

The Angel Tree Project: Incorporating Mathematics into a Family and Consumer Sciences Service-Learning Project

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Service-learning projects can promote student engagement and learning as they make real-world connections. Family and consumer sciences (FCS) classrooms provide students with unique opportunities to integrate academics, skills, and community service. The paper highlights a three-step service-learning project developed by a FCS teacher wherein students combined FCS and mathematics skills in the real-world as they managed a bake sale, set a budget, and made purchases for less-fortunate children in their community.

There is an emerging interest in FCS and incorporating more core academics such as mathematics into its curriculum. Mathematics is interwoven into our lives because it is a part of most daily tasks. These tasks help make mathematics connections in the FCS classroom where budgeting, food preparation, interior design, parenting, and child development are taught. Deaton et al., (2018) notes that the “pragmatic nature of FCS makes it a natural contender for STEM learning opportunities.” STEM is the acronym for the Science, Technology, Engineering, and Mathematics integration movement. The use of STEM in FCS can be linked to its early beginnings where mathematics and sciences, in particular, were a part of its foundation and helped it become a stand-alone discipline and profession (Deaton et al., 2018; Hustvedt, 2015). However, finding creative ways to teach STEM, especially mathematics, can be challenging.

For many students, mathematics can be difficult to understand, or it can make them anxious. Ashcraft (2002) describes mathematics anxiety as a fear or apprehension when dealing with mathematics. Hunt and Maloney (2022) reveal previous mathematics experiences mediate mathematics anxiety and attitudes as well as resilience in how mathematics is perceived. Apprehensive feelings can be found in both students and teachers. Many teachers feel anxiety, too, as they try to find ways to incorporate mathematics across the curriculum. In a study by Lau et al. (2022), it was revealed teacher confidence in teaching mathematics reduces an individual’s feelings of uncertainty. Furthermore, student perception of teacher confidence while teaching mathematics impacted the level of anxiety as well as the level of mathematic achievement. While there is an increased interest within FCS and its connections with STEM and STEAM (i.e., Science, Technology, Engineering, Arts, and Mathematics) movements (McGregor, 2019), it is important to consider the role FCS has in improving perceptions of mathematics among students and teachers alike.

FCS teachers have unique opportunities to create authentic, real-life learning for students through service-learning projects. Service learning is a teaching strategy that intentionally links community service to academic instruction. As students make connections to real world issues and address ways to resolve them, the level of classroom engagement and motivation increases (Filges et al., 2022). Service learning is important in the educational process because of the many benefits it has for students, educators, and the community. Erasmus (2013) noted that it is

increasingly important for students to learn content knowledge and be exposed to strategies that promote the development of problem solving, critical thinking, communication skills, and active learning. FCS provides students with the opportunity to use learned skills in engaging, real-life settings. This can be achieved through Family, Career, and Community Leaders of America (FCCLA), classroom activities, labs, fundraising events, and service-learning projects. In fact, finding ways to improve student engagement, graduation rates and even career readiness has gained momentum among educators in recent years (Kantrov, 2014). The use of service learning can provide teachers, especially FCS teachers, with engaging ways to keep students motivated and interested in school. In turn, this could help students make important connections between FCS, mathematics, and other foundational skills that lead to personal success. When core academic skills such as mathematics are incorporated into areas such as FCS, it becomes fun and relatable and will follow students long after they leave high school.

The Role of Service-Learning Projects in FCS

Service learning connects acts of service with learning in the classroom. The Arkansas Department of Human Services (2016) notes that service learning is an approach to learning that uses skill acquisition, self-discovery, and community impact. Service learning allows students to make connections between what they have learned and service activities. FCS courses are multifaceted and include activities that lend themselves well to the use of service-learning projects. Examples include food labs to prepare baked goods for fundraising purposes, sewing projects for the homeless, and FCCLA, which encourages students to participate in community-oriented projects as part of its STAR Events competitions. FCS teachers are in a unique position to use service learning not only to teach, but to help engage students in their own learning.

There are several benefits for students associated with participating in service-learning projects. Studies have shown that service learning has the potential to positively impact students in four areas: academics, personal and social development, citizenship, and career awareness (Arkansas Department of Human Services, 2016). Examples of positive outcomes from service learning noted in the literature include improved leadership (Ejiwale, 2013), increased self-efficacy (Hilarski, 2013), and a positive effect on student engagement and achievement (Hullender et al., 2015; Kropp et al., 2015; Lee, 2012). In one study by Hullender et al., 2015, students reported that service-learning projects made them feel more responsible and school more meaningful. Binder and Freytag (2013) indicated that those who volunteer have more significant well-being than those who do not, and Pilkington et al. (2012) reported an increased level of life satisfaction related to volunteer work. Lastly, Meurers (2021) noted that students may become more aware of differences in cultures and diversity issues as they work with others. Service-learning can improve the lives of students and the communities they serve in many ways.

Incorporating Mathematics into FCS

There is growing interest for increasing interdisciplinary mathematics and FCS integration (Berleth, 2020). The catalyst for this interest is Perkins V, which was signed into law in 2018. This law allows CTE programs to recalibrate innovative and creative ways of teaching to provide more opportunities for students. Two specific areas of Perkins V that affects mathematics in CTE are CTE programs of study and CTE work-based learning. Perkins V emphasizes academic and technical content as well as employability skills within CTE programs of study. In work-based learning, Perkins V calls for interactions with real or simulated

workplace settings that foster first hand engagement of tasks that are aligned to curriculum and instruction (Association for Career and Technical Education, 2018b).

In relation to the areas of emphasis, Jacob (2017) stated that CTE can integrate academics into a real-world context, which can motivate students to attend school, become more engaged, and improve core academic skills. These real-life connections have many benefits to students. One benefit of incorporating mathematics in FCS is the connection of interactive learning to everyday tasks. From measuring recipes, balancing finances, to determining vehicle gas mileage, we use different forms of mathematics each day. Scholastic, Inc. (2021) stated interactive learning helps develop critical thinking skills, which are essential to analytical reasoning. Students who explore with imagination and logic learn to make decisions instead of simply memorizing information, thus increasing retention.

Another benefit of mathematics in FCS is building self-confidence in both students and teachers. Mathematics is commonly perceived to be difficult (Fritz et al., 2019) and many students experience anxiety as a result. FCS teachers may go through similar emotions when trying to incorporate mathematics into their curriculum. In fact, Yancura (2018) noted that one of the biggest challenges among teachers is the lack of self-efficacy and feeling less qualified to include mathematics and sciences in their FCS classrooms. Despite these concerns, there has been success using the Math-in-CTE Model (Stone et al., 2008) which uses both pedagogy and professional development for teacher collaborations. It looks at practical mathematics applications when creating lesson plans and helps make connections between mathematics and classroom concepts. Stone et al., (2008) conducted a study using the model and determined five core principles of its use which include developing and sustaining practice among teachers, working with the FCS standards, understanding mathematics as a workplace skill, maximizing mathematics in the CTE curriculum, and recognizing CTE teachers are Math-in-CTE teachers rather than mathematics teachers. Stone et al., (2008) also revealed that the Math-in-CTE Model helped students understand how to solve real problems at hand, use creative problem-solving and application of mathematics to solve abstract problems. Students who participated in the study performed significantly better on two of three math ability assessments.

Whether teachers use developed models or their own lessons, creating meaningful learning opportunities using mathematics can easily be done. FCS teachers have a variety of instructional activities, such as service-learning projects, which can make mathematics in the classroom fun, relatable, and relevant.

The Angel Tree Project

The Angel Tree Project was created after realizing the value of service-learning for students and the need to reinforce mathematics into the FCS classroom. The project lasted for approximately two months during November and December; however, because it was so successful, it will be continued for years to come. *The Angel Tree Project* had three purposes: 1) Equip FCS students with skills in food preparation, cost analysis, and decision making during a Christmas bake sale; 2) Help students learn skills in budgeting, teamwork, and critical thinking about the needs of children in their immediate community; and 3) Utilize real-world budgeting skills to make purchases for children in students' community.

Using the five core Math-in-CTE principles outlined by Stone et al., (2008), the FCS teacher worked with two mathematics teachers to ensure students had a strong foundation in workplace mathematics skills. Percentages, fractions, division, addition and subtraction were highlighted in instruction. The FCS standards remained at the heart of the service-learning project as students maximized mathematics and FCS skills for a bake sale, established a budget,

and shopped. In the end, the FCS teacher helped facilitate and support students' use of mathematics through the *Angel Tree Project*.

Details of the Service-Learning Project

The FCS program associated with the project highlighted here is in a small, rural school where with a yearly enrollment of approximately 100 students. Due to low benchmark mathematics scores, district leaders asked teachers to find creative ways to include mathematics into their curriculum. Realizing mathematics could easily be incorporated into a service-learning project, the *Angel Tree Project* was created using a three-step process. The first step was to hold a week-long Christmas bake sale where students could raise money to fund the project. The bake sale was held for one week in the FCS kitchen lab. Students arranged display tables to create a small store where baked goods were sold. To get ready for the bake sale, FCS students worked during their classes and after school to prepare baked goods. During the sale, they established daily shifts to bake and to sell goods to elementary, junior high, and senior high students. Parents, teachers, and community members also came to the bake sale to purchase prepared goods and to support student efforts. The importance of presentation, consistent portions, and social skills necessary for running a small business became apparent as students worked each day. The bake sale generated approximately \$980.00.

During the second stage of the project, students worked as a team to decide how many children to sponsor from the list provided by the Angel Tree coordinator, establishing a budget based upon bake sale profits, and determining the needs and wants of each child. The Angel Tree community coordinator provides an anonymous list of children who have been identified as low income and in need each year. During the last phase of the *Angel Tree Project*, students shopped in teams for children on the Angel Tree list using the established budget. Students met at the local Wal-Mart store and formed shopping teams to purchase each child's needs first, then wants, from the list provided. Participation in the *Angel Tree Project* allowed students to use mathematics skills, decision making, teamwork and leadership to help others in their community.

Outcomes of the Service-Learning Project

Bake Sale

In November, students met to determine what baked goods to sell and establish pricing for each food sold. Mathematics skills were used to determine production cost, selling cost, and profit margin. Because the school is in a low socioeconomic area, students set prices which were within a selling range, while also providing a profit margin. Prices were determined by using a food cost percentage formula. This was calculated by dividing the cost of each item by the revenue it provided. Overall, students maintained a 33-50% profit margin. Items such as cookies netted a higher profit margin while larger items such as pies yielded smaller profits due to ingredient costs. Cookies sold for \$1.00, cakes \$10-20.00, pies \$10-15.00, brownies \$3.00, sealed bags of chocolate covered pretzels \$4.00, apple fried pies \$3.00, and Oreo truffles \$5.00 for a three-piece bag. The FCS kitchen lab was transformed into a small store as tables were moved and set up to showcase the bake sale goods. Festive decorations and table garnishments helped create a welcoming room. Students also created work schedules to prepare baked goods during school time and on Saturday before the bake sale began. Three parents volunteered to assist students in the FCS kitchens as well. Students donated some baking supplies, but the FCS department purchased most of the ingredients and supplies needed.

During the bake sale, students worked thirty-minute shifts in assigned roles such as cashier, display table salesperson, and customer assistants. Learning different roles within the

hospitality and restaurant industry can help students identify potential career pathways such as managers, waiters, and event planners. The Association for Career and Technical Education (2018a) notes that 80% of restaurant owners and 90% of restaurant managers report their first job was an entry-level position. Once foods were prepared, students began packaging them in attractive plastic bags and ribbons. Neat and orderly placement on selling trays was another important task as fresh baked goods were rotated into the existing stock. Since cookies and brownies were the best sellers, they were made fresh throughout the day. Student workers came by before school to help package fresh goods for that day's bake sale. Middle and high school students came during the last fifteen minutes of lunch while elementary teachers scheduled times throughout the day to bring their classes. It was an important mathematics lesson for younger students as teachers used this as an opportunity to learn how to count money.

Budgeting and Decision Making

After the bake sale, students met to calculate their profit and decide on a budget for the *Angel Tree Project*. This allowed them to determine how many children they could afford to sponsor. The bake sale generated approximately \$980.00, so students chose to sponsor three children for \$300.00 each. The Angel Tree community coordinator provided a list of children ages six months to 18 years of age whose names and information were removed so identities were anonymous. This list provided important information on age, gender, clothing size, special needs and wants. FCS students decided to sponsor an infant, young child, and a teen from the list. Lastly, students chose a date and time after school to meet for shopping. Parent volunteers organized carpools to help transport students while the FCS teacher made reservations at a local pizza restaurant so students and parents could eat before shopping. This time provided a positive social experience for students and a way for the teacher to build rapport with parent volunteers.

Shopping For Children

Students established a day and time to shop for the Angel Tree children they sponsored. Upon arriving at the store, they established shopping teams for each sponsored child and provided a list of needed items. The FCS teacher gave each team one hour to shop and a place to meet for check out. Before teams began shopping, students went over the budget and designated one person to keep track of expenses as they shopped. Students shopped independently without teacher or adult supervision unless needed. Purchases were made by comparing the quality of similar items, utilizing clearance racks, and taking age appropriateness into account. Once a sponsored child's needs were met and enough money remained within their budget, the child's wants were purchased. This included things such as toys, candy or other novelties. At the end of the shopping hour, teams met at the front registers where the FCS teacher prepared each team's purchases. Students anxiously waited to see if they stayed within their budget as cashiers processed the purchases. The final price for sponsoring three children came to \$897.93.

Conclusion

FCS classrooms can provide valuable contributions to the development of innovative and creative curriculum. Brown (2020) notes that FCS programs reinforce academics by integrating mathematics and sciences while allowing students to identify personal abilities by using hands-on activities. Students not only benefit from the integration of academic curriculum, but also service-learning opportunities that can enhance learning by providing personal benefits to students. The *Angel Tree Project* brought students to a higher level of engagement and promoted the FCS program as more students and parents saw its relevance. From the first year to the

second year of the project, student participation increased from ten students to twenty-five due to increased interest.

This project was impactful and served as much more than a fundraiser or a fun activity. Instead, it is a prime example of what effective FCS classrooms can do academically and personally for students and will be continued for years to come. Future projects may also include a student-written article for the local newspaper, additional parent volunteers to help with baking and transportation, as well as a targeted advertising effort within the community. The *Angel Tree Project* helped build a stronger FCS program through increased participation among students as they actively saw real-life connections with mathematics. It also helped students develop a greater sense of leadership and gain an understanding of how service-learning can affect those in need. More importantly, students developed a deeper understanding of the connections between FCS and mathematics as they become independent adults. This was evident from student comments about using prior learning from mathematics courses. Students also demonstrated a greater ease in using mathematics as they calculated profit margins and established a budget. The impact of this project on the FCS program, community, and students was far-reaching: The *Angel Tree Project* not only provided real-world connections to mathematics in the classroom but connected the school and community as well.

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