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Technology Review and Redesign
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      I looked at the iPhone app *Sushi Monster* by Scholastic. *Sushi Monster* is intended to teach addition and multiplication facts according to the *FASTT Math* learning framework. There are seven levels of addition challenges and five levels of multiplication challenges. Each level consists of several rounds. The game displays a circular table with a hungry cartoon monster in the center. The monster wears a sign around its neck with a number on it. In each level, sushi plates with numbers on them are placed on the table. The player taps the plates to put them in front of the monster. If the plate numbers add (or multiply) to the monster's number, the monster eats them and a new number appears on the monster's sign to be solved with the remaining plates for the next round.


      Overall, I did not think this was a good game for teaching math. My biggest complaint concerns the game mechanic in which the player must solve for consecutive sums or products using one large batch of plates. This system can create a situation wherein the player feeds the monster an entirely correct batch of numbers, but be penalized because they used a number they were going to need later for a different sum or product. For example, if my sushi numbers in addition mode were 6, 2, 8, and 1, and the monster's number were 8, I could feed it 6 and 2. But if the monster's next number is 7, I no longer have the 6 to add to the 1, so I cannot solve the 7. The "correct" thing to do was to use the 8 on the first number, but this requires planning ahead. I do not think that the game designers actually intended this to be a game about mentally planning ahead. This is a much more cognitively demanding task than the rest of the game, and the upcoming numbers are shown on an insignificant area of the screen. I cannot imagine a real-world situation wherein a person might need to "save" numbers like that. Worst of all, I worry that this mechanic might teach children that there are "right" and "wrong" ways to add up to 8, to use the number from my example.

      This game also has the "chocolate-covered broccoli" problem, whereby a fun façade masks a tedious task. The narrative does not make sense. The sign on the monster does not mean anything in the game world. It's not an indicator of how "hungry" the monster is, because if that were the case, it wouldn't matter in what order the player fed it the sushi. The numbers on the sushi don't mean anything either, and don't reflect the amount of sushi on the plate or anything tangible. The

whole "match the sign number to feed the monster" conceit is a totally arbitrary justification for doing these exercises.

As far as creative presentation, I don't think *Sushi Monster* has many issues. All of the characters are cartoon monsters, so the game somewhat sidesteps diversity questions by not presenting any raced or gendered characters. The game uses a Japanese restaurant aesthetic, but does not indulge in any Japanese stereotypes, as far as I can tell with my knowledge of that culture. The monsters are all mean-looking in a cartoonish way—clearly meant to be "scary" but not actually threatening or disturbing. The art and animations are well done, and the player is rewarded with success by a funny animation of the monster gobbling down the sushi.

I think *Sushi Monster* may emphasize its game elements to the point of detracting from good teaching. As I mentioned above, the upcoming numbers important for strategizing are confined to a small corner of the screen. These numbers are smaller than the score and the game clock, which are both far less important in terms of content, but are the things I'd expect to be large in a non-educational video game. (This may be less of a problem on an iPad.) The app's approach to assessment and reward also feels very video-gamey. When the player gets an answer wrong, whether due to math mistakes or input error, they do not have any opportunities to try again, which may not be the wisest design choice for encouraging reflection on these errors. Each level ends with a rating (one to three stars) and a high score comparison. The player can also get "trophies" for accomplishing in-game feats (complete all addition levels, complete all multiplication levels, and earn 30 stars). Perhaps these mechanics encourage some learners to play, but I can also imagine them discouraging some learners with a low rating, or having players lose their interest after unlocking all rewards. I played every level of *Sushi Monster*, earning all three trophies, and (as a long time video gamer) I feel like I "finished" it. Some learners may not return to games they feel they "finished."
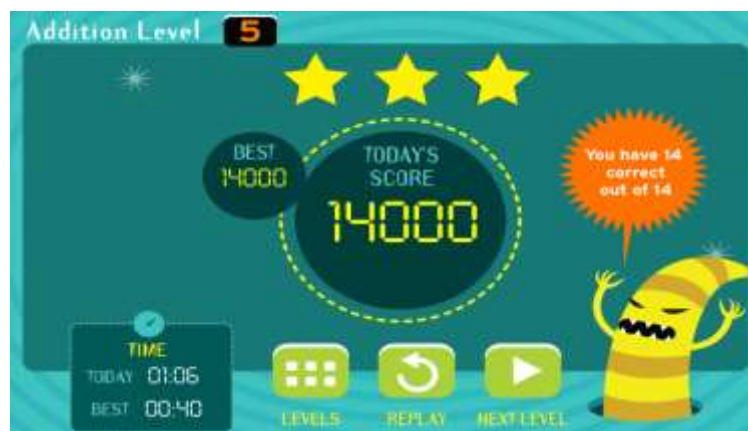
If I redesigned *Sushi Monster*, I would adjust the narrative and gameplay to fix the planning problem and the "chocolate-covered broccoli problem," which I think are big issues. In my version, over the course of one level the player would feed a series of hungry monsters, not just one. Each monster's number would represent the amount of sushi it wanted to eat. The size of the sushi plates would scale with their number, and in multiplication mode, some of the numbers would be serving-multipliers ("3 plates," "50 plates") instead of sushi. With this reimagining, the monster's number would represent how hungry it was, and the player's number would represent an amount of sushi, so the task would actually make sense. The monster wants some amount of sushi, and it is your

job to feed it that amount. My second major change would be that the plates would not carry over from monster to monster, so the ordering problem would disappear. The player would be able to provide any correct combination of plates possible to satisfy the current monster, without worrying about the subsequent monsters' numbers.

To discourage players from "finishing" the game, I'd eliminate the "levels" system and present the game as essentially "endless," adjusting the difficulty depending on performance without ever having the learner reach a "last level." I might leave the stars in for an extrinsic reward, but would present them as a cumulative score to build up forever as a sign of growth, not as a discrete "You got two stars on level 3" system, which may discourage some weaker users.