

GeoGame: An Online Geography Game for Learning about the Green Revolution

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Abstract: Instruction in geography on the “Green Revolution” at The Ohio State University was supplemented by the *Green Revolution GeoGame* in effort to improve student understanding of the challenges and technologies of farming in developing countries. Students played through seven turns, each representing a growing season, acting out the actions of their families, including buying plots of land, planting different kinds of seeds, and choosing irrigation levels. Our results so far suggest the *Green Revolution GeoGame* gives students a better understanding of how challenging farming in developing countries can be.

The Green Revolution

Between the 1940s and late 1970s, the Green Revolution stimulated increased agricultural production in many countries. This movement, led by the “Father of the Green Revolution”, Norman Borlaug, applied new technologies and research to agriculture. Some main innovations that drove the Green Revolution were the development of high-yield seeds and the improvement of irrigation systems (e.g., Evenson & Gollin, 2003).

Green Revolution GeoGame

A computer-based game was designed to supplement classroom instruction on the Green Revolution in an undergraduate General Education course on World Regional Geography. The game is integrated into the classroom as a homework assignment. After the signup process, students choose a family and use their starting funds to buy digital plots of land of varying size in India. Students play through several turns over the course of as many days, with each turn representing a growing season. Each turn, students can variably irrigate their plots; buy, sell, and plant both land race and high yield seeds; sell excess grain for profit; and buy more parcels of land. Once the student made all necessary decisions, the turn progresses and random variables such as weather and pests come into play. Family members must be fed each turn and students may purchase extra labor if necessary.

Learning Goals

The goal of the *Green Revolution GeoGame* is to give students a better understanding about the challenges of farming in developing countries. For example, students should understand the agricultural benefits gained through the introduction of high-yield seed and better irrigation, and at the same time appreciate the challenges that a farmer may face at the individual household level. During game play a built-in assessment module would ask students to respond to various prompts to gauge their understanding of the concepts presented. Most questions were given between rounds, and some were given as prompts in response to certain actions. Some example questions were:

- In your opinion, which kind of seed is better to plant, high-yield or land race? Briefly explain why.
- Farming in developing countries is hard work, but farmers can still have some measure of success. Agree or disagree?
- In your opinion, which is the most important item to spend money on, irrigation, fertilizer or high-yield seed (or some combination)? Briefly explain why.
- Did your definition or expectations of success for this game change during the course of the game? Briefly explain.

As some questions were prompted only in response to specific user actions, not all students answered all questions each round.

Results

Development of the *Green Revolution GeoGame* is still underway and only preliminary user testing results from the first development iterations are available at this point. In one semester 152 students played the game in one turn per day over the period of a week. Of these, 100 completed a voluntary survey about the game.

After playing through the seventh turn, students were asked if their definition of “success” for farming in developing countries had changed over the course of game play. Most students (55/100) stated that they did not change their definition, often maintaining their initial conservative and optimistic views for farming in the developing world. However, most students reported that they did change their definition of success. Notably, 26/100 students began the game with a business-like definition of profit and expansion, but left attempting only to provide for and maintain their own digital family. Others changed their expectations after a pest attack or a bad yield. Example responses were:

“Yes. First I wanted to make money. Then I changed to just keeping them all alive.”

“Yes. Initially I hope I would earn much money and born children. However, I can only meet the basic demand of my people now, and do not have enough saving for bad years. [sic]”

“Yes because I wasn’t expecting some of the wild cards and [that threw] off my projections”

“Yes right in the very beginning my expectations for success went down after I was hit with a pest attack.”

Many other students who changed their definitions did so by reporting a technical change in their specific expectations and strategy of planting and spending. Only a small fraction (2/100) of students shifted their views in the opposite direction—from survival to profit. Use of the game in subsequent terms produced similar results.

A key factor of the Green Revolution is the use of enhanced high-yield seed instead of the native land race seed. After seven rounds of game play, students were asked which type of seed, high-yield or land race, they thought was a better option for planting. Approximately 60% of students favored the high-yield seed and about 40% preferred the land race. The split opinions here serve as a good starting point for de-briefing in class after playing the game since the Green Revolution has provided both negative and positive outcomes for farmers. Despite the relative balance of seed preference, reasoning for these choices were diverse. Some example responses are shown below.

“I think high yield is better because it’s faster.”

“High yield seed is better because you can produce more in a smaller acreage.”

“High yield because if you irrigate it you will get a better yield.”

“Land-race. It is cheaper and more consistent.”

“Land race seed because it is better equipped to deal with the weather.”

“Land race because of its diversity.”

Conclusions and Future Direction

The *Green Revolution GeoGame* is a work in progress and results are still preliminary, but promising. Many students left the game with a better appreciation of the difficulties involved in the life of these farmers, and some of the strategies needed to be successful. We believe any success achieved by the game is due to the active learning environment provided by game play.

Future improvements to the *Green Revolution GeoGame* may include the addition of additional variables. Some examples include adding new regions to help students make connections between regions; adding more different social circles and types of farmers to more accurately reflect the local social landscape; or adding geographical variables such as access to water and its dependence on the lay of the land and proximity to sources. In addition to studying how added game complexity effects learning, the intent of added variables will be to make the challenges of game play reflect the actual challenges of farming in a developing country as closely as possible.

References

Evenson, R. E., & D. Gollin. (2003). Assessing the Impact of the Green Revolution, 1960 to 2000. *Science*, 300(5620), 758–762.

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