CS416 Narrative Visualization Project: Global Population Growth Trends from 1999 to 2000

**Messaging.**

The global birth and death rates have decreased in the past twenty-two years. However, the birth rate drops significantly faster than the death rate, so the differences between these measures are falling, reflecting a decreasing trend in global population growth. These phenomena could have positive or negative relationships with several factors across multiple development domains like economy, health, and education.

**Narrative Structure.**

My Narrative visualization is designed to follow the martini glass. There are three scenes in the visualization: the first two are author-driven, as I limit the measures that readers can explore, while the third scene is reader-driven, in which I give the maximum capability to explore relationships between different indicators.

In the first two scenes, I am conveying my discovery and highlighting my focus to the audience: the birth rate is decreasing significantly worldwide, and the differences between the global birth rate and the death rate are decreasing at a noticeable speed. Readers are guided to read through my writing piece and annotations and follow my logic to view the dataset. These scenes may lead readers to many thoughts and doubts.

In contrast, in the third scene, readers can play with different measures and navigate relationships between pairs of them. In this scene, readers can ask their own questions, for example, “Does the birth rate and GDP annual growth rate have a positive relationship?” or “In which country the difference between the birth and death rate is the largest?” Readers can filter with measurements that they are interested in and choose their personal path of further exploration.

**Visual Structure.**

First, all three scenes follow the same design template. The template divides the window (or body of the .html file) into three boards. There is one board on the top, which is reserved for the title, article (background introduction and theme of this narrative visualization), and general instructions. The other two boards lay below the first board and parallel to the other. The one on the left-hand includes the highlight point of the scene, the required knowledge to understand the data (for example: “the formula to calculate the birth rate”), and my understanding as well as triggers to switch between scenes. The one on the right hand is the chart that can support my judgment with emphasis annotations.

Overall, the top board stays relatively the same across three scenes, while the content of the other two boards changes, but the position of these boards remains the same at all times, on which one focuses on writing and the other catches readers’ eyes with graphics. With this uniform-designed task of three boards, readers will not panic about a massive change across scenes and

overwhelming tremendous new information. Still, they can devote their attention to selected and significant changes. The little-changed board that holds the key message that I hope to convey to readers can continuously remind readers of the main theme of this narrative visualization and my intention.

Second, the chart of the first two scenes has the same legend on the x and y-axis. All initial charts have “year” (or timeline) on the x-axis and values (in percentage) on the y-axis. These unchanged legends can reduce the likelihood that readers cannot follow my path of thinking. Besides, the same indicators remain the same color across different scenes, and these colors are very different from each other, so people who are not sensitive to colors can also quickly tell which measurement they are looking for. Furthermore, there are charts annotations that help readers follow my thoughts or navigate their path.

Third, the triggers are put in the same position on different scenes so users can find them easily, and they are designed meaningfully large so readers can click on them conveniently. Besides, though the narrative structure is a martini glass, there are four buttons designed so that users can choose freely whether they want to navigate in order or to look back or jump to a specific scene. These designs promote the convenience and clarity of navigation.

**Scenes.**

The first scene emphasizes the decreasing trend of the global birth rate. The writing board explained the definition of the global birth rate and highlighted the trend I discovered. The line chart has “year” on the x-axis and “birth rate” in percentage on the y-axis so that how the global birth rate changed over the past twenty-two years is exhibited clearly.

The second scene emphasizes the decreasing trend between global birth and death rates. The writing board explained the definition of the global death rate and highlighted the trend I discovered. The line chart has “year” on the x-axis and both “birth rate” and “death rate” in percentage on the y-axis, and the difference between these two is highlighted as an annotation on the chart so that how the global birth rate, global death rate, and the difference between these two changed over the past twenty-two years is described meaningfully and efficiently.

The third scene is more like a playbook. Readers can select two indicators they are interested in and place them on the x and y-axis as scatter plots so they can intuitively sense how these pairs of measurements changed over time and thus make their own judgment on their personal questions.

Scenes are ordered relatively linear by bringing more and more indicators to readers: the first scene has two indicators only (“year” and “birth rate”), the second scene adds one more (“death rate”), then the third scene contains multiple measurements that readers can play with. This design has several benefits. First, readers won’t be overwhelmed at the beginning, and the information comes to mind from the order of most important to “not the emphasis but may valuable for further exploration.” Thus readers swipe in gently. Second, as mentioned above, though readers are guided linearly in order, they can look back or jump to a specific scene they

are interested in. This gives readers more freedom and makes navigation more convenient and personalized.

**Annotations.**

First, the tooltip is followed. The tooltips are always meaningful since they can provide detailed information on demand (when readers click). For example, when readers move the mouse over a point, they can see the exact number of the "birth rate." Second, "Responsive with Types and Hover" from the "d3-annotation" [1] is applied because it is helpful when I want to highlight a specific point I noticed on the chart. Third, plain text (or short article) is used. These writings can express my findings and give hints to readers of emphasis. Annotations changed across scenes because I want to highlight different points on charts.

**Parameters.**

First scene: birth rate; year; country

Second scene: birth rate; death rate; year; country

Third scene: birth rate; death rate; year; country (including all/global); annual GDP growth rate; government expenditure on education (% of GDP); Urban population (% of total population); secondary school enrollment (% of total population)

The first two scenes have one state only. The third scene has tons of states; each state is composed of or defined by a country and two measurements (from the above list included in the third scene).

**Triggers.**

Buttons are one of the most intuitive methods to change scenes. The shape is relatively large so that readers can find it easily. Notes are given so readers are informed with text on how to use buttons.

Selection menus are given to users to change the state of the current scene. The shape and text are provided as well to readers to inform them of the possibility and method to interact with the web page.

**Citations.**

[1] annotation library: https://d3-annotation.susielu.com

[2] data source: https://data.worldbank.org