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"Global Goals" Coding Game

A riveting game-based challenge that will inspire your students to code their journey sustainable future!

Grades: 2-6 (flexible for k-8)

Overview:
This is a no-tech coding game that will help students understand the fundamentals of coding while learning about the United Nation's SDGs and how they can create positive change within their own community.

The is plenty of opportunity to extend this project to standards-based literacy, digital literacy, data science, and level up with robots and a variety technology applications.

Objective:
1. Each student (or pair) will choose and research a Sustainable Development Goal
2. Each student (or pair) will build a structure or space for their community that supports their chosen SDG (or is a barrier to a SDG – if they picked a card with an X on it)
3. Each team will create a community grid, populated with all structures that support the UN SDGs along with several "SDG Hazards", components of their community that go against the SDGs.
4. Students will build a character and code it to navigate the community, passing as many SDG structures as possible without encountering a hazard.

Time:
Estimated 2-3, 40-minute class periods.

Materials
1. Printouts. Cut out game cards, rules, and cover card. One set per team of 6-12 students.
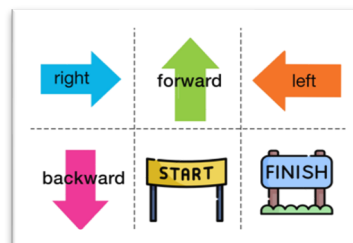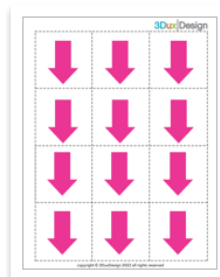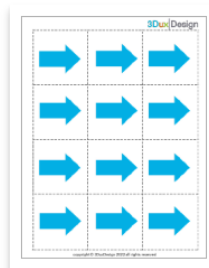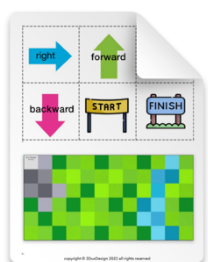
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2. One 3DuxDesign Bot Map (coming soon) or 72 – 6"x 6" paper squares which will make a 3x6' site plan. (6" Origami paper from amazon works great). Paper should be taped together. Expect 6-12 students per team/map.

3. 3duxdesign GOBOX kit (or assorted cardboard and card stock pieces and tape/glue)
4. Markers, paint, tape, scissors, assorted crafts for model making.
5. Optional add-ons:
    a. Led lights (Gobox pro kit)
    b. Robots – kai-bot (is the best), Edison is second choice, If using other bots, make sure the paper is the same unit distance that the robot is

Class 1

1. Discuss SDGs with group. Discuss project.
2. Divide into groups of 6-12 students (younger ages work better with fewer students per team).
3. Each student (or team of 2) should receive one map template and one set of direction cards to cut out and save. You can use a paper cutter to do this in advance or they can cut out 6 of each to start and cut out more as needed if time is an issue.

4. Each student should receive 1 or 2 goal cards and/or hazard card at random. For first game, consider a total of 8 SDGs and 1-2 hazards to keep it easier. Note that even with 2 hazard cards, depending on the grid layout, it is possible that not all goal cards will accessible. (This is a

good opportunity for student observation and analysis).

5. Each student/pair may research their assigned SDG and draft out an idea for a space/structure that represents that goal. They should have access to the paper or mat and be informed that their structures need to stay within that area of space. Students who receive a hazard card (with red X on it) will need to think of a component of their community that hinders the achievement that SDG. For example, goal number 6 (clean water) may be affected by a local oil rigger or landfill dumped into local water source.

6. Students will draft ideas for their structure/space.

- Extension: include a digital literacy component to the project with research
- Extension: add a scale/geometry element by having students calculate the surface are (and cost) of their structures. (Material costs/sq foot sheets available in tiny house challenge)
- Extension: create questionnaire and interview community members (live or remotely)
- Extension: collect data and use a digital technology to create a data bank
- Extension: write a report about the SDG will add a writing component to the project
- Extension: Use digital graphics app like Canva or Adobe Express or video technology and create an advertisement/commercial (design thinking also involved in this extension)

Class 2:
1. Each student (or pair) should create a structure corresponding to their SDG card based on their design from last class.
2. The structure must stay within their allowed area. Notify students that the characters won't need to travel through the structure/space to "collect" a SDG card, they can merely pass along the perimeter of structure during the game to collect that SDG. But, it students design their space in a way that allows a character to pass through, (doors or paths with their allotted space), then a character may travel directly on top of that space. (Students will likely discover that this will actually improve the likelihood of success when playing the game).
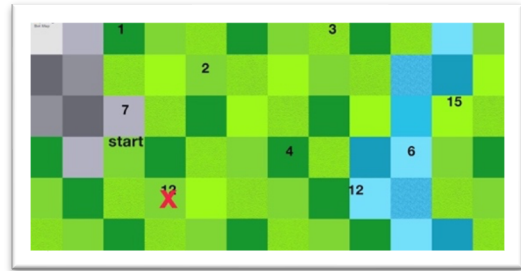3. Each structure should be labelled with the corresponding SDG card.

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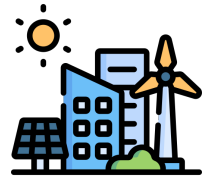
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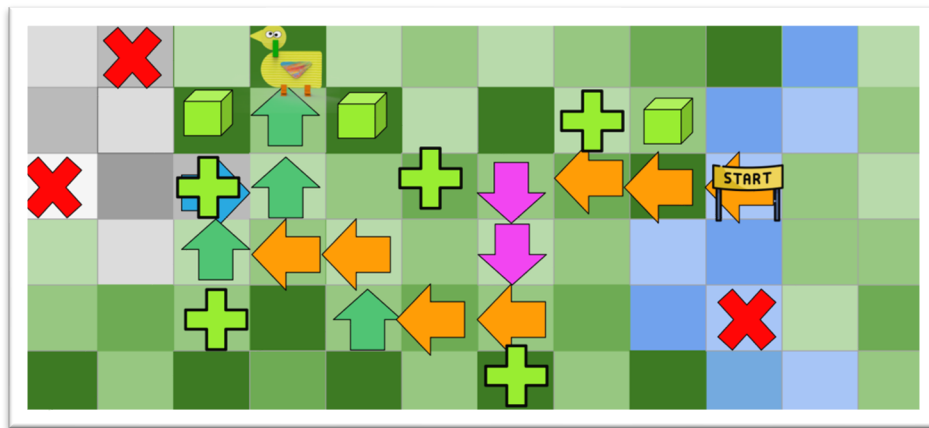
4. As a group, students will place structures randomly on the grid to set up their community.
5. Each student (or pair) will make a character piece that can walk through the community.
6. Practice and Play time!
   a. While the team is sitting around the community grid, each student (or pair) will create a replica of the site plan from their own perspective (4 unique perspectives based on where they are sitting). Use the printed map as the template and label with corresponding structures labelled by SDG number, an X or any code they wish to create (along with a legend). For a digital option, copy this google drawing template for each student. On the template, the green plus represents a SDG space that can be traveled through. A green cube represents an SDG space that can only be passed. https://docs.google.com/drawings/d/10ScahrX2BNMvHhvEagLB0tfWDm9EOALmNO9UUuTz3Po/edit?usp=sharing

   b. Students will use their template to mentally map out their journey to pass (and collect) as many SDGs as they can in 24 moves. They must avoid passing any hazards. They may start and end anywhere they like. It is important for students to understand that they can collect an SDG card if they bypass any of the 4 sides surrounding the structure (the perimeter) OR they can actually *enter* the space. (This is only possible if the structure has doors, is elevated, or has a

pathway). If the grid is set up such that the game is too easy, they player (or pair) that collects all SDG cards in the fewest moves will win. If the game is impossible to complete, students need to consider why that is and move things around.

    c. Students (or pairs) should make multiple attempts, coding their character's journey to collect as many SDG cards as possible. They should be aware that they will need to keep track of their best pathway for reproducing in the final challenge.

7. The final challenge!
   a. Teams should each share how many cards they would have collected in their best attempt.
   b. Top 2-3 teams will be asked to place out their code in front of them for the group to see and their character/code will be put to the test, with the group counting SDGs passed and collected along the way.

- Extension: Students may create promotional add, inviting community members to visit their space. Technology can include Canva, PowerPoint, video WeVideo, iMovie, stop motion, green screen, Chaterpix, flip etc.
- Extension: Project analysis and deeper computational thinking. Questions to ask:
  - Have you come up with tricks to shorten the trick?
  - If you were to redesign your own structure to improve access, what would you do? (Answers may include moving it to a more accessible location, adding a pathway like open doors on all sides, raised structure etc.)
  - How might you improve the grid layout? (4-6 CT3)? Are there general trends in the layout you noted that would make for more efficient travel? (For example, grouping of structures so characters pass more things at a time. Students may suggest designing multifunctional buildings to get multiple goals from one space
- Extension: Game Design – Have students consider an adapted game. Perhaps they can come up with a 3d version of the game. Alternatively, students can create a "fun facts" quiz so that at every SDG, players need to answer the questions correctly to "collect" that SDG card. Ask students, "How would you design it? Can you create new instructions/rules? Can you add conditional if/then rules?"