research literature related to FC. Chapter 3 explores the results of the action research that was completed using a FC Unit.

Methods

The instructor created an FC unit to deliver material regarding equipment and product function and use during a food unit. This information would be vital for a student to use prior to an assessment and laboratory experience and was not previously taught during classroom time. Students were encouraged to use it but not required. The unit took the instructor approximately 65 hours to complete and required the help of a technology specialist to prepare the final product.

Data were collected from 18 of the 23 Foods and Nutrition students in grades 9-12. Two students did not participate in assessments because of the Individual Learning Plan (IEP) which requires them to be assessed differently. Three of the 21 students were absent the day of the first survey about technology but were present for the FC activity and the assessment. Out of the 21 students, 10 were males and 11 were females. Five students of the 21 have an IEP but do not have assessment modifications that would prevent them from participating. The grade breakdown of these 21 students is as follows: nine 9th-graders, one 10th-grader, five 11th-graders, and six 12th-graders. It is important to note that the 9th-graders had the same instructor as their 8th-grade teacher for a quarter and had opportunities to use the kitchen tools, equipment, and food products more recently than the other students who have not had exposure for several years.

Findings

The results of this action research project are reported in Figures 1, 2, 3, and 4. The following paragraphs summarize these findings and draw attention to the most significant results.

Research Question

Because of the need of educators to find innovative ways to transform student learning experiences, I asked myself "To what degree does the FLIPPED classroom delivery method influence high school student achievement?"

The first survey was conducted to collect student data related to their perceptions related to the use of technology as a learning tool, and their preferences regarding classroom and learning environments. The significant questions and the student responses are represented in Tables 1 and 2 are discussed in greater detail in the conclusion portions of this chapter.

Table 1

Table Results Part I

Technology Pre-Assessment Survey Questions	**Responded Yes**	**Responded No**
Do you prefer traditional lecture based in-class format?	22.2%	77.8%
Do traditional lecture based in-class formats hold your attention?	22.2%	77.8%
Do you prefer activity based in-class format?	66.7%	33.3%
Do activity based in-class formats hold your attention?	77.8%	22.2%
Do you like using technology in your classes?	72.2%	27.8%

Table 2

Survey Results Part II

Technology Pre-Assessment Survey Questions	Responses	
Do you prefer pre-class videos with lecture material over the traditional lecture based in-class format?	27.8% 55.6%	I do not know what this is, and I would NOT be open to try it. I do not know what this is, but I would BE open to try it.
Would you find pre-class lecture videos combined with in-class discussion and activities engaging? (1=not engaging, 2=somewhat engaging, 3=very engaging)	22.2% 5.6% 44.4% 0% 27.8%	I do not know what this is, and I would NOT be open to try it. 1=Not Engaging 2=Somewhat Engaging 3= Very Engaging I do not know what this is, but I would BE open to try it.
How willing would you be to view pre-class materials online prior to a classroom activity (1=not at all, 2=somewhat, 3=very)	38.9% 55.6% 5.6%	1=Not at all 2=Somewhat 3=Very
How willing would you be to view pre-class materials online, in a video format, prior to a classroom activity (1=not at all, 2=somewhat, 3=very)	33.3% 61.1% 5.6%	1=Not at all 2=Somewhat 3=Very

The second step was to give students access to an FC, interactive unit designed in preparation for a lab experience and product assessment. Students were instructed on how to use the unit since only one student had exposure to an FC previously. The unit and directions were given 1 week prior to the lab and 10 days prior to the assessment. They were reminded everyday about the opportunity and were encouraged, but not directed or required, to use it.

The third assessment was a food lab that required students to complete a food product utilizing the information presented in the FC. Data were collected through a product evaluation, teacher observation, and a student reflection survey. The instructor provided little instruction during the laboratory activity other than to address a safety concern with a very hot pan. Before

the lab began, students were asked who used the FC Unit. Five students raised their hands and it was noted. Teacher observation records are noted below in the findings portion of this chapter.

The final data collected were from an assessment on the material that was presented in the FC Unit and utilized during the hands-on laboratory activity. Students were reminded to share information they learned with each other about the availability of the FC resources on their technology devices and paper copies in the classroom, to help them complete the lab activity. These resources are easy to access if they choose to use them. Only three more students used the FC resource during the lab. Laboratory activity observations and product results will be reported in the findings. Assessment scores can be viewed in Figures 1, 2, and 3.

Figure 1

Assessment Results for FLIPPED and Non-FLIPPED Classroom Users

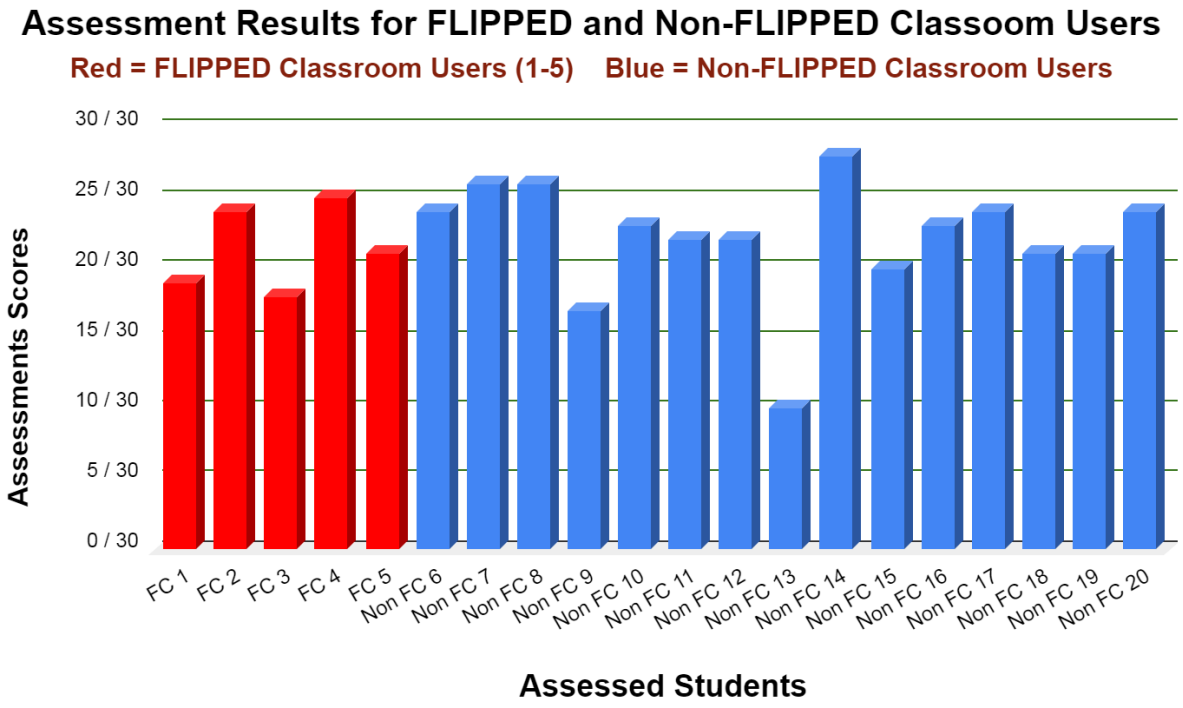
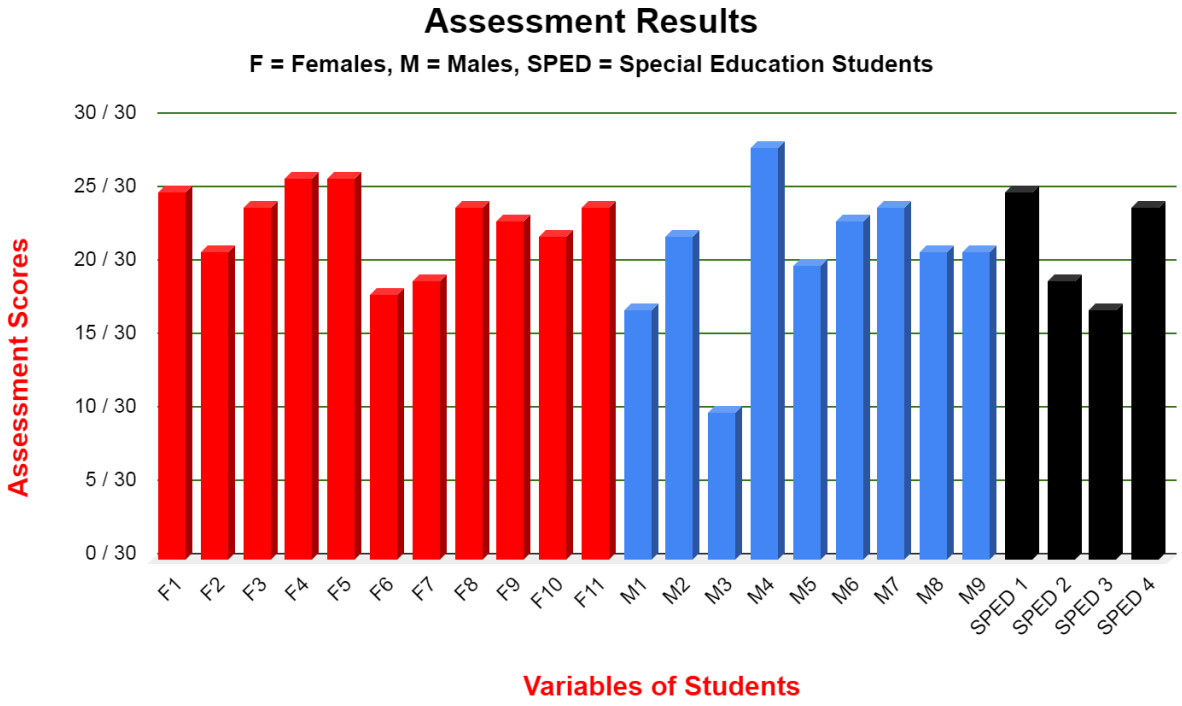


Figure 2

Assessment Results



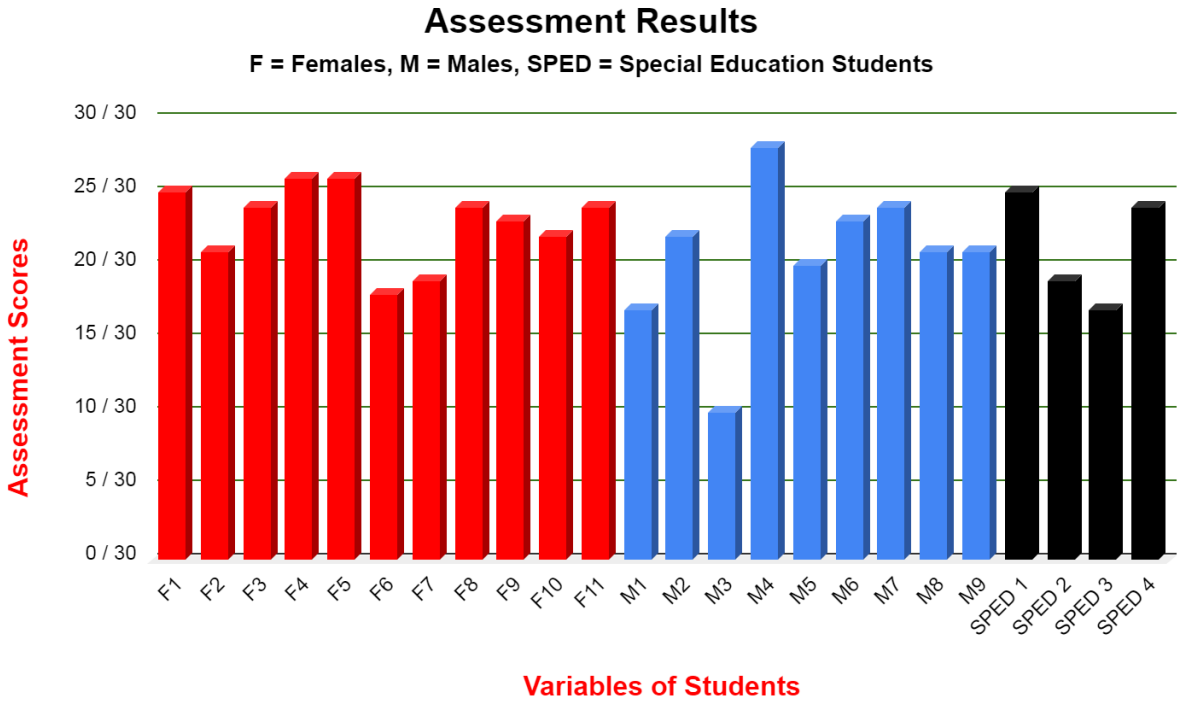
The significant questions and the student responses, that are used to answer the question regarding student attitudes toward and use of technology in learning material, can be found in Tables 1 and 2. It is interesting to note that a large majority of students prefer to use technology, 72.2% and 66.7% preferred to learn through interactive curriculum choices rather than the traditional delivery methods. However, when given the opportunity to learn using these methods, only 27.7% of the students used the FC delivery method, 2% used it to complete the laboratory activity and 0% of the students who struggled completing the lab used the material to address their questions or need for guidance.

Results from the pre-assessment survey are reported in Table 1. Seventy-seven-point eight percent of the students reported that they prepared activity-based classroom formats, 77.8% of the students did not prefer a traditional classroom and 72.2% of the students reported like using technology and 66.7% prefer to use technology over the traditional paper pencil materials. When students were evaluated on their use of the FC, 27.7% of the students were recorded to have used the FC option. Table 2 reports that 5.6% of the students said they would be very willing and 55.6% of the students said they would be somewhat interested in viewing pre-class materials while only 27.7% of the student's report using the FC, as seen in Table 2.

When given the opportunity to complete a unit using an interactive FC presentation in preparation for an in-classroom activity lab, 20.2% used the material prior to the lab activity and 10% of the students took advantage of the provided materials and interactive lesson during the lab. Results from the laboratory activity, reported through teacher observation and product evaluation, reported that lab groups that had 1 or more of the students who gained access to the FC materials prior to the lab, had an 85-95% final product success rate compared to the groups with no FC user, who had a 63% final product success rate.

Figure 3

Assessment Results



The average score of people who used the FLIPPED classroom = 71.33% (107/150) and two of the five were SPED students. The average score of people who DID NOT use the FLIPPED classroom = 73.55% (331/450) and two of these 15 students were SPED students.

During the lab assessment portion of this study, five out five of the students who used the FC reported that they felt confident about doing their food lab and where the equipment was stored and how to use it. Five out of five of the students who used the FC were able to describe the function of the products used in the FC when asked. FC users were observed being asked

questions and looked to for help during the classroom lab activity. Eight out of 20 of the students had the instructor the prior year who taught a similar curriculum and lab requirements.

The instructor provided little instruction other than to address a safety concern with a very hot pan. Before the lab began, students were asked who used the FC Unit. Five students raised their hands and it was noted. These five students were more confident in the lab, they knew where the equipment was and how to prepare their final product. They were able to answer questions from other students and stood out as leaders. Students who did not use the FC Unit were much more scattered, nervous, and fumbled through the kitchens. They asked more questions than the students who used the FC and thought that they would be given the answers whether they used the unit or not. The instructor answered all student questions during the lab with the direction to consult the FC materials. Zero percent of the students who asked for help used the FC material to help them and decided to guess or copy what another group was doing rather than find the information themselves. Students could have retrieved their iPad and utilized their information but chose not to and preferred to ask classmates or observe what other kitchens were doing.

Conclusions

According to the findings reported in Figures 1-3, the teacher observations, student interviews, and the lab product success, there was very little data to prove that the FC delivery method increased student success or improvement in student achievement. The information gathered in this research project, through the assessment and a laboratory activity, are in sharp contrast to the literature reported in Chapter 2. These research findings reported that very few students used the FC materials, but those that did found success and confidence in completing

the assessments and lab. Literature reports in Chapter 2 made one believe that all the students, in their studies, used the FC of their own free will but in this collection, very few did and would not even when struggling. Few students used the materials, 22.2%, and 0% used the resource when struggling to complete a challenging lab activity.

The results of this study have been very interesting for me as a Family Consumer Science Educator. My daily lessons include a wide variety of lab projects ranging from food preparation to home construction and design boards. My hope was that I would find a new educational mode to help deliver vital lab information to students to help them prepare for and execute these lab activities. What I observed was that many students did not take advantage of the material and resources provided in advance to them; instead, they preferred to troubleshoot on the fly and were not concerned about their outcome or grade. It seemed like many of the students were hoping that someone else in class would help them out if they got in a fix or they would just look around and copy what someone else was doing.

When surveyed prior to the FLIPPED classroom, students had said that they would use online technical resources over a lecture format (Figure 1). Twenty-two-point two percent of the students preferred a lecture format versus 77.8% of the students who preferred using technology and activity-based learning methods. This was in direct contradiction to what they did in class. They did not use the technology and chose not to have a successful lab experience. Assessment scores and lab product success remained close to the same as a classroom who did not have access to FC materials. The results are difficult to draw solid conclusions from since the majority of students did not choose to use the FC delivery method.

According to the survey results in Figures 1 and 2, one would conclude that the students would have activity pursued the FC materials, but the results in Figures 1-3 show that very few did. Only 20.2% of the students used the unit. Another result in this same Figure 2, show that 5.6% of the students said they would be very willing and 55.6% of the students said they would be somewhat interested in viewing pre-class materials, while 27.7% of the students report using the FC, as seen in Figure 3.

It is also interesting to note that two of the five students who reported using the FC materials were special education (SPED) students. Many SPED students are taught how to access a variety of educational resources that have been provided and utilize them as encouraged. They have found and benefited directly from using these resources so when they are offered, they tend to use them; while general education students tend not to value additional resources as much and rely on teacher instructions. It was also reported by the instructor that two of these five SPED students, who are not always respected among their peers, really stood out and were asked for help from other students in class struggling to complete the lab activity. The two SPED students who used the FC materials did better on the lab and on the written assessment than their general education counterparts. See Figure 3. One may conclude that we have taught or encouraged our SPED students to access and utilize the resources provided to them, such as an FC and other students have not found the need to because they have been able to rely on the traditional delivery methods for their success. Although this was not part of the research question being addressed in this paper. It is worth exploring in the future how we can better train all students to take advantage of a variety of resources available to them.

Since the assessment results did not vary greatly as the literature suggested, it is important to note that there needs to be some way of addressing how the student is using the FC materials and to what degree. A suggestion might be to conduct a FC educational session prior to their use and to use a technological recording method to better assess their usage of their materials.

Because of the need for educators to find innovative ways to transform student learning experiences it is important to find delivery methods that students will use and balance the number of man hours needed to design and create such material with increased student achievement. It took the teacher over 65 hours to create this FC resource, 6 weeks, and an additional technology support person to complete the project that yielded little to no change in the final assessment results or lab products. One would conclude that these resources might be better spent on a delivery method which creates a greater result. The time spent did not equal the benefit produced.

Limitation of the Study

This study was limited by the difficulty of obtaining some of the most current research in a timely and inexpensive manner as well as having a traditional classroom model to compare the FC classroom results to. Limitations might also be found in student and teacher attitudes and experiences prior to using an FC, and the resources available to both educator and learner. There is a lack in long-term and short-term data that directly relates to flipped classroom instructional methods and studies that more closely link increases in student achievement on standardized tests. It was also difficult to assess the validity of previous studies and whether the students used the FC which also was true in this research. It was difficult to make a correlation between the

competition of the pre and post surveys, the use of the FC materials, and the assessment results were not validated. "However, the findings reaffirmed that the flipped learning model can be both promising and challenging" (Chen et al., 2014, p. 26).

Limitations of the Technology

The obvious limitations to a flipped classroom were best stated by students with disabilities, students who lacked confidence, students who lacked self-motivation, those students who needed greater challenges, lack of proper technology and time and or curriculum that did not incorporate a pre-class learning activity or material (van Wyk, 2018).

Limitations that students identified were: difficulty in finding a suitable degree of difficulty, too long or too short, technical problems, no way of getting immediate clarification, challenges with sequencing or material, and the lack of teacher and peer interaction (Cronhjort & Weurlander, 2016). It is not clear that the students understood the FC terminology and if they were properly trained in how to use and explore the given FC materials. It seems that there would need to be several prior learning sessions to adequately prepare students to use the FC tool as an instructional method, different from the traditional model.

Further Studies

Overall, there were many discrepancies with the student reports and several limitations stated were even in conflict with those stated advantages. It depends on the individual student, their specific needs and prior experiences. Some students who claimed to use an FC, and had their name recorded in the data, could have just simply opened it and not ever gone through the material or utilized its resources. It may be interesting to complete another study using elementary school-aged students to compare these results with students in a variety of grade

levels. Younger students may find an FC delivery method more appealing, interesting, and engaging than these high school students did.

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Appendix

Technology Survey Questions	Yes Responses	No Responses	
Do you prefer traditional lecture based in-class format?	**22.2%**	**77.8%**	
Do traditional lecture based in-class formats hold your attention?	**22.2%**	**77.8%**	
Why or Why Not do lectures based in-class format hold your attention? Please number your answers			1) too much wordage for mah little brain They are boring I can't focus for that long and they get boring Lectures are boring to me 1. They're boring. It's easier for me to listen to the teacher Don't know Idk They suck I would rather learn any other way Don't know They don't because they get boring and then I can't concentrate I don't know what that is but I'm gonna assume that it holds my attention because your talking to us I don't know 1) I do not like it when I have to sit and listen to a teacher talk for a long time because I get really bored and I stop paying attention. 1. They are not interesting to me because i prefer it is hands on. It keeps my attention because I'm used to it and have learned how to pay attention. 1) I can't listen to people talk for along time and hold attention. Listening helps me retain information

Technology Survey Questions	Yes Responses	No Responses	
What helps hold your attention in a traditional lecture based in-class format? Please number your answers			I don't know Nuthin' More hands on work Being involved and hands on Stuff that makes me laugh Nothing It's rather hands on instead The teacher up front talking gives me something to focus on, we can't talk so I won't get distracted Don't know Idk Nothing they suck and would rather blow my ear drums out then listen to a lecture Don't know Games When we're doing activities and being active in the classroom. 1. Hands on activities Having a good speaker that doesn't repeat things too often. 2) Doing things hands-on instead of listening and taking notes. An interesting lesson
Do you prefer activity based in-class format?	**66.7%**	**33.3%**	
Do activity based in-class formats hold your attention?	**77.8%**	**22.2%**	

Technology Survey Questions	Yes Responses	No Responses	
Why or Why Not do activity based in-class format hold your attention? Please number your answers.			Idk Don't know 1) too many things to do Because they keep me moving and awake Keep my attention and interesting 1. Because it's hands on It gives me something hands on to focus on Cause I'm actually doing They do because they are fun mostly I don't like the activities I would just rather get lecture They are fun Because your interacting with everyone and I like being/ helping with other students. 1. They hold my attention because im actually doing what we are learning about. It holds my attention because it's giving me something to do. 3) It helps me stay participating. Sometimes the activities get boring
What helps hold your attention in a traditional lecture based in-class format? Please number your answers			I don't know Nuthin' More hands on work Being involved and hands on Stuff that makes me laugh Nothing It's rather hands on instead The teacher up front talking gives me something to focus on, we can't talk so I won't get distracted Don't know Idk Nothing they suck and would rather blow my ear drums out then listen to a lecture Don't know Games When we're doing activities and being active in the classroom. 1. Hands on activities Having a good speaker that doesn't repeat things too often. 2) Doing things hands-on instead of listening and taking notes. An interesting lesson

Technology Survey Questions	Yes Responses	No Responses	
			Don't know 1) too many things to do Because they keep me moving and awake Keep my attention and interesting 1. Because it's hands on It gives me something hands on to focus on Cause I'm actually doing They do because they are fun mostly I don't like the activities I would just rather get lecture They are fun Because your interacting with everyone and I like being/ helping with other students. 1. They hold my attention because im actually doing what we are learning about. It holds my attention because it's giving me something to do. 3) It helps me stay participating. Sometimes the activities get boring
What helps hold your attention in an activity based in-class format? Please number your answers.			Idk Nuthin' They aren't boring Keeping it moving Actually doing it I have something that I'm doing actively to keep me focused Don't know I'm up doing stuff and I'm not just listening to you ramble about stuff that doesn't matter Dont know Trivia fun games It doesn't hold my attention Constantly doing something Group projects activities with the class 1. Making the activity fun and challenging Having a fun and interactive activity. 4) I like to be able to touch things to see how it works and see examples. Interesting activities

Technology Survey Questions	Yes Responses	No Responses	
Do you prefer pre-class videos with lecture material over the traditional lecture based in-class format?	**0**	**16.7%**	**55.6%** I do not know what this is and I would BE open to try it **27.8%** I do not know what this is and I would NOT be open to try it
Would you find pre-class lecture videos combined with in-class discussion and activities engaging? (1= not engaging, 2= somewhat engaging, 3= Very engaging)			**5.6%** 1 = Not Engaging **44.4%** 2 = Somewhat Engaging **0%** 3 = Very Engaging **27.8%** I do not know what this is but I would BE open to try it **22.2%** I do not know what this is and I would NOT be open to try it
How willing would you be to view pre-class materials online prior to a classroom activity (1= not at all, 2= somewhat, 3= Very)			**38.9%** 1 = Not at all **55.6%** 2 = Somewhat **5.6%** 3 = Very
How willing would you be to view pre-class materials online, in a video format, prior to a classroom activity (1= not at all, 2 = somewhat, 3= Very)			**33.3%** 1 = Not at all **61.1%** 2 = Somewhat **5.6%** 3 = Very
Do you like using technology in your classes?	**72.2%**	**27.8%**	

Technology Survey Questions	Yes Responses	No Responses	
What kinds of technology are used in your classrooms? Please number when listing.			**14 IPads** **4 computers** **1 chrome book** **1 clever touch** **1 phone** **1 projector** **1 interact able screen**
Have you ever heard of a FLIPPED classroom format before?	**22.2%**	**77.8%**	
Where did you hear about a FLIPPED classroom format before?			**72.2%** I have never heard of it **16.7%** I've used it in one of my classes **5.6%** I have only heard the term but I'm not sure what it means **5.6%** I have heard about it and would be able **5.6%** to describe it to another person