GAME REPORT

SHIFTING SANDS DEVELOPMENT MATRIX GAME

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INTRODUCTION

Assiniboine College's Russ Edwards School of Agriculture and Environment hosts a matrix game as part of the Environmental Legislation second-year course in the Land and Water Management diploma program. The Land and Water Management program prepares students to enter careers focusing on environmental monitoring and stewardship.

Matrix games provide a forum for exploring competing interests between multiple players in an evolving narrative that emerges from structured discussion among the players. These games balance the ability for players to take any reasonable action, even those not foreseen by the game developer, with a simple adjudication system. They are used in higher education, government, and industry as an educational and planning tool.

For the Environmental Legislation course, the Shifting Sands matrix game provides an interactive opportunity for students to evaluate the environmental, social, economic, and community impacts of development in the context of an extraction project. The proposed project presents opportunities to support electrification at a global scale but with potential negative impacts to local groundwater used by local rural and Indigenous communities. Students play the role of local stakeholders as the proposal advances through the regulatory framework, requiring them to apply program and course learning outcomes around sustainability, decision-making, and legislative and regulatory frameworks.

MORE INFORMATION

More information about the Land and Water Management program can be found at **assiniboine.net/landandwater**

The authors welcome your questions and comments by email at **hoodj@assiniboine.net** and **huntc3@assiniboine.net**

GAME DESIGN

Set at a regional level centred on a rural municipality, Shifting Sands puts the players in the role of individual stakeholders as part of an in-person matrix game. The Edwards School has run this game twice. The first iteration featured the roles of a rural municipality councillor, a local business owner, and a local environmentalist. The second iteration added a local First Nations knowledge keeper role which was developed in consultation with the Director of Indigenous Education at Assiniboine College.

Players act by proposing an action they wish to take and the effect that it would have if it were successful. The player indicates reasons why it would succeed, while other players identify reasons why it may fail. Facilitators judge the validity of these arguments. Reasons for and against are evaluated and expressed as a modifier applied to a dice roll of two six-sided dice added together. Success is achieved with a net result of seven or higher.

The students in an Environmental Legislation course were divided equally into teams of players, with each team of 3-4 collaboratively assuming the role of one of the stakeholders. Each team was allowed to make one structured argument per turn. The design team selected individual stakeholders, instead of institutions, to increase player freedom to set their own direction, to foster feelings of responsibility for decision-making, and emphasize local, community impact. This also lessened the learning curve for the second-year college student player audience.

In addition to background reading on the scenario, players received a qualitative briefing on all player roles including background information and likely interests. However, players only received specific success condition criteria, including quantitative goals, for their own role. This provided some indicators which might imply other players' objectives, but this limited knowledge introduced uncertainty and unpredictability into possible cooperation between player roles.

Players had access to two types of quantitative resources in the game. The first type tracked influence with a variety of broader stakeholder groups including political, business, and community groups at the local, provincial, and federal level. The second type included money tokens, representing an abstract amount of wealth, and time tokens, indicating the amount of time available to each role outside of their regular responsibilities. These resources could be spent either to allow a particular action or as a bonus to dice rolls.

In addition, a publicly visible tracker indicated the relative health of social, economic, and environmental factors. Each factor began at a middle value and could be increased or decreased through play, either directly as an intended effect or as an unintended effect determined by the facilitators. When the trackers were at high levels, for example indicating high environmental quality, all players enjoyed bonuses to actions, while at lower levels, all players received penalties including a game loss for all players should any factor reach a particularly low level. The level of each factor was visible to players, but the game effects were not disclosed in advance of these effects being triggered.

Facilitators adjudicated project approval at the end of the game by tracking the approval probability as percentage on a hidden tracker called the Approve-o-Meter (AoM). The AoM was the probability, expressed as a percentage, that the project would be approved at the end of the game. Players could not see the AoM but could get information about it through an in-game action, such as knowing the tens digit of the current probability. Facilitators adjusted the AoM based on player actions and as a result of facilitator-judged unintended consequences for actions and other game effects. Facilitators provided a qualitative description of the change on the AoM. For example, the publication of the report detailing the negative effects on groundwater would significantly reduce the AoM.

The Matrix Game Construction Kit was used for tactile game components such as tokens and counters, while a satellite image overlaid with boxed area graphics represented an abstraction of the region. More information about the Matrix Game Construction Kit may be found at **thegamecrafter.com/designers/magck**

GAME CONDUCT

The Edwards School has conducted two iterations of Shifting Sands as an in-person, one day event over 4-5 hours. Second-year Environmental Legislation students played the game as a culminating course exercise. Students were not assessed on gameplay but were required to complete a post-game reflection for course credit. The course instructor, James Hood, led the game design process and was lead facilitator, leveraging subject matter expertise and prioritizing program and course learning outcomes with support from fellow instructor Patricia Malcolm. Christopher Hunt of the Peters School of Business assisted with game mechanics development and interpretation of the results of player actions and arguments.

The first iteration of the game saw four turns completed with three stakeholder roles in play. Students were highly motivated to play and fully engaged in the game. They applied their course knowledge effectively and gained an appreciation of the varied local impacts of projects such as these to the environment, community, and economy. Students were strongly competitive and, because of a lack of a mechanic requiring players to have resources available at the end of the game, students played aggressively to achieve short-term results while ignoring the long-term consequences of such decisions. One player in particular deployed a "scorched earth" strategy which had a strong impact on the overall scenario. This was addressed in the second game.

The second iteration of the game included a fourth role, a local First Nations knowledge keeper, and finished in turn three. Each role had both short- and long-term objectives in this iteration, resulting in players considering the longer-term impacts of decisions beyond the conclusion of the game. This game saw more consultation and cooperation. Teams were slightly larger than the first iteration, allowing more robust internal discussion on strategy as well as more capacity for team-to-team negotiation.

Long-term consequences were strongly emphasized not only by individual long-term objectives, but also the inclusion of the First Nations knowledge keeper role, which brought forward a strongly long-term, generational perspective both in general outlook and in quantitative game objective terms. This long-term perspective from the knowledge keeper team shifted the discussion among other teams towards a similarly long-term direction, significantly changing what was an acceptable decision-space. Unexpectedly, the knowledge keeper player was able to secure resources to purchase a controlling interest in the project, allowing them to control the balance between employment opportunities and mitigation of negative environmental impacts.

INSIGHTS

As noted previously, the addition of long-term objectives, slightly larger teams, and the presence of the First Nations knowledge keeper role resulted in a marked difference in both player decisions and the metanarrative of the second game. Players met short-term objectives through aggressive competition in the first game in contrast to the more consultative approach used by teams in the second. The knowledge keeper's long-term perspective had a strong qualitative effect in shaping the metanarrative values of all players.

Students were very interested and engaged in the game, including students who previously had been less engaged in classroom discussions. While some students had early challenges understanding game mechanics, by the second turn students understood the game, which allowed them to focus on playing their role and gaining an applied perspective on evaluating the trade-offs inherent in development projects.

LESSONS LEARNED AND BEST PRACTICES

In both games, the first turn took a significant amount of time as students grappled with the concept of a matrix game both in terms of the free play available and how to translate actions into the weighted probabilities system. A practice turn could benefit students ahead of the full game. One option might include running the first turn in an earlier class as a demonstration and then resetting it for the full game. Another option used by one author in a different course is the use of a very short matrix game as an active learning activity in an earlier class using a different scenario.

The inclusion of quantitative objectives, including long-term objectives, aided in pulling player actions towards realistic gameplay and allowed both facilitators and players to more clearly understand the effects and consequences of player actions. These objectives included items like project approval or denial, holding a certain amount of resources at game end, and maintaining certain ratings on the environmental, social, and economic factors tracker. In the case of this game, these game mechanic goals aligned well with the qualitative, narrative goals and perspectives of each role.

While students received links to significant background information, few read much of those materials. Students primarily read their background and the general game information. Although a general best practice in matrix games is to assume players will read only a short 1-2-page background summary, as college students, it is expected of the players to do background reading. Students will be incentivized to do further background reading and preparation in future iterations.

The facilitation and design team engaged with experts in the development of roles outside of their areas of expertise. This was particularly relevant in developing the First Nations knowledge keeper role through engagement with Assiniboine College's Director of Indigenous Education. This is recommended even in areas where designers have some applicable background but may not have the lived experience or specific knowledge to a role. For example, while one of the authors has a background in political science and partisan politics, engagement with a former member of the legislative assembly (MLA) was planned while the team considered adding a fifth role of opposition MLA to the second game iteration.

Students were not assessed on their success in achieving their role's objectives in the game. Instead, they received course credit for a written reflection after the game. This reflection required students to describe how the game connects to course learning outcomes with a particular focus on the interests and perspectives of their assigned stakeholder. While assigning marks for engagement may be appropriate, students should be able to achieve high marks despite not achieving in-game objectives in order to prevent grade pressure from encouraging highly gamist, unrealistic play which would detract from learning objectives.

FUTURE ITERATIONS

For the next iteration, the course instructor plans to incentivize student background reading and preparation. This may take the form of assigning a role with character background and some objectives and requiring the students to do research and develop an additional objective. This could include consultation with experts with relevant experience, initially within the college community as a test case. Course credit may be attached to this activity.

The second iteration of the course considered an additional role of an opposition member of the legislative assembly, but was not included based on the number of students. The design intent for this role is to illuminate the political dimensions of these development project processes without injecting a role with an outsized level of influence on project approval.

Future iterations will introduce measures to manage time pressure, including placing time limits on deliberation each round as well as a way to expose students to matrix game arguments ahead of the full game. This may take the form of a practice first turn or unrelated mini-matrix game in an earlier class which would demonstrate the game concept and provide a low-stakes practice opportunity.