Appendix

Figure 1: Storyboard of the proposed game.
To design the game, we used several references for building the gameplay, developing the engagement loop, and for budgeting.

The career game has three playable occupations which involve performing occupation-relevant tasks: web developer (selected because web development combines technical and creative competencies), game developer (selected because game development fosters positive attitudes towards computing), and data scientist (selected because data science is increasingly crucial in today's society).

Figure 3: Core engagement loop.

At the beginning of the game, the player has just started an internship at a computing company. The player can walk around the virtual office, which has assigned areas for each occupation type (departments). See Figure 2.

The player can interact with employees whom will provide one-line responses. These responses will be career text.

“Welcome to Tech-co, I’m sure you’ll fit in just fine around here... And if you don’t, well, you’ll be fired! Ha ha... Only joking. You’ll get used to my sense of humour. Now let me show you around...”

Figure 2: The office environment.
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Figure 1: The office environment.

Figure 3: Core engagement loop.

Each module is re-playable. See Table 1 for the primary learning objectives of each occupation. The player

Figure 4: Interactive coding screen.
in the communal area, there is a laptop that has the company job board on. The Player can access this to view a summary of the Career paths and other information, typical of a job seeker: For example, job titles, duties, salary, location. A list of actual companies that hire in that domain.

NOTE: The Job Board will also be a module given by the Manager to complete from time to time (to guide them to the computer). Job Board information will form part of the questions in the quiz tests for the module.

- The Player selects the TAB for the Career Path.
- On a career path page, they can see a ‘low’/‘med’/’high’ broad range for that path. Click TAB for a broken down list of types of tasks they will learn, in order, and connected to their career level.
- The screen also has Job-Academic examples. Click on an advert to expand the lower half of the screen to view. These are real-world adverts, but it is not dynamic.
- NOTE: While on the Job Board computer, the Mouse pointer is active too. Click BACK to exit.

Figure 5: Job board.
Table 1: Main Topics and Learning Objectives.

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Topics Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Scientist</td>
<td>Python; Pandas; Data Visualization; Statistics; Hypothesis Testing; Machine Learning; Supervised Learning, Unsupervised Learning</td>
</tr>
<tr>
<td>Fundamentals of Python, Pandas, Data Visualization, Statistical Analysis, and Machine Learning Algorithms</td>
<td></td>
</tr>
<tr>
<td>Web Developer</td>
<td>HTML; CSS; JavaScript</td>
</tr>
<tr>
<td>Fundamentals of HTML, JavaScript, and CSS</td>
<td></td>
</tr>
<tr>
<td>Game Developer</td>
<td>JavaScript; Phaser</td>
</tr>
<tr>
<td>Fundamentals of Game Programming, JavaScript, and Phaser</td>
<td></td>
</tr>
</tbody>
</table>

Overall Progress is shown on a progress bar (without values) per career track. Since more tasks may be added over time (and you don’t want a player to think they have gone backwards).

Figure 6: Weekly report card.

The categories can be further explained to pull the relevant ‘Manager’s Feedback’ across 3 disciplines:
1. Programming (the best Web, Data or Game score, range A, B OR C)
2. Socializing (the best Social Time talking A, B OR C)
3. Overall Grade (Use Grade A, B, C, D OR E)
E.g.:
1. You have a good aptitude for web-based programming.
2. Perhaps spend a little more time practicing with your co-workers.
3. Keep up the good work!
Proposed Research Plan

The proposed research plan consists of two phases. In phase one, we will develop the career game using an iterative approach to facilitate early throw-away prototypes. In phase two, we will conduct two studies. The first study (Study A) will focus on the effects of design decisions in the career game. The second study (Study B) will focus on the effects of playing the career game. The career game will be made open-source on GitHub, guidelines in the form of a project report will be posted on a public website, and two research-informed videos will be shared on social media. See Figure 12 for a timeline.

Phase 1: Game Development

Phase 1 will focus on the development of the career game itself. In designing the career game, we were careful to align the game with our theoretical framework. See Figure 13. The game itself will be developed using a spiral HCI approach by repeatedly implementing, evaluating, and (re-)designing increasingly complex prototypes. Iterations will be evaluated by university students recruited locally. These iterations will focus on usability, learnability, and enjoyment. Because careers rapidly change over time, one goal of the career game is extensibility. Thus, career paths, modules, and NPC dialogue will be represented as JSON to facilitate additions.

Phase 2A: Experimentation: Game Design Choices in the Career Game

RQ1. How do different game design decisions in the career game influence career exploration and game experience outcomes?

Intervention: This study examines game design decisions’ influence on career exploration and game experience outcomes. The goal is to study the following six game design mechanics:

1. Job-Info: The presence (vs. absence) of real-world job and career information integrated into the core gameplay. This is operationalized as an in-game job board. Real-world job information can help foster more accurate outcome expectations and allow for increased career exploration.

2. Multiple-Jobs: The presence (vs. absence) of the three job types (Web Development, Data Science, Game Development). In the absence condition, one of the three job types is randomly selected at the start of the game. The player will only have access to tasks in the randomly selected job type. The game design will be adapted. Having multiple job choices in the game can enhance autonomy and lead to increased exploration of different occupations.

3. Flat-Difficulty: The presence (vs. absence) of tasks that have a flat difficulty curve (are all easy). Flow theory posits that activities should provide a continuously optimal (intermediate) level of difficulty for the learner. However, recent work has shown that easy difficulty levels in educational games can be