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Virtual Interview Training: Perceptions and Performance using Digital Hiring Managers

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Abstract

Interviewing for a job can be an intimidating experience for students and recent graduates. Many individuals may feel unprepared for their first interview and uncertain about what they could be asked. Having confidence and strong interview skills is very important for professional development and career attainment. In this work, we describe a web-based platform designed to provide experiential learning and interview practice for job seekers. The system, called Virtual Interview (VI)-Ready, offers an immersive role-play of interview scenarios with 3D virtual agents serving as hiring managers. We applied Bandura's concept of self-efficacy as we investigated: 1) overall impressions of the system; 2) the impact on students' job interview preparedness; and 3) how internal perceptions of interview performance may differ from external evaluations by hiring managers. In our study, we employed a convergent parallel mixed methods approach. Undergraduate and graduate students (n = 20) underwent virtual job interviews using the platform, each interacting with one of two different agents (10 were randomly assigned to each). Their interactions were video recorded. Participants then completed a survey to reflect on their performance, using the Marino Interview Assessment Scale (MIAS), and answered questions about their preparedness and the system. Later, hiring managers (n = 2) watched the videos of the interactions and rated the students' performance using the MIAS. We used Mann-Whitney U tests to compare the students' ratings to those of the external evaluators. We also utilized descriptive statistics to analyze the closed-ended questions and thematic analysis for the open-ended responses. Although there was no significant change in self-assessed performance relative to external evaluations in hiring scenarios, we observed the need to help students improve their introduction and closing in a job interview. Furthermore, 90% of students agreed or strongly agreed that the system enabled them to identify areas for improvement in their interview preparation. The results from this work could be valuable for educators and administrators looking to enhance their curriculum and integrate new technologies to improve the career trajectory of students. We also hope to raise awareness of the effectiveness of using virtual reality as a career training approach to help students combat anxiety and gain practice using low-pressure interactive scenarios.

1 Introduction

As of March 2023, roughly 5.8 million individuals were seeking employment in the United States [1]. Although the hiring process can be intimidating for all applicants, it can be especially daunting for those new to the job market. Nearly half (49%) of recent graduates reported that they avoided applying for entry-level positions because they felt underqualified [2]. Apart from a lack

of confidence, obtaining a job can be a lengthy, arduous, and competitive process. Finding a position can necessitate preparation (e.g., goal setting and completing resumes) [3] and typically involves undergoing one or more interviews for each role [4]. These interviews can be "high-stakes" evaluations that entail strategy and effort on the part of the job seeker [5]. In addition to responding to the questions asked, individuals must also consider how they present themselves and leave a positive impression. To help students put their best foot forward, higher education institutions must consider opportunities to enhance graduate employability and aid in professional development.

Multiple approaches may be taken to prepare students to enter the workforce, like offering resume workshops, job seminars, or mock interviews [6, 7]. Mock interviews are role-playing simulations of a job interview that can allow an individual to practice and hone their technique [8]. Gaining feedback from a mock interview can have several benefits. They can boost the participant's confidence, enhance interview skills, help students evaluate how well they respond to questions, and allow them to identify opportunities for improvement [6, 9, 10, 11].

In recognition of the value of mock interviews, we describe a web-based platform designed to give job seekers a similar experience in the comfort of their own homes. The system, called Virtual Interview (VI)-Ready, offers participants an immersive role-play of interview scenarios with conversational virtual human agents serving as hiring managers. It was created to provide students with the opportunity to gain experiential learning and practice.

Using this tool, we explored students' perceptions of the system as well as their impressions of their own performance relative to that of a hiring manager. We employed a convergent parallel mixed methods approach to the study. Bandura's framework of self-efficacy [12, 13] guided our investigation as we sought to answer the following research questions (RQs):

- **RQ1)** *How does VI-Ready affect job interview preparedness?*
- **RQ2)** *How do internal perceptions of interview performance differ from external evaluations by hiring managers?*
- **RQ3)** *How do users perceive VI-Ready, in terms of the questions asked and overall system?*

In this paper, we describe pertinent related work towards hiring practices and preparation in Section 2. In the section that follows, we further discuss the theoretical framework we utilized (Section 3). We delve into an overview of the system and our approach in Section 4. In Section 5, we elaborate on the procedure, participants, and quantitative and qualitative data collection and analysis. Afterwards, we present the results in Section 6 and discuss the implications of these findings in Section 7. We then describe some of the limitations of this work in Section 8 and finally present the overall conclusions in Section 9.

2 Related Work

There has been a significant amount of research on using technology to provide job interview preparation. For example, FreeSWITCH [14], a real-time, task-oriented dialog system framework, was created by Yu et al. to offer users job interview practice. Specifically, these scholars used FreeSWITCH to help non-native speakers develop English conversational skills. Towards this goal, they posed a hiring scenario in the context of a potential employee

interviewing for a pizza restaurant.

Similarly, Xiao et al. [15] created a prototype of an artificially intelligent chatbot to respond to user input. Their system was developed to empathetically respond to open-ended responses in interview scenarios using a combination of rule-based and data-driven models. Although their work did not include a usability assessment, they did describe the benefits of active listening in hiring scenarios.

Meanwhile, advancing virtual reality has been identified as one of the 14 grand challenges in engineering in the 21st century by the U.S. National Academy of Engineering [16]. Several efforts have been made to enhance job preparation using virtual reality, although the focus of each has been fairly different. Some scholars may focus on performance [17, 18, 19], whereas others center on the graphical fidelity of the agents [20], and others still have considered the agents' non-verbal behaviors [21, 17, 22, 23]. Additionally, scholars have applied non-verbal manipulations to convey agents' affect [24] in terms of their emotions, moods, and "personality." We review a subset of these to frame the necessity of our system and what makes it distinct from what already exists.

Burke et al. [25, 18] established a system with 3D virtual agents to provide interview training and confidence to the neurodivergent population. Their subscription-based service, called Virtual Interactive Training Agents (ViTA), could be run from any desktop or laptop. Pre- and post-test analyses illustrated that the system positively enhanced interview skills and self-efficacy [18]. Likewise, Kumazaki et al. [19] also examined performance for the neurodivergent using a group-based online job interview training program using a virtual robot (GOT).

Kwon et al. [20] created a system for students to practice interactions with a virtual interviewer at a virtual career fair. A major focus of this work was not performance but rather the graphical fidelity of virtual humans, ranging from real images to cartoon-like. They observed that more realistic versions elicited higher perceptions of presence but had less of an impact on anxiety than anticipated. They posited that this may be less about the realism of the agent itself and more likely linked to the situation.

When considering the non-verbal behaviors of an interviewer, Antonio Gomez Jauregui et al. [23] focused on establishing agents acting for employment interview practice with regard to posture. They used a seated agent, with its face blurred. Transitions and fidgets were the focus of their work to introduce a more natural interaction, gauging participant behaviors using a Kinect camera and force plate sensors. Their assessment illustrated that although participants may have initially perceived the human-virtual agent as more threatening before the interaction, afterwards they were less stressed in interactions with their agents relative to a real interviewer.

Meanwhile, Jones and Saburet [24] established TARDIS, a serious game using a virtual recruiter imbued with affect. They utilized a model to build a socially and emotionally realistic agent using multiple sensory devices for "Social Signal Interpretation" to respond to input collected about the emotions and attitudes of the participants. In their system, positive and negative attitudes (e.g., friendly), emotions (e.g., joy, distress, hope), moods (e.g., hostile, relaxed), and personality (e.g., agreeableness, neuroticism) were conveyed using a combination of adaptive changes to the agents' behavior and emotional expressions based on the data gathered.

Like several of the systems described, we used 3D virtual agents to provide interview practice. We did consider both the verbal and non-verbal aspects of the scenario, although we intentionally kept the questions generic to allow students to gain practice they might find applicable to multiple situations. A key distinction between the proposed system and others described is that VI-Ready is web-based. This is important since modes of delivery have been described as potentially limiting access and/or content to a select few [26]. Allowing users to access content through the internet rather than having to download the technology to a desktop or laptop can be more equitable, providing users with flexibility and reducing storage concerns. Furthermore, students' interactions were recorded in our system, giving participants the opportunity to revisit and reflect on how they did. In the work that follows, we elaborate further on the platform, describe our efforts to assess the system, and compare participants' self-assessed performance to that of external evaluation.

3 Theoretical Framework

In our investigation, Bandura's concept of self-efficacy [12, 27, 13, 28] was applied as the guiding framework. It was introduced to describe the influence of how individuals may think, feel, and act to "successfully execute the behavior required to produce the outcomes" [12, p. 193].
Self-efficacy beliefs can influence an individual's ability to accomplish or achieve an intended goal in a particular context. As illustrated in Figure 1, we considered the impact of different sources of influence on self-efficacy, leading to effort, actions, and ultimately outcomes — in the context of a job interview.

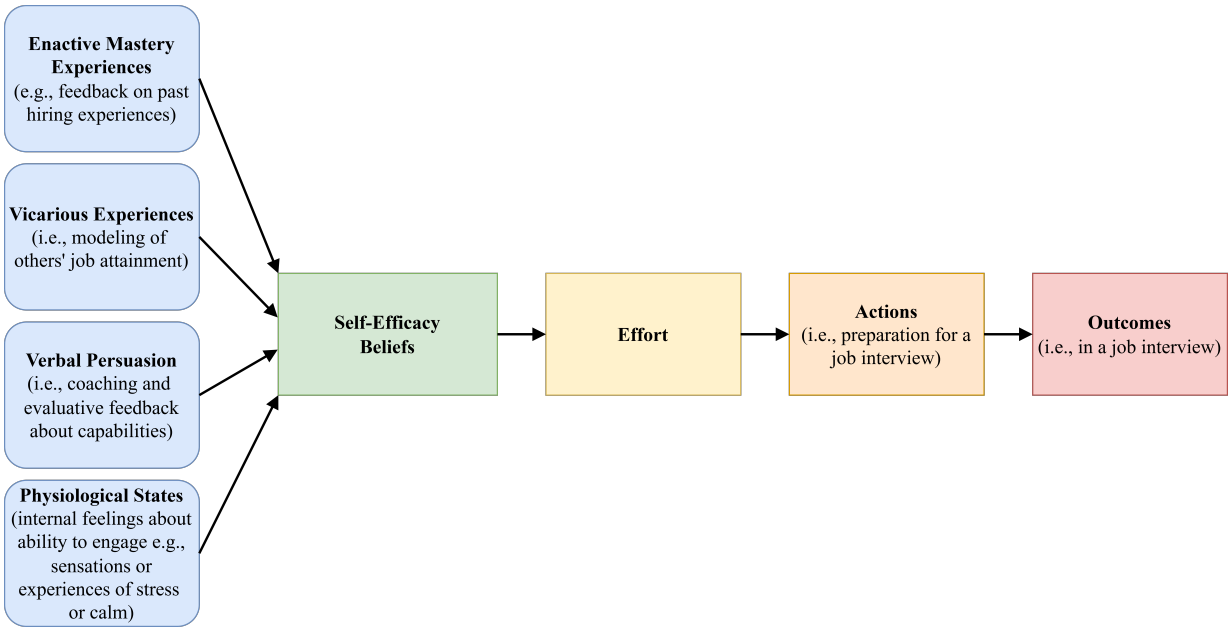

Figure 1: Bandura's Theory of self-efficacy, adapted from [28] and [29, pp. 317-323]

Studies have described that increased self-efficacy can enhance career-related behaviors and outcomes [30, 31]. In particular, its development has been shown to be valuable in the context of hiring, particularly for job seekers during interviews [32]. It is recommended that applicants use some combination of practice methods to further their own self-efficacy, such as using videos to

vicariously learn or employing role playing. Additionally, a prior study illustrated that anxiety can serve as a mediator for self-efficacy and that applications of techniques to reduce anxiety (such as providing positive feedback) can lead to more productive outcomes [33].

Given the relationship described between self-efficacy and job interviews in prior literature, we applied this framework to our research. We sought to explore how such beliefs might shape the effort impacting interviewing actions to yield outcomes arising from the hiring process. It shaped the framing of RQ2, our research design, and the interpretation of our results.

4 Our Approach

As mentioned, VI-Ready is an online interview simulation system that utilizes 3D avatars serving as hiring managers. VI-Ready was initially designed and developed by the Dan Marino Foundation to address the high rate of unemployment for persons with Autism Spectrum Disorder and other unique abilities. Later, it was adapted for general use by organizations to provide job and interview training to all job seekers (learners). The system works on any browser that supports 3D rendering.

Within the web-based system, organizations create accounts for their instructors, who in turn invite learners to set up their own accounts. Once created, the instructor can assign different types of interview conditions (i.e., hostile, neutral, or friendly) to the learner. VI-Ready interviews are constructed using a database of questions commonly asked in most job interviews (the scripts we employed are described further below).

Learners can practice the interview before submitting it to their instructor. To submit an interview, using their webcam, learners must record themselves answering the questions of the interviewer. The video recordings of interviews are sent using HTTPS to a secure cloud storage service.

The backend of VI-ready was developed with Elixir. Elixir is a dynamic functional language running on the Erlang virtual machine. Erlang is mostly applied in telecommunication systems as it is efficient in error containment and distributed computing. Elixir allows the backend of VI-Ready to be lightweight and fault-tolerant, which is advantageous for online systems. The frontend of VI-ready was developed using Clojure, a functional Lisp-like programming language. The system stores user information, logs of the interview, interview questions, and avatar information in a PostgreSQL database.

In our study, learners were randomly assigned one of two possible virtual hiring managers (Figure 2). Since we cannot make assumptions about the perceived gender of an agent, we refer to these two conditions as Hiring Manager A and Hiring Manager B. Both of these hiring managers were assigned employing the “friendly” condition in this study, a designation that impacted both the script applied and the non-verbal expressions of the agents.

Each of these hiring managers used a different script. The script employed by Hiring Manager A is presented in Table 1. We share the script for Hiring Manager B in Table 2. Although the general format of the questions are similar, the language is varied slightly between them. For example, Hiring Manager A asks “Soon we’ll get into some questions about the job, but before we do, why don’t you tell me about yourself?” Comparatively, Hiring Manager B asks, “Before I start asking you a bunch of questions, why don’t you tell me a little bit about yourself?”

(a) Hiring Manager A

(b) Hiring Manager B

Figure 2: Virtual agents used in the study

Table 1: Script for Hiring Manager A

Hiring Manager A
Thank you for coming in. How are you doing today?
1. Soon we'll get into some questions about the job, but before we do, why don't you tell me about yourself?
2. This job requires a lot of focus. You look like someone who's up to the challenge, but can you tell me of a job or a task you've done that required a lot of focus?
3. Are there any kinds of work situations in general you find difficult to handle? Dealing with customers? Taking inventory? Meeting Deadlines?
4. Maybe you haven't thought this far ahead, and that's okay, but have you set any career goals for yourself? If so, can you tell me about some of them?
5. Okay, so I'm curious, what for you is the most important thing you're looking for in a job?
6. Do you require any special accommodations to perform this job?
7. What kind of personal qualities do you think a good employee should have, for this or any job?
8. What hours are you available?
9. Is there anything else you want to tell me about yourself? Think of this as your time to brag.
10. Great. Any questions for me before I let you get outta here?
Well, it was great talking with you. I've got a few other candidates to talk to so I'll be in touch as soon as that process is over. Thanks again.

Table 2: Script for Hiring Manager B

Hiring Manager B
It's so nice to meet you. Thank you for coming in today.
1. Before I start asking you a bunch of questions, why don't you tell me a little bit about yourself?
2. Ok, let's get started. Do you consider yourself a team player?
3. I think you'd like it here, but I have to warn you, it can get a bit hectic. Do you have any experience working in a fast-paced environment?
4. I've made my fair share of mistakes in the past. But what's important is that we learn from them. Now can you think of a situation in your past where you have learned from a mistake you've made?
5. How we deal with difficult situations is pretty important. Can you think of a time when you had to deal with a difficult situation? And how did you resolve it?
6. Besides being friendly, what other qualities do you think a good employee needs in a job like this?
7. I should add that while this position is entry-level, there are opportunities for growth. Where do you see yourself in 3 years? Do you have specific goals for this job?
8. Well, this has been great. Just a couple more questions and I'll let you go. How soon would you be available to work?
9. Thank you so much for coming in and meeting. Do you have any questions or is there anything else you would like to tell me before you leave?
It was a pleasure speaking with you. I'll be in touch when we've made our decision.

5 Methods

Below, we describe the participants, the steps involved in data collection, the items considered, and the quantitative and qualitative analyses in our convergent parallel mixed-methods approach. We also include our reflexive process on how the authors may have had an influence on the research. As an additional note, the procedures and consent language employed were approved by our Institutional Review Board prior to beginning the research.

5.1 Participants

Our study involved (n = 20) undergraduate and graduate students from a large, public university located in the southeastern United States. These students were recruited from a STEM education listserv that included both students and faculty (who further passed along the call for participation). In total, n = 11 identified as male, n = 8 identified as female, and n = 1 identified as transgender. When considering the self-identification with race and ethnicity, n = 2 identified as Asian, n = 6 identified as Black or African American, n = 6 identified as being Hispanic, Latinx, or Spanish origin, n = 1 identified as Middle Eastern or North African, n = 8 identified as White, and n = 2 identified as "Another race or ethnicity not listed above." Students who completed the study were given $20 Amazon gift cards as compensation for their participation.

In addition, two individuals who have served as hiring managers were also involved in the study. They acted as external evaluators of the students' performance. These hiring managers were identified through convenience sampling. Their participation was voluntary.

5.2 Data Collection

Once students expressed interest in participating, they were sent a consent form. After this was signed, they were then given a link to register with the VI-Ready System and were randomly

assigned an interview with a virtual hiring manager, with $n = 10$ assigned to Hiring Manager A and $n = 10$ assigned to Hiring Manager B. They interacted with our web-based training system, emulating a mock job interview, and their interactions were recorded. Upon completion, the students completed a survey in Qualtrics, which contained both open- and closed-ended questions, as described further below.

The hiring managers independently watched all $n = 20$ of the students' videos after the sessions were complete. After reviewing each, they rated the students' performance using a form shared through Qualtrics. More information on the scale they applied is included in the next subsection.

5.3 Closed-Ended Questions and Quantitative Analysis

We used several closed-ended questions for the quantitative analysis. The survey items considered, the response options available, and where we applied them to answer each RQ are presented in Table 3. For RQ2, both the students and the hiring managers rated performance perceptions using the pre-defined Marino Interview Assessment Scale (MIAS). Details on this previously validated scale have been described further in other publications [18].

Quantitative data was cleaned and analyzed using RStudio in the R programming language (version 4.2.1). Descriptive statistics were used to examine the frequency of the Likert scale questions [34]. We compared students' self-reported evaluations to those of the external evaluators, taking the average of the hiring managers' scores for each student. A Jarque-Bera test indicated that the data was not normal (the p-value was less than 0.05). As such, we selected a non-parametric test, the Mann-Whitney U test, to compare the scores on each of the five aspects of interview performance.

5.4 Open-Ended Questions and Qualitative Analysis

We employed inductive thematic analysis to identify, analyze, and report themes within students' open-ended responses. We describe exactly which items were used to assess each of the three topics in Table 4. These topics included performance (related to answering RQ2) as well as perceptions of the system and questions asked (related to answering RQ3).

Our approach entailed data familiarization, generation of initial codes, searching for themes, and then defining and naming themes, as has been previously described for qualitative analysis by Braun and Clarke [35]. Given the need to address each of the constructs mentioned in Table 4, the analysis entailed creating three separate codebooks and distinct cycles of negotiation and coding. The authors utilized NVivo for Windows (release 1.7.1) for all coding and to calculate the interrater agreement.

Initial code generation and thematic identification were conducted independently by both authors. Upon completion, the two authors met to review and negotiate. Then, the authors separately coded the pertinent data.

We used the definition of Landis and Koch [36], in which an "excellent agreement" includes a kappa coefficient between 0.81 and 1.00 and a "substantial agreement" includes a kappa between 0.61 and 0.80. For the perceptions of performance, the raters obtained a kappa coefficient of 0.89, an "excellent agreement." The kappa coefficient for the system ratings was 0.74, considered a

Table 3: Closed-end questions considered for the quantitative analysis

Survey Item	Response Options	Corresponding RQ
I feel more prepared for an interview than before using the system.	5-point Likert scale: Strongly agree to Strongly disagree	RQ1
After interacting with the system I feel more confident in my ability to speak about myself and my accomplishments.	5-point Likert scale: Strongly agree to Strongly disagree	
The system enabled me to identify areas for improvement in my interview preparation.	5-point Likert scale: Strongly agree to Strongly disagree	
How would you rate your own performance on the following: First Impressions; Interview Responses; Self-Promoting; Active-Listening; Closing	MIAS: Accomplished (4); Adequate (3); Developing (2); Beginning (1); Not Using (0)	RQ2
The questions the virtual hiring manager asked were challenging and required critical thinking.	5-point Likert scale: Strongly agree to Strongly disagree	RQ3
The questions the virtual hiring manager asked were too easy.	5-point Likert scale: Strongly agree to Strongly disagree	
The questions asked were in line with what I would expect to be asked in a real job interview.	5-point Likert scale: Strongly agree to Strongly disagree	
Please rate how likely you are to use the system to prepare for an interview in the future.	5-point Likert scale: Strongly agree to Strongly disagree	
The platform made me feel like I was in a live interview setting.	5-point Likert scale: Strongly agree to Strongly disagree	
I thought the system was easy to use.	5-point Likert scale: Strongly agree to Strongly disagree	
I enjoyed participating in this session with the virtual hiring manager.	5-point Likert scale: Strongly agree to Strongly disagree	

Table 4: Open-end questions considered for the qualitative analysis

Survey Item	Construct Assessed	Corresponding RQ
How would you rate your interview responses?	Preparedness	RQ2
What aspects of the system would you change and why?	System	RQ3
If you have any recommendations that could make the system better, what would they be?		
Please describe your thoughts about the questions asked by the virtual hiring manager.	Questions Asked	
What questions did you expect the virtual hiring manager to ask that were not mentioned?		

"substantial agreement." Finally, when coding the questions asked, the kappa coefficient was 0.84, an "excellent agreement."

5.5 Reflexive Process

Given that the backgrounds of the researchers involved can shape outcomes [37, 38], we want to disclose the factors that could play a role in our choices and interpretations. The first author is currently a professor and has sought to include professional development aspects related to hiring preparation in her courses. She has provided students with feedback on how to hone their job interview technique. As part of her prior research and studies, she is also familiar with system development and human-computer interaction. In addition to her academic experience, she has worked in non-computing roles. She has been through the hiring process for multiple roles and has also served on hiring committees. Accordingly, she is aware of the expectations during interviews and has seen a range of responses to questions commonly asked. She leveraged her familiarity with computing, education, hiring, and interview preparation throughout her contributions to the study. She was involved in the development of the questions asked, the data analysis, the interpretation, and the writing of this manuscript, considering what aspects of the system and content may be meaningful, where improvements may be important, and what could help students feel more confident in the future.

The second author is currently employed with a major technology company and has a background in user experience research. As a program manager, she has experienced the hiring process as a candidate and has also facilitated interviews for both technical and non-technical roles. Within her role, she has experience writing interview questions and has completed multiple training scenarios for navigating candidate responses and avoiding bias in the interview process. She leveraged her familiarity with conducting interviews and candidate performance frameworks throughout her contributions to the study. She also helped to develop the questions asked, participated in the data analysis, and provided critical analysis during the writing of the paper.

6 Results

In the section that follows, we describe the findings as applicable to each RQ.

6.1 RQ1: How does VI-Ready affect job interview preparedness?

The descriptive statistics related to students' feelings of preparation are described in Figure 3. The majority of students (85% agreed or strongly agreed) reported that they felt more prepared

for an interview than before using the system. In addition, they declared feeling more confident in their ability to speak about themselves and their accomplishments (80% agreed or strongly agreed). Furthermore, 90% (considering those who agreed or strongly agreed) noted that the system helped them identify areas for improvement in their preparation.

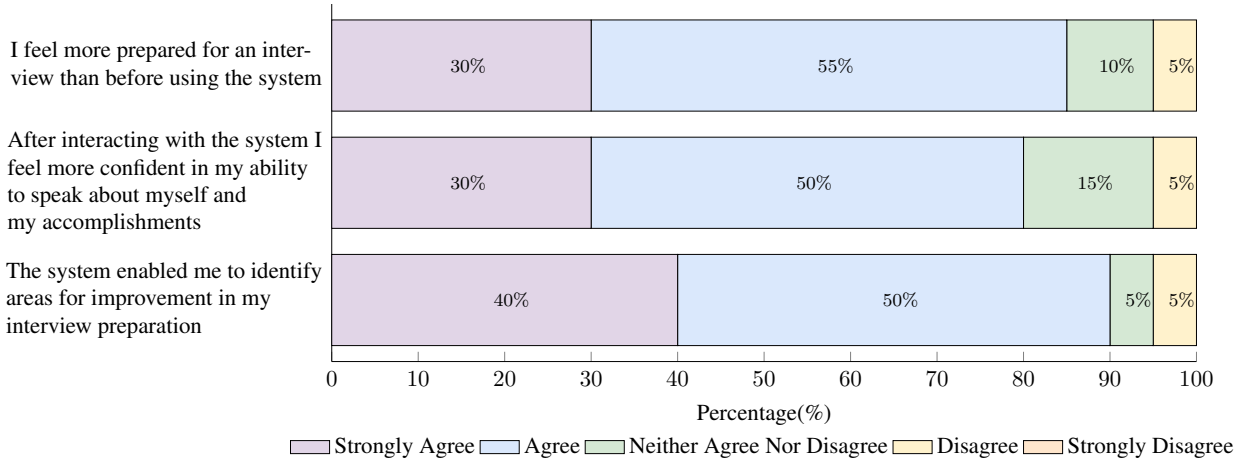

Figure 3: Students responses around preparation

6.2 RQ2: How do internal perceptions of interview performance differ from external evaluations by hiring managers?

Students' performance was assessed in two ways. Students ratings on the MIAS scale were compared to the ratings of hiring managers, as described in the quantitative subsection below. We also used thematic analysis to categorize responses around self-perceived performance, as described in the qualitative subsection.

6.2.1 Quantitative

Students' self-reported performance was compared to external evaluations from the hiring managers. The results of this evaluation are presented in Table 5. As illustrated, there was no significant difference between students' self-reported evaluation scores and those of the external evaluators.

Table 5: Comparison of students' self-rated performance relative to that of external evaluators

	Self		**External**		**Mann-Whitney U Test**		
	Mean	*Standard Deviation*	*Mean*	*Standard Deviation*	*U-value*	*z-score*	*p-value*
First Impressions	2.80	1.01	2.725	0.95	192.5	-0.19	0.85
Interview Responses	3.05	0.69	3.05	0.92	190.5	0.24	0.81
Self-Promoting	2.90	0.79	3.10	0.91	163	0.99	0.32
Active-Listening	3.30	0.86	3.23	0.57	169.5	-0.81	0.42
Closing	2.55	1.00	2.85	0.96	160.5	1.05	0.29

6.2.2 Qualitative

In addition, we asked each of the students to describe their own performance and used thematic analysis to categorize the responses. The results of this are shown in Table 6. As demonstrated, there were four codes, which fell under the purview of two broader themes: "Success" and "Need for Improvement."

Table 6: Thematic analysis of students' responses around their performance

Perceptions of Performance		
Theme	*Code*	*Description*
Success	Confidence	References that alluded to the participant feeling that they performed went well when interacting with the system.
Need for Improvement	Self-Distress	This code spoke to the internal discomfort students felt and how it may negatively impact their performance.
	Elaboration	The need to add more information, be more clear, or to prepare further, a growth opportunity.

The theme of "Success" referred to positive aspects of confidence the students had in their performance, feeling like it went well or better than expected. As one participant described, "*I would rate them [my interview responses] 4/5, they weren't anything perfect, but I feel as if I got the point across and gave a good first impression*."

Meanwhile, the theme of "Need for Improvement" encompassed several areas they felt could be worked on for future interviews. Participants spoke about how anxiety or self-doubt might have an impact, such as how one participant articulated, "*...sometimes I get nervous when speaking with someone else and can sound a bit confusing.*" They were also critical of how they answered, as expressed by another student: "*I feel as though they could have been better. I believe, in retrospect, I did not go into enough detail about my accomplishments and achievements*."

6.3 RQ3: How do users perceive VI-Ready, in terms of the questions asked and overall system?

We examined students' thoughts of the questions asked and the overall system through both descriptive statistics of the Likert scale questions and thematic analysis of open-ended responses. Below, we split these up into quantitative and qualitative subsections.

6.3.1 Quantitative

The students responses to the Likert scale questions are illustrated in Figure 4. Overall, 70% of the participants (referring to those who agreed or strongly agreed) enjoyed participating in the session with the virtual hiring manager. 95% (of those who agreed or disagreed) thought the system was easy to use. Comparatively, 75% (again, considering those who agreed or disagreed) felt like they were in a live interview setting. 80% of participants also said that they agreed or strongly agreed that they would use the system to prepare for an interview in the future.

When considering the questions asked, 100% of the participants agreed or strongly agreed that the questions asked were in line with what they would expect to be asked in a real job interview. The

majority of participants (80%) disagreed or strongly disagreed that the questions asked were too easy. The responses on whether or not the questions required critical thinking were split, with 50% agreeing or strongly agreeing, 30% disagreeing or strongly disagreeing, and 20% remaining neutral.

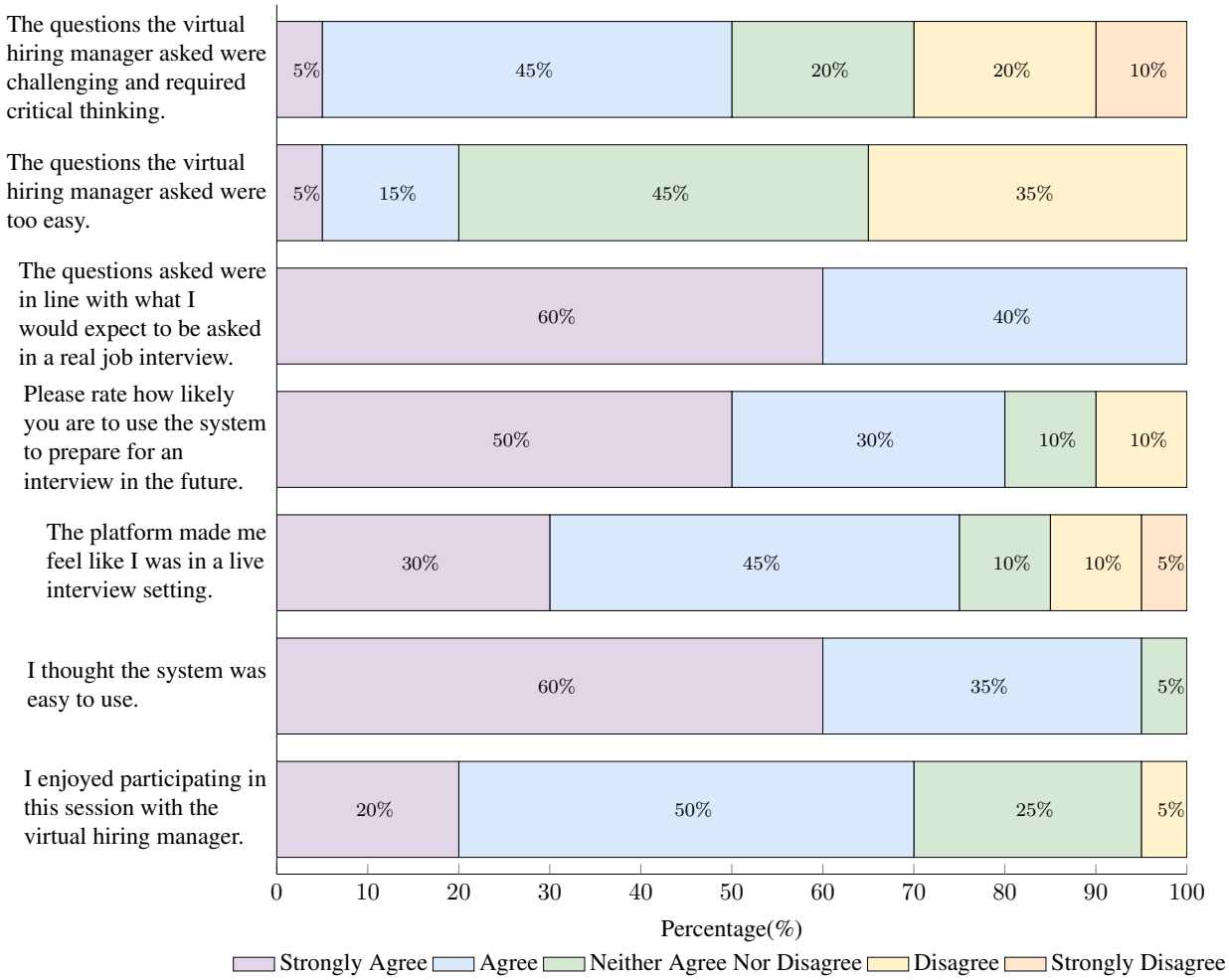

Figure 4: Students responses around the questions asked and the system

6.3.2 Qualitative

Students were asked to describe their perceptions of the system. Thematic analysis of the system-related responses yielded four codes belonging to two themes (Table 7). These themes were “Acceptable” and “Revise.”

Multiple participants found the system to be okay, as described by the theme of “‘Acceptable.” They spoke of not having any concerns nor feeling like improvements were required. As one participant described, “*It was easy to use.*” Other students commented more on the structure of the interview, as illustrated in the response of another student, who mentioned that: “*This is a good system, especially because it lets you preview the question beforehand to have answers to the question as they come.*”

Table 7: Thematic analysis of students' responses around the system

Perceptions of the System		
Theme	*Code*	*Description*
Acceptable	Sufficient	Students reported no concerns with the current version of the system
Revise	Context	Referred to students' preferences for more background information or greater framing for a specific role or position to make for a more authentic interaction.
	Content	Refers to requests for questions that are more difficult and/or require more critical thinking. May also include wanting a range of possible questions in different hiring scenarios for the sake of increased variety.
	Overall Experience	Interactions with the agent that do not feel realistic and therefore did not feel authentic. Desire to have variety in the scripts for repeated practice or novel questions to feel more natural.

Responses surrounding the system needing updates suggested changes in several areas, as described in the theme "Revise." Although some students mentioned how realistic the role play was, others found it unnatural. As described by one student, "*I would say to add more human to it*." Meanwhile, others wanted the conversation to be more interactive, with responses from the agent based on their answers. As a participant commented, "*Maybe adding a feature where the interviewer responds to my answers*."

A few of the students mentioned they would like to have a more specific scenario or potential role to guide their responses. As one participant commented, "*One of the last questions refers to making progress in that particular role, but we don't know what kind of job this is. Maybe provide an option that can tailor the questions to a specific job or even to a specific industry*." Another echoed this statement, elaborating that:

> *I understand that the system is probably meant to be pretty general to cater to as wide an audience as possible. However, I found it harder to answer the questions because I wasn't provided any details about the position for which I was supposedly interviewing. For example, it would be very helpful to know things such as industry, role, remote/in-person, and internship/part-time/full-time. Knowing this information is very helpful because it allows the candidate to 1) relate their skills and experiences to the job responsibilities and 2) ask pertinent questions at the end when they are asked whether they have any questions for the recruiter.*

Students also spoke about the choices available. They wanted to have the opportunity to navigate tougher questions. As one student stated, "*Make some of the questions more challenging. When preparing for an interview, there are specific types of questions that worry me more than others, and I feel that those questions were not asked here*." Such responses were understood in greater detail through thematic analysis, specifically around the questions.

Thematic analysis of the question-related responses yielded four codes belonging to two themes (Table 8). The themes observed pertained to the questions either being effective or problematic. The theme of being "Effective" was often described as how likely they were to align with a hiring scenario. As one student expressed, "*These are questions I have been asked in a real interview. So*

I believe it is very realistic. I had to be prepared for the questions being asked." The theme also included depictions of being reasonable and straightforward. As another participant mentioned, "*They were straight to the point and easy to understand.*"

Table 8: Thematic analysis of students' responses around the questions asked

Perceptions of the Questions Asked		
Theme	*Code*	*Description*
Effective	Realistic	Participants described that the questions asked were similar to those encountered in a real job interview or authentic to a hiring scenario.
	Clarity	Descriptions of the questions' content asked being easy to understand and/or clear
Problematic	Overly Simplistic	Comments that the questions asked did not pose enough of a challenge or were too vague. Also included a preference to delve more into the company or role.
	More Personal	Students suggestion that questions should be more specific to them and/or tailored to their resume or things they have worked on

Under the theme of "Problematic," several participants spoke about how they would have preferred something more directed or challenging. One student commented that "They were very vague. I wasn't sure how to answer them." They also noted they anticipated having to speak more about themselves than was necessary with the current script. Towards this concern, one student described, "*I expected more personal questions about my education and past job experiences.*"

7 Discussion

The study conducted demonstrated the efficacy of the VI-Ready system in achieving its desired goal. 85% of students felt more prepared for an interview than they did prior to using the system. The majority of students also noted that it helped them identify areas for improvement (90%). In addition, the participants reported feeling more confident speaking about themselves and their accomplishments (80%). We conceptualize these changes as possible sources through which the participants gained enactive mastery experiences that could influence their self-efficacy beliefs and strengthen future performance [28]. These findings align with those of others who have used virtual reality to help participants recognize problem behaviors needing improvement, such as stuttering [39]. When considering the theme of "Effective" in reference to the questions asked, students emphasized how well the scenarios reflected a real-life job interview.

When speaking of their own performance, students stated that the system also helped identify areas they could work on, as delineated by the theme of "Need for Improvement" (within RQ2). Respondents mentioned needing to overcome their own anxiety and how nerves or distractions that caused them to lose focus could impact how well they did during the interview. Gaining awareness of such physiological states can influence self-efficacy and ultimately the actions and outcomes related to hiring, as touched on in Bandura's framework [28, 29]. It also helped them recognize the need to elaborate further in their responses and the desire to allow time to think through answers to the questions.

However, students' interactions and responses also identified potential areas for improvement, both within themselves and in the system. Although 100% of the respondents emphasized that the

questions asked were reflective of what they would expect to be asked in an actual interview, they did also mention that the questions may have been overly vague and simple. They also requested probing questions asking about more personal information, as articulated by the theme of "Problematic" (detailed more in RQ3).

In addition, performance was rated the lowest, both by participants and hiring managers, in first impressions and closing. We posit that this is in part due to the lack of context provided. Although the scripts were intentionally kept vague to encompass a range of potential positions and scenarios, the lack of direction may have made it harder for students to know the expectations. While 75% of participants agreed or strongly agreed that they felt like they were in a live interview setting, the theme of "Revise" and code of context spoke to the desire to have more structure. Even though it may be helpful to offer more generalized training, introducing specific scenarios, whether or not they are applicable to each participant, could help guide responses given and questions asked as an additional option in the system.

While the performance scores between the participants and external evaluators were not significantly different, both groups scored "active listening" as the top skill demonstrated in the interviews. In the rubric, the highest score (4) described this as "consistent and confident use of active listening skills including eye contact, body movement, nodding, facial expressions, and turn-taking." Although this may have been something the students did well with, their qualitative responses around the system and the theme of "Revise," included statements where students requested a more human-like interaction with an interviewer that could respond to their answers. Active listening has been shown to make a chatbot appear more engaging and has been helpful at eliciting higher-quality responses [15]. This is something we may want to consider for future iterations of the system to create a more equitable dynamic and further its authenticity.

Overall, employment readiness training can help participants recognize their own shortcomings and empower them by building up their self-efficacy, so they feel more prepared. VI-Ready presents a unique opportunity to gain practice without the need to download extra software. Accordingly, although the system might benefit from further enhancements, the research illustrated its potential for providing web-based training. Offering a way for students to get exposure and reflect on possible strategies to improve privately can eliminate some of the equity concerns associated with other, more cost-prohibitive options for professional development, such as career coaching [5].

8 Limitations

There are several limitations we want to acknowledge. First, the number of participants is fairly small, limiting the statistical power of the analysis. While the study was meant to be exploratory in nature, having more users interact with the system will help to better understand varying experiences. Additionally, all the users were recruited from a single university, and their performance and perspectives about the system may vary. Going forward, it would be beneficial to expand this study to include students from additional locations.

Another limitation was the appearance of the agents. While we cannot make assumptions about what the users perceived their gender, race, and ethnicity to be, the agents used in this study did not present a range of looks that may have appealed to a broader audience. Including a wider range of choices may yield different reactions and outcomes, something that should be explored

in future studies.

Apart from the physical look, expanding the interviewing conditions available (from beyond just hostile, neutral, friendly) could yield further insight into performance perceptions. While the overall content delivered is not impacted by varying the condition, the way it is presented and the nonverbal expressions of the agent could affect the way students view the authenticity of the session and their enjoyment. While we wanted to limit the options presented to focus on the system and questions rather than their delivery, comparing students' impressions of each condition is something that should be investigated further.

Finally, when comparing self-assessment of the students' performance relative to external evaluation, there were no significant differences in the ratings. While such information illustrated potential areas students could improve upon, it does not provide data about how performance actually changed through the use of the tool. In the future, it would be beneficial to conduct pre- and post-studies of performance to better understand how VI-Ready could alter outcomes or to conduct follow-up studies with participants about interview-related successes.

9 Conclusion

In summation, this work presents a first look at students' perceptions of VI-Ready and describes the correspondence between self-perceived performance and that of external evaluators. The students found the system to be a beneficial tool to use when preparing for a job interview. However, introducing a wider variety of questions and potentially introducing responses from the hiring managers were cited as areas for improvement. While the work presented offers an encouraging first step, in the future, we would like to further expand on the present study to consider additional perspectives and conditions. Enhancing graduate employability can be critical for job attainment, and we hope that the work presented offers educators and administrators insight into the potential value of integrating virtual reality into job preparation to help students put their best foot forward.

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