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Addressing Public Speaking Anxiety with an AI Speech Coach

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Abstract: Public speaking anxiety (PSA) can hinder academic performance when students face challenges engaging in class discussions, delivering fluent presentations, and undertaking oral examinations. A primary reason for the prevalence of PSA is students' perceived lack of speaking skills. Speech coaching has been found to be an effective way of enhancing public speaking skills but its effects on PSA reduction need further investigation. In this paper, we report our experiments to evaluate the impact of utilizing an AI speech coach in reducing students' anxiety, improving their self-perceived competence, and increasing performance in public speaking tasks. A mixed-method approach combining qualitative analysis of participants' experiences with the AI speech coach and quantitative measures of anxiety levels and speaking performance improvements was utilized. Results from participants' pre- and post- public speaking anxiety scores showed an average of 25.2% reduction in the anxiety levels and 60.5% increase in speaker speech competency. Statistical metrics and personalized feedback given by the speech coach allow participants to monitor their speech and identify areas for improvement which are essential for self-improvement efforts. These findings can inform educators and students on the potential use of digital speech coaches to address PSA while providing the latter with a personalized platform for practicing their speech delivery.

Keywords: Public speaking anxiety, speaker speech competency, AI speech coach

1. Introduction

Public speaking anxiety (PSA) refers to the psychological discomfort experienced by individuals when faced with the task of speaking in front of an audience (McCroskey et al., 1970). It is a common and debilitating fear that is estimated to affect 75% of people to some degree and 15% severely (Kiani & Ghasemi, 2021). A notable proportion of individuals aged 18-21 years old experience high (8%) or moderate levels (72%) of PSA (Naz et al., 2021).

In the academic environment, PSA can significantly impact students' academic performance, career opportunities, and social interactions (O'Conner & Czopp, 2017). Studies show that students' perceived inadequacy in their speaking skills is one of the primary causes of public speaking anxiety. These perceptions can be attributed to several factors which include the lack of a wide vocabulary, poor acquisition of grammar rules, incorrect pronunciation, and insufficient opportunity for speaking practice (Goberman et al., 2011; Hasibuan et al., 2022; Tran, 2022).

Public speaking anxiety can be addressed through speech training and coaching (Herbein et al., 2018; Fremouw & Zitter, 1978). Raja (2017) further noted that managing the fear of public speaking is a learned skill and can be overcome by practicing and rehearsing before delivering the presentations or speeches. Students with PSA, however, would require assistance as they perform practice exercises to prepare themselves for public speaking (Grieve et al., 2021).

The availability of technology-based speech coaches offers individualized feedback on the speech of their users which have yielded positive effects on the speaking skills of students

(Zou et al., 2023). Maknun (2020) reported that 17 to 19-year-old students who used the speech coach, Orai, had a gradual improvement in their speaking skills, lending both participants and instructors to express positive perspectives on the tool's potential in oral speech training (Liu et al., 2022).

Prior studies have evaluated the impact of digital speech coach in improving the skills of EFL students. However, little to no research has been done on the use of such technologies in alleviating the public speaking anxiety of Filipino students, whose population ranked 22 out of 111 in the English Proficiency Index (Antivola, 2023). Our study aims to address this with the research question: "***What is the impact of digital speech coaches on Filipino students' anxiety levels and public speaking skills during public speaking engagements?*** "

Through a mixed method approach, we examined how Yoodli (https://yoodli.ai), an AI speech coach, affected Filipino Senior High School students' perceived anxiety levels, confidence, and overall speaking performance. We conducted pre- and post-intervention assessments using the *Personal Report of Public Speaking Anxiety* developed by McCroskey, Ralph and Barrick (1970) and participant interviews to evaluate the changes in students' self-perceived anxiety levels. We then offer our findings on digital speech coaches that are most effective in fluency and speech delivery during public speaking scenarios.

2. Related Work

Public speaking skills encompass fluency, confidence, and delivery (University of Minnesota, 2016). Fluency refers to the flow of speech, while confidence relates to the individual's self-assurance in delivering their message. Delivery encompasses non-verbal cues, vocal modulation, and engaging the audience effectively. Here, we briefly present studies that report speech training and coaching strategies and the use of speech coaches to alleviate public speaking anxiety.

Speech coaching is a field that encompasses a diverse range of techniques aimed at improving spoken communication skills. Herbein et al (2018) reported that a multi-component speech training program had positive effects on the organizational public speaking skills and speech anxiety of children. Fremouw and Zitter (1978) found that skills training involving behavioral rehearsal and videotape feedback was effective for high and low social anxiety. Kimani et al (2019) compared the effects of a virtual speech coach that uses cognitive behavioral therapy techniques to help presenters restructure irrational thoughts associated with public speaking anxiety.

Previous studies have also examined the impact of digital speech coaches on EFL learners. Zou et al (2023) focused on automated speech evaluation programs involving 40 Chinese undergraduate EFL learners practicing for a month using popular platforms like Liulishuo and Shanbay. Liu et al (2022) explored automatic speech recognition technology with 249 English majors, finding positive perceptions from both participants and instructors regarding its impact on oral training. Maknun (2020) examined the Orai speech coach and discovered that students who spent more time using this tool for spoken English practice exhibited gradual improvement in their speaking skills. Yoodli (https://yoodli.ai) is a speech coach that can provide users with feedback on basic communication skills through its various features that include a dashboard for tracking core metrics, personalized exercises, and real-time prompts. A study at the University of North Carolina School of Nursing showed how the use of this tool to learn basic communication skills helped in raising awareness on personal communication styles among students (Panke, 2023). These studies collectively highlight the potential effectiveness of digital tools in advancing EFL learners' speaking proficiency.

3. Method

Building upon existing literature on public speaking skills, we assessed the extent in which the speech coach, Yoodli, enhances these skills among Filipino students using the metrics *fluency*, *confidence*, and *delivery*. *Competency* assesses the vocal variety in terms of rate,

pitch, and volume that can sustain the interest of the audience. *Fluency* looks at pronunciation, grammar, and articulation, while *delivery* evaluates the physical behavior that support the verbal message. Furthermore, the study focuses on looking at *performance anxiety* only and not *process anxiety*. *Performance anxiety* is concerned with the student's worry in delivering a speech publicly in front of an audience, whether online or face-to face (Cllela, 2007).

Participants. 20 senior high school students were recruited based on their public speaking anxiety levels as measured using the *Personal Report of Public Speaking Anxiety* (PRPSA) instrument, a 34-item scale that assesses a variety of cognitive, physiological, and behavioral symptoms of public speaking anxiety (McCroskey et al., 1970). The 20 participants have a distribution of 7 low, 8 moderate, and 5 high PSA following the anxiety levels defined by Cizek and Burg (2006).

Pre-Assessment. Participants underwent a pre-test by recording a predefined speech to assess their public speaking skills. An English teacher rated the participants using a modified version of the *Competent Speaker Speech Evaluation Form* (CSSEF) developed by the National Communication Association (NCA). The modified CSSEF contains criteria for public speaking assessment across three competencies related to confidence, fluency, and delivery. A participant can receive a rating of *excellent*, *satisfactory*, or *unsatisfactory* for the items in these metrics.

Experiment. Over the course of one week, each participant used Yoodli for at least 10 minutes daily as part of their online conversation or as a platform for practicing public speaking. They were provided with a set of instructions on installing Yoodli; using the app to practice their public speaking either with an impromptu speech or using a predefined speech entitled "*The Hypocrisy of American* Slavery" by Frederick Douglas for self-improvement; reviewing their session's statistical data (talk time, pacing, and usage of filler words); and submitting this data to the project team for later analysis.

Post-Assessment. At the end of the experiment period, participants took the PRPSA again. The pre- and post-assessment scores are used to determine if the daily use of Yoodli led to any improvements in the students' PSA. A user survey was also administered to collect feedback regarding participants' perception on the features of the speech coach. Specifically, participants were asked to share features of Yoodli that they find useful and their perceived effect on their public speaking skills.

Public Speaking Evaluation. The recorded speeches before and after the experiment period were sent to an English language teacher for evaluation using CSSEF. After recording the CSSEF evaluation scores for analysis, these were returned to the participants for their personal record and analysis.

Data Analysis. The study adopts both quantitative and qualitative analysis. Quantitative analysis entails examining the relationship between the pre- and post- PRPSA scores and the usage of Yoodli, and the CSSEF values that may indicate notable changes in the student's confidence, fluency, and delivery as indicators of improvement in public speaking. Results are clustered into three based on the pre-experiment public speaking anxiety levels of the students as measured using PRPSA – low (below 98), moderate (between 98 and 131), and high anxiety levels (above 131). Qualitative analysis of feedback from the participants aims to identify features of Yoodli that users perceived as effective.

Ethics. Informed consent and assent forms were administered to the parents/guardians and participants as part of the selection process to detail the data to be collected, the different instruments to be administered, and how the logs will be evaluated. The English language teacher also signed an informed consent that includes data privacy and confidentiality clauses. No monetary compensation was given to the participants.

4. Results

The results are presented according to the data gathered from the different instruments that were administered to the participants before, during, and after the intervention period, as well as the evaluation scores provided by the English language teacher. The participants were clustered according to their PSA levels: 7 low, 8 moderate, and 5 high. Moreover, 60% of the participants practiced using their impromptu speech while 30% used the provided speech.

4.1 Participants' Anxiety Levels

Table 1 shows the average PRPSA scores of participants for each of the three clusters. There is an overall average 25.2% reduction in the anxiety levels of the participants across all three clusters through the daily use of the AI speech coach for a period of one week.

Table 1. *Average PRPSA scores of participants (n = 20) on Day 0 (prior to the experiment proper) and Day 7 (at the end of the experiment period).*

	PRPSA				
PSA Level	**Day 0**	**Day 7**	**Inc/Dec**	**t-value**	**p-value**
Low (n = 7)	81.00	62.14	-23.3%	2.13392	0.029317
Moderate (n = 8)	120.71	88.29	-26.9%	6.03943	0.000015
High (n = 5)	138.40	103.00	-25.6%	5.41992	0.000315

4.2 Participants' Public Speaking Performance based on CSSEF

Table 2 shows the average CSSEF scores of participants for each of the three clusters. Based on the ratings provided by the language teacher, a participant's CSSEF score is computed by taking the sum of his/her scores in confidence, fluency, and delivery, where a rating of *excellent* equates to a score of 3, satisfactory is 2, and unsatisfactory is 1. Results suggest that there is a meaningful increase in the public speaking performance of the across all clusters. The quantitative data indicated enhanced performance in these areas post-intervention, suggesting that the AI speech coach effectively supported the development of key areas of public speaking as measured in the instrument.

Table 2. *Average CSSEF scores of participants (n = 20) on Day 0 and Day 7.*

	CSSEF				
PSA Level	**Day 0**	**Day 7**	**Inc/Dec**	**t-value**	**p-value**
Low (n = 7)	4.71	7.43	57.7%	-4.24853	0.000565
Moderate (n = 8)	5.00	7.71	54.2%	-9.44235	<0.00001
High (n = 5)	4.60	7.80	69.6%	-4.13118	0.001647

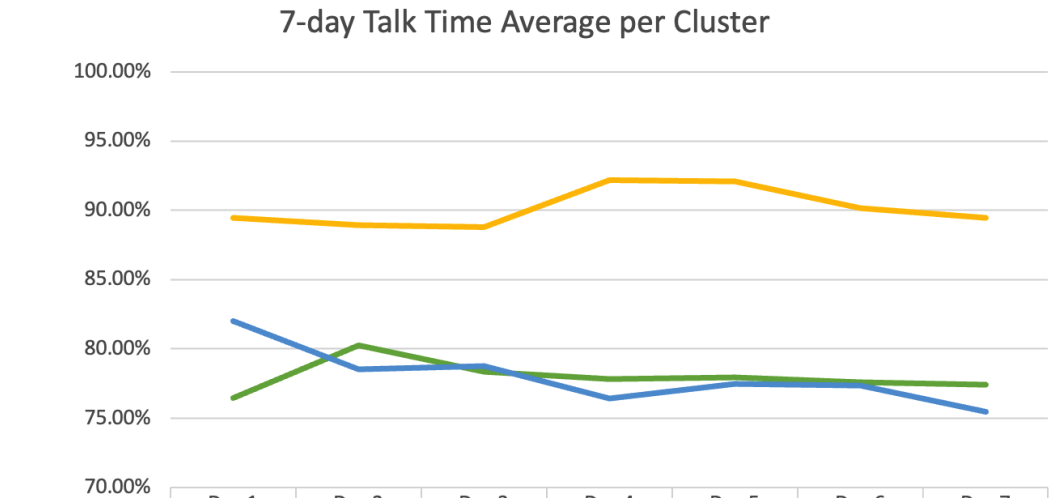
Despite the seeming improvements in the vocal delivery, tone, and facial expression, the English language teacher noted some areas for improvement in the non-verbal communication skills of the participants. For instance, the posture, gestures, and eye contact of P2, a participant from the low cluster, remain short of acceptable standards, with evident inconsistency between his/her body language and verbal communication that diminishes the student's credibility and distracts the listener from the intended message. The facial expression of P7, still from the low PSA cluster, did not match his/her verbal message. In general, physical behaviors, such as fidgeting or pacing without intent, can detract the speaker's message. Stiff movements give off the impression that the speaker lacked the confidence required for effective speech delivery.

4.3 Participants' Public Speaking Performance based on Daily Logs

We further analyzed the data from Yoodli, particularly the talk time, pacing and the use of filler words, as another means of assessing the public speaking performance of the students. The

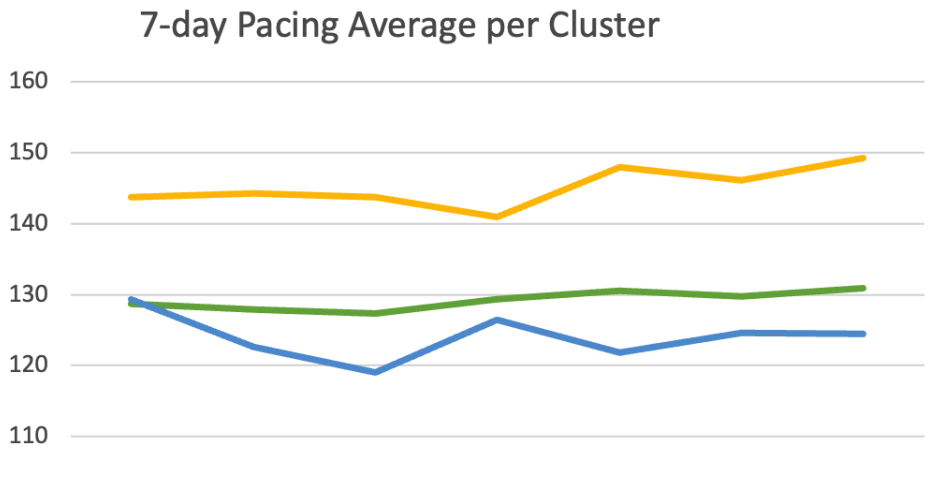
talk time percentage represents the amount of the time the participants talked during each of the recorded session; for instance, if the talk time is 50% and the recording is 10 minutes long, this means they spoke for 5 minutes. The *filler words* percentage, on the other hand, refers to the number of filler words, such as “uh” and “so”, that were uttered during the whole speech.

The results showing the 7-day average talk time, pacing and usage of filler words in each of the clusters are found in Figures 1 to 3. As can be seen, the changes are not statistically significant across the low, medium, and high PSA clusters. While Yoodli has reduced the anxiety levels and improved the overall speaking skills based on PRPSA and CSSEF results, respectively, it did not significantly influence specific aspects of public speaking skills. This may be attributed to the short-term intervention period.



	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Low	76.47%	80.28%	78.37%	77.84%	77.93%	77.58%	77.42%
Moderate	82.03%	78.55%	78.78%	76.41%	77.51%	77.34%	75.50%
High	89.44%	88.91%	88.77%	92.20%	92.08%	90.14%	89.46%

Figure 1. 7-day average talk time for each cluster.



	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Low	128.7	127.9	127.3	129.4	130.6	129.8	130.9
Moderate	129.4	122.7	119.1	126.5	121.9	124.6	124.5
High	143.7	144.3	143.7	141	148	146.2	149.3

Figure 2. 7-day average pacing for each cluster.

4.4 Participants' Evaluation of Yoodli

From the qualitative responses, we performed a simple thematic analysis that is based on the features of Yoodli that participants perceived as the contributing factors in the reduction of their anxiety. The resulting themes or features are shown in Table 3.

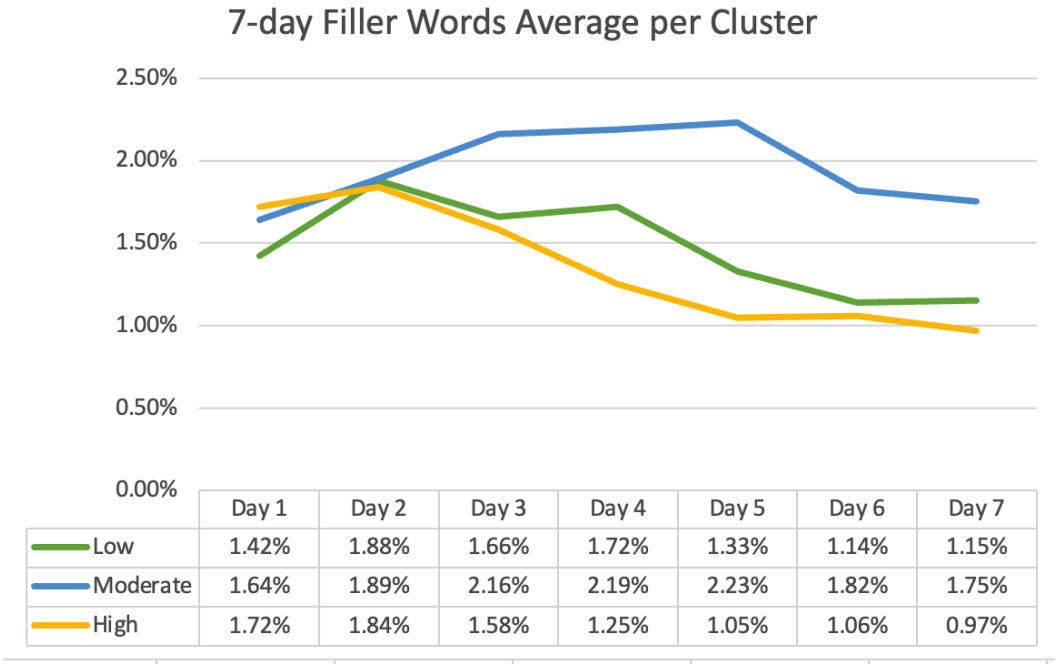


Figure 3. 7-day average usage of filler words for each cluster.

Table 3. *Features of Yoodli that participants (n=20) found most useful in reducing their PSA.*

Feature	Frequency	Feature	Frequency
Comprehensive analysis	5 (25%)	Coaching & engagement	2 (10%)
Words per minute	4 (20%)	Weakness identification	2 (10%)
Speech speed & pacing	3 (15%)	Monologue timing	1 (5%)
Filler words detection	2 (10%)	Pop-up notifications	1 (5%)

As seen in Table 3, participants generally found the overall ability of Yoodli in computing and displaying statistical data to be very useful (P4, P16). This enabled them to identify their weak points (P14) which is an important factor in creating "*a valuable impact on speech improvement*" (P11). Tracking students' pacing, specifically the speaking speed and the words per minute, was not only helpful (P7, P15) but was also "*crucial for monitoring speech delivery*" (P7). "*Knowing the duration of my monologues*" was perceived to be valuable in assisting P19 to practice "*effective time management*". This sentiment is echoed by P7 who became more conscious with his/her pacing so that "*I do not go too fast or too slow*", and P10 who can now "*control my talking better*". Breaking down public speaking components into clear metrics also helped the participants pinpoint areas that they need to work on to improve and enhance their speaking skills (P3, P7, P9, P20). Personalized coaching and realistic practice exercises contributed to the enhancement of P8's communication abilities and motivated P11 and P21 to improve their public speaking skills.

When asked if Yoodli made them want to talk less, P8 openly praised the speech coach stating that: "*Yoodli's interactive features and personalized feedback encouraged me to engage more in conversations and speech practice. As I gained confidence in my speaking abilities through using Yoodli, I felt more inclined to communicate and express myself verbally.*

Additionally, the platform's supportive environment and constructive feedback motivated me to continue practicing and improving my communication skills, rather than feeling inclined to talk less."

P9 also "*wanted to talk as much as I could to receive insightful feedback*". While P10 admitted that the two-minute warning made him/her want to talk less, this also reminded him that he/she should "*allow the audience to take in the speech I'm giving by having more pauses during my speech*". P11 treated the imposed time limit as a way to "*talk less but better*" by being more concise yet comprehensive with his/her speech through "*a combination of good word choices, pacing and pauses*".

When asked to share the effect of Yoodli on their perceived public speaking anxiety, more than half (59%) of the participants admitted that practicing with the speech coach made them be more confident in their public speaking skills. Increased confidence leads to reduced anxiety, which then enhances one's public speaking, as described by P16: "*It is innate that I get more confident when I get better at something and I do believe I have improved a little bit, especially in the delivery of my speeches.*"

Participants also arrived at the realization on the potential value of digital technologies through the following feedback:

> "*Yoodli showed me that public speaking can be easier than what people first perceive*." (P4); and,
>
> "*Before trying Yoodli, I was genuinely scared to do so because I didn't know what it had to offer. However, it gradually alleviated my fears and boosted my confidence.*" (P8)

It should be noted that P11 raised an important insight on the approach of Yoodli as "*less for capturing an audience and more of delivering the main message*". This may help in rationalizing the statistical data generated by Yoodli that does not include metrics on non-verbal communication skills such as posture, gesture, and eye contact, which are indicators of a good delivery as found in the CSSEF and raised by the English language teacher.

5. Discussion

We now present relevant insights on the influence of Yoodli on students' public speaking in terms of reducing anxiety and increasing confidence and fluency.

5.1 Influence of Yoodli on Students' Public Speaking

The PRPSA pre- and post-intervention scores revealed an average of 25.2% reduction in the anxiety levels of participants across all clusters even for a short period of seven days. Qualitative feedback from surveys supported these findings, with 59% of the students reporting increased confidence and reduced anxiety. The improvements in public speaking skills, as seen in the 60.5% increase in the CSSEF score, can be attributed to the detailed feedback and personalized coaching provided by Yoodli. Features like coaching, weakness identification, and statistical analysis on words per minute, pacing, and usage of filler words helped students identify their weak points and refine their speech delivery.

However, even though the students found the various features of the speech coach to be helpful, analysis of the statistics generated by Yoodli revealed insignificant differences over the 7-day intervention period. This implies that an improved CSSEF score does not necessarily translate to better Yoodli metrics. Regardless, being able to receive guidance and assistance while preparing for public speaking can help build students' confidence and overcome their anxiety, as pointed out by Grieve et al. (2021).

5.2 Useful Features of Yoodli

Several features of the AI speech coach are found to be particularly effective in reducing students' public speaking anxiety. Statistical measures that track and display words per minute,

pacing, and filler words enabled students to make real-time adjustments and refinements in their delivery. Immediate feedback from Yoodli addresses students' need for assistance in the form of tailored guidance and personalized exercises, further supporting the findings of Raja (2017). The combination of detailed metrics and personalized coaching created a structured learning environment that significantly contributed to reducing PSA levels. A better understanding of the different aspects of public speaking can assist the students in appreciating their strengths while recognizing their weaknesses, which are essential components to building one's communication skill (Hasibuan et al., 2022).

Despite Yoodli's extensive features to support students' speech practice, these are limited only to assessing elements of verbal communication. Non-verbal communication, which encompasses the tone of voice, eye contact, posture, and other body language, can be utilized to increase one's ability to convey his/her message through public speaking (Azemi, 2021). This is one area of improvement that students should consider when delivering their speech, as indicated in the evaluation given by the English language teacher.

5.3 Public Speaking and Digital Technologies

Among the two types of public speaking anxiety described by Cllela (2007), only the performance anxiety is explored in the current study. Process anxiety which arises when the speaker is worried when preparing the content of his/her speech, is another area where digital technologies may be utilized. For instance, AI speech coaches can extend their support by including features to support speech construction. These capabilities are already found in AI writing assistants with the release of large language models.

A different perspective in addressing speaker anxiety is proposed by O'Hair, Rubenstein, and Stewart (2007). In their paper, they classified public speaking into distinct phases that span from acknowledging the need to deliver a public speech, to preparing the speech, practicing the delivery, and eventually delivering the speech itself. This would require an AI speech coach that guides students across these four stages of public speaking.

6. Conclusion

Public speaking is an essential skill that every student must develop to succeed not only in their academic life but also in their future career. This skill can be enhanced through practice that can lead to increased confidence and fluency while reducing feelings of anxiety. The availability of digital technologies, such as AI speech coaches, affords a platform for such practice to take place. In this paper, we provided a one-week intervention among senior high students with varying levels of anxiety as measured using PRPSA. Results indicate that with daily use, there is an average of 25.2% reduction in the students' anxiety levels and a corresponding 60.5% average increase in their speaker speech competency scores. Qualitative data revealed that the statistical metrics and individualized feedback provided by Yoodli are the two main features that students perceived as the most helpful in their strive towards addressing their public speaking anxiety.

Despite the positive results, the short-term duration of the intervention and low participant count are not sufficient indicators on the benefits of AI speech coaches to the general study population. Longitudinal studies can help determine if the improvements yielded by our experiments can be sustained over time and if continued use of Yoodli leads to enhanced public speaking skills. Different demographics may experience varying levels of public speaking anxiety and respond differently to interventions. Understanding these differences can help tailor Yoodli's features to better meet the needs of a broader user base. Lastly, **i**dentifying the relative strengths and weaknesses of Yoodli compared to other methods can highlight unique benefits and potential areas for improvement.

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