The Family Angle: Building Connections Between Home and School Through Math
A Design Project
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The Family Angle

Impressions:

In an effort to bridge two organizations, the home and the school, and strengthen math connections the Primes Project created a series of everyday math resources for parents and educators. The Primes Project, a collaboration of Stanford, WestEd, and SM Productions, presented the television show, The Family Angle, on January 20, 2002. Following the viewing of the show, a panel of educators and researchers engaged in a discussion with the audience.

The primary goal of the show is to link the home and the school by encouraging families to build connections between everyday math opportunities and formal math concepts. The show not only focuses on math but also emphasizes the importance of family values and communication. In fact, in the introduction the narrator addresses a common problem associated with math and the home. The narrator explains that often math homework creates stressful, frustrating situations for both children and their parents. The Family Angle provides real-life scenarios and ideas in an attempt to transform the attitudes and activities surrounding math within the home. The underlying message of the show is that families can use math as a meeting point, a common ground upon which discovery and quality communication can occur.

The ‘slice of life’ design of the show personalized the experience and made it easy for viewers to relate to the scenarios. Much of the success of the show relied on the dynamic families and their ‘stories’. As viewers, we became invested in their stories, wanting to see the end result – the finished ballet costume, the most efficient bus route. The narrator’s verbal explanation coordinated with the visual formulas and math facts provided a final, more concrete connection between the everyday math lessons and formal math skills.

While the family math scenarios were entertaining, we questioned their realism. Some conversations seemed ‘planned’ and unnatural. For instance, would two brothers really discuss the advantages and disadvantages of renting or buying video games while playing a game? Would a family really perform long division while at a baseball game? How could the design of the show be more realistic?

The families featured were very confident in their math skills. Was this a product of participating in the show? Or, was this confidence the rationale behind the choice of families? It would have been interesting to hear how the families were chosen and the effects they experience after contributing to the show. Will the show continue to follow these families? Will viewers be able to watch their everyday math skills progress over time?

While the show did an excellent job highlighting everyday math situations, the strategies provided at the end of the show lacked substance and creativity. We felt that more ideas
should be given to families, concrete ideas on how to make math more visible. Suggestions should be stated that offer parents a starting point, how to discuss math, how to involve their children in actual calculations. We observed that while the parents in the show modeled the use of practical math skills, rarely were the children asked to perform the calculations. Parents should be taught how to engage their children. After all, parents are not trained educators. It is even difficult for trained educators to balance modeling learning and guiding learning. How can we expect parents to naturally possess this skill? It is a challenging task to make the implicit explicit. Parents need to be scaffolded in the beginning (lists of strategies, situations that include math) with the hopes that over time they will naturally capitalize on everyday math opportunities. Perhaps the design of the show can convey this notion of fading scaffolding.

We found that the show primarily focused on the home and the role of math within family situations. In order to ensure the success of the project’s goals, we feel stronger connections need to be made between the home and the school. Where does the school fit in? How can the project increase the visibility of everyday math within the home, but at the same time challenge the child to connect those situations with formal concepts learned at school? A point mentioned in the discussion that we will capitalize in our design solution is the role of the child as the cultural broker. The child, a participant of both organizations, must be encouraged to facilitate communication between the two environments. Our design solution relies on the increased responsibility and accountability of the child.

Proposed Solution:

According to the situative approach, students’ learning is greatly affected by not only the individual characteristics of the learner, but also by the community and its members that surround the learner. Considering one of the main goals of the Family Angle is to build connections between school and family, it is logical that a design solution incorporates the situative approach to learning. To fully embrace the situative approach, the design solution must allow students to construct their own knowledge through collaborative, practical, situated activities. In turn, this type of design will enable learners to transfer their new knowledge to other problem-solving situations.

To encourage students to become more aware of math in their everyday life, one of the requirements in math class shall be the creation and maintenance of a math journal. The math journal shall be the student’s own, where she can freely jot down her ruminations on her personal math learning. More importantly, this is where she will record everyday problems that relate to math concepts learned in school. The student shall then be gradually encouraged to bring these math problems to class and share them with classmates. The process of consciously observing and noticing such occurrences is a crucial step in bridging the gap between ‘school math’ and ‘everyday math’, enabling students to transfer math concepts learned in the formal school setting to the informal home setting.
The teacher initially models this link by providing rich examples of everyday problems solved mathematically. For example, the Family Angle video presentation can be shown to the class as an effective way to stimulate discussion. Teachers will also provide one model or example “home math problem” each week that focuses on the current concept being studied in the math curriculum. Students will record the example in their journals along with the formal math concept that relates. Teachers may also choose to have students record a parallel school math problem along with this entry. Solutions may or may not be worked out when the example is presented depending on the level of comfort the class feels with the math concepts involved.

Afterwards, the students are required to observe problems at home and in the community that can be solved by math concepts learned in school. Following the example presented by the teacher, students develop a similar home math problem and record it in their journals, attempting a solution as well. A specific time block is set aside each day during class for one student to present a problem he or she finds. The class is encouraged to solve the problem collaboratively, either as an entire class or in small groups. The discussion ends with the student presenter showing his solution, and the teacher providing feedback to the class. At least five problems will be presented each week, and every student is required to participate. This practice aims to advance the learner’s development of concrete strategies to use in solving mathematical problems, as well as stimulate the transfer of knowledge between school and home settings.

It is recommended that teachers also find time to provide occasional feedback on home math problems through constructive comments in the children’s math journals. This process allows for the teacher to be more connected with the individual students’ lives as well as provide time to assess the students’ understanding and transfer of the formal math concepts covered. Both the teacher and student contributions to the math journal are designed to strengthen the connection between home and school. Parents will be encouraged to review their child’s math journal, adding comments and feedback to support their child’s motivation and learning.

This simple exercise can be expanded with each student taking on a more active role. When observing their everyday math problems, students can record their choice problems on index cards, color-coding them by setting (home-kitchen, home-bedroom, lawn, grocery store, etc.) and by topic (basic operations, statistics, measurement conversions, etc.). In the classroom, students can share/swap these cards with their classmates and try to come up with the most creative and efficient solutions to the problem among themselves. They can also add a card each day by jotting down the daily math problem from the activity mentioned above. By creating their own ‘everyday math problems collection’, students review math concepts learned in class. The index cards also ensure learning and provide students with an active archive of everyday math examples.

But how can these index cards be used more actively? One way is to let students design a board game that represents their life. For example, they can customize the settings in it (include a theme park, remove the mall, etc.) or the different steps to advance the game. One rule, however, is that for players to move in the board game, they need to answer a
problem in each setting. They choose problems from the stack of index cards the students have collected during the months in class. This is one way of reviewing math concepts creatively, and motivating students to do so in a fun and casual way. Students are also encouraged to share and play the game with their family members—another step in connecting the family and school life.

Depending on the resources available and the target audience, a parallel step students can take to actively archive their everyday math problems is to create an online database which can be accessed by parents as well. Students can bring their problems and solutions to class, and with the teacher’s guidance, put them up on the Web. This allows easy sharing of information among the teacher, students and parents (providing they all have access to connected computers), as well as keeping an archive of problems, solutions and strategies for researchers, teachers, parents and other students to refer to. However, issues on easy access to computers and the Internet, as well as available resources (time and money), should be carefully evaluated before taking this step. Based on the target audiences of the Family Angle, we decided not to include the technical archive as a major point in our proposed solution.

Conclusion:

Building on the present design, our solution incorporates a more school-focused companion design to strengthen the tie between school and family learning. The weekly development of home math problems allows each child to situate their learning in their own experience. Utilizing their parents and other community resources, the children construct their everyday math knowledge through a collaborative effort. Families’ understanding and knowledge of their students’ school learning is facilitated through this opportunity to create situated math problems. Additionally, the activity makes everyday math explicit.

The use of journals to record students’ impressions and ideas enables them to reflect on their learning and the progress they make over the year. Children can also record collaborative learning that takes place in the classroom. In addition, the journals provide both students and families with a resource that will further aid their ability to make math visible in everyday life. Teachers’ comments on home-created math problems make visible and explicit to families the formal aspects of everyday math. The journal serves the dual purpose of bringing everyday math to school and formal math home.

Lastly, the sharing of home math problems and the building of board games help build opportunities for motivation and feedback. Children are able to share their ideas in a non-threatening environment as well as develop a sense of pride in their own work. The game environment is individualized by the creator and provides additional motivation to practice everyday math skills. Lastly, the game builds a greater sense of the family and school bond by providing an artifact of school learning to be utilized in the home environment.
Example problem:
Shana's weekly allowance is $10. She must buy her mother a birthday gift. Knowing her mother loves flowers, she decides to send her an arrangement which costs $35 before tax. How many weeks will Shana need to save if tax is 8.25%? What will she have left over after she buys the flowers?

Math concepts:
Solving for an unknown, Algebra, Percentages and decimals

Solution
\[
\$35 + \$35 \times 0.0825 = 35 + 2.89 = 37.89
\]
\[
x \text{ must be a whole number}
\]
\[
10x > 37.89
\]
\[
x \geq 3.789
\]
\[
4(10) = \$40.00
\]
\[
x = 4 \text{ weeks} \Rightarrow \text{good labeling}
\]
\[
\$2.11 \text{ left over}
\]

My problem:
I wanted to buy a CD which cost $17.99. I had $19.50 in my purse. Could I afford the CD? If so, how much change would I get? If not, how much did I need extra? How would you estimate this in case the CD didn't exist? (I did not think of this one). What if I made it with $3 to spare? How would you show where you got this number?
Game Board Mockup

MAD ABOUT MY MATH