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| Table 2: Computational Thinking Involved in Epidemic Modeling. | |
| Decomposition | Students think of the stages of COVID-19 people go through and eventually break down a population into four groups: susceptible, exposed, infectious, and recovered. The SEIR model is used to summarize these people and their relationships. |
| Generalization |
| Abstraction | Students discuss the agents, agents’ properties and behaviors, environment characteristics in the simulation. Eventually, they decide:   * Agents’ background, such as age, gender, occupation, health history, etc., are uniform, * Agents’ mobilities are uniform. * The infectious symptomatic people do not infect other people as they are isolated at home or in hospital over the disease period. * The recovered people are immune to the disease. * The environmental factors, such as seasons, temperatures, etc., are uniform.   They also decide to   * Use humans as the agents\* * Color code the four types of people in an epidemic * Define the agent behaviors and interactions as below:   + All human agents may move around.   + The carriers infect the susceptible.   + All carriers eventually become infectious.   + The infectious will stay at home or in hospitals.   + The infectious may die or recover.   *\*Agents are defined differently in epidemiology and computer modeling. Pathogens are referred to as “agents” in epidemiology. In agent-based computer modeling, agents are the objects interacting with each other in a simulation. In this simulation, the agents are humans.* |
| Algorithms | Students come up with a step-by-step scenario:   1. A carrier comes into a community where all people are susceptible. 2. During the defined incubation period, the carrier contacts the susceptible people and may infect some of them at a transmission rate. 3. Carriers become sick (infectious) after the incubation period and then stay at home or in hospitals. 4. The infectious recover or die at the mortality rate after the disease period. |