



Results and Discussion from Two Seasons of the Talking Technicians Podcast

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Abstract: This study analyzes the first two seasons of the Talking Technicians Podcast, which consists of 24 episodes with working technicians. The study aims to demonstrate that podcasts featuring working technicians provide unique insights into technological education that other methods cannot easily obtain. The themes that emerged from the interviews include the importance of soft skills, teamwork, and when in a large company environment, it pays to be aware of opportunities for professional advancement. While wage and benefit comparisons were not made between the technicians interviewed, the study found that podcasts offer a powerful tool for sharing knowledge and connecting with audiences, enabling listeners to focus on the content and engage with the ideas of presenters and guests.

Keywords: podcast, talking technicians, technicians, dissemination

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Introduction

The Talking Technicians Podcast [1] is a podcast about working technicians. The Micro Nano Technology Education Center (MNT-EC) produces and supports the podcast under the National Science Foundation Advanced Technological Education (ATE) program.

Each podcast episode is an interview with a technician or a panel of multiple technicians. The Talking Technicians Podcast aims to share and promote technician jobs with community college students and faculty to broaden participation in the workforce. In addition, we aspire to drive awareness of technician education and careers. The goal of each episode is to share the life of a working technician: who they are, what they do, and where they come from.

A Brief History of Podcasts

Podcasts have been around in some guise since the 1980s, but with the advent of portable media players such as the iPod, they became increasingly popular by the early 2000s. These digital-only players made it easy for people to listen to podcasts on the go, and the rise of broadband internet made it easy to download and stream [2].

The term podcast itself was coined in 2004 by journalist Ben Hammersley, and it was derived from the words “iPod” and “broadcast.” Podcasts continue to grow with the rise of smartphones and other devices, and podcasts remain an increasingly popular way to consume information [3].

Podcasts are typically audio recordings, but some may include video. They cover a wide range of topics, from news and politics to sports and entertainment, and are often created by individuals or small teams. Many podcasts are free, and listeners can subscribe to them to receive new episodes automatically via a web-based podcast player or an app on a mobile device.

Overall, podcasts are a way for people to stay informed and entertained, and the platform has opened up new opportunities for educators to share their ideas with a global audience.

In 2006, only 22 percent of the adult population in the United States was aware of podcasting. By 2022, this figure rose to 79 percent. Podcasting is an increasingly popular pastime in the US, with 79 percent of respondents being aware of the format, while over 82 million people listened to podcasts in 2021. This number is estimated to rise even further, reaching over 100 million listeners in 2024 [4].



Podcasts as Dissemination

For educators, podcasts provide a valuable tool to distribute and disseminate information to their students. In addition, they can be used to supplement traditional classroom instruction, providing additional information and examples for students to learn.

Podcasts are also a flexible and convenient medium for students to access. They can be listened to on various devices, including smartphones and laptops, and downloaded and listened to at the student's convenience. This allows students to learn at their own pace and in their own time, making it an effective way to reach students who may have busy schedules or learn best outside the classroom.

In many niche specialties, in business and education, podcasts have proven to be an effective way to share information [5]. Within ATE, other principal investigators have also found that podcasts are a popular and accessible format for conducting effective and valuable outreach [6]. It allows us to reach students where they are and for them to consume the information when and how they want or are able. Arguably, it is a more engaging and interactive learning experience and format. Another benefit is that they are easy to share via text, email, or Bluetooth, with Apple's easy-to-use "AirDrop" button pushing a file from one iPhone to another.

Platforms and Resources Considered

We considered five major podcasting platforms to disseminate the Talking Technicians podcast. Buzzsprout is the platform we chose for Talking Technicians with benefits as explained below.

- Buzzsprout — Best Podcast Hosting Overall [7]
- Libsyn — For Beginners to Experts [8]
- RSS.com — Best for Beginners & Affordable [9]
- PodBean — Easy to use Podcast Hosting [10]
- Transistor — Podcast hosting for brands & professionals [11]

Buzzsprout offers a range of features and tools for beginners and experienced podcast creators. It has a simple interface that is easy to use and provides a variety of player templates that can be embedded in websites.

In addition to standard distribution through Buzzsprout and across its partner podcast platforms, our second most significant source of traffic is from the Micro Nano Technology Education Center (MNT-EC) website. To take advantage of this platform, we customized and embedded a Buzzsprout podcast player directly on the website, allowing visitors to listen to our podcasts from the web player.

This web player provided two main outreach benefits - listeners spend more time on our website with its dedicated episode page. It also helps us optimize our content for search engines, also known as SEO, so potential listeners can easily find our podcasts via searches they make on relevant keywords around technician education.

In 2023, we plan to promote our podcasts on additional social media platforms, including the MNT-EC LinkedIn page [12] and Twitter accounts [13] which will include shareable content for our partners and allies to use.

In social media testing, we have studied and found widespread, well-trafficked hashtags helpful in driving traffic, and allow us to reach the largest audience possible. We have also found that directly encouraging or inviting our network (partners, professional connections) to "Like, Comment or Share" our posts yields higher engagement. Social media is constantly changing as an entire category and on each individual platform. For example, we adapt methods based on what works on LinkedIn, an image and two paragraphs of text, but we would only post the image and not the text on Instagram. We continue to learn what works on social media and change, adapt as necessary to gain more listeners, and encourage audio content sharing.

In addition, we have a prominent section in the MNT-EC Monthly Update emails, which features our podcasts in each issue. This outreach email is sent to over 3,200 subscribers and is one of our most successful ways of gaining listeners [14].



An audio file of each episode was also uploaded to YouTube.com as a static video (which means it shows one image for the entire episode). Although YouTube is known mainly as a video platform, there is data that shows it is a popular way for people to find and listen to podcasts [15].

One of the standout features, and possibly the most important for our learning and growth as a producer, is Buzzsprout's analytics and tracking capabilities [16]. These analytics provides detailed insights into listener demographics, engagement, and other metrics, allowing the Talking Technicians team to understand our audience, what they like and dislike, and improve/customize our content accordingly.

Methods

Finding Guests

Podcast guests were solicited and selected based on a few criteria. All guests were required to have a degree or certificate from a community or technical college and to work or have worked as a technician in an advanced technology field. Besides these two criteria, guests were selected based on their identities belonging to a group under-represented in technician education and the advanced technological workforce. The identities shown below are not exclusive to each other. We are all unique individuals, and podcast guests could identify intersectionality with multiple identities.

Table 1. Solicited Podcast Guest Identities

Gender	Race	Family Background	Language	Ableness	Nationality
Female	Black College Student	First-Time	ESOL	Differently Abled	US Immigrant
Non-Binary	Latino or Latina Indigenous	Single Parent			

Our goal is to ensure under-represented voices in the technician workforce are shared and heard. When we searched for guests to interview, we outreached to guests with at least one or more of the identities listed in Table 1. We believe we met this goal, but guest self-identification data was not collected or solicited. This work has made us consider a more complete demographic scan of interviewees. We plan to collect this data in future seasons with the guidance of the MNT-EC External Evaluator.

Methods to secure guest contacts included emailing MNT-EC PIs, emailing MNT-EC partners, emailing community college colleagues, asking about guests during online meetings, and seeking out former students. Guests were also solicited from previous guests. We asked each guest after the recording session if they could suggest anyone else for the podcast.

Tech Check

Before recording, each Podcast guest ran through a “tech check” with the Talking Technicians Podcast Program Manager. The guest’s audio quality, internet connection speed, and stability during the tech check were evaluated to ensure a high-quality recording. The tech check also provided guests the opportunity to ask questions about the podcast recording before it started. Depending on the guest, tech checks took 10-20 minutes over Zoom. Tech checks were completed a few days to a week before the podcast recording.



Recording

Each episode of the Talking Technicians Podcast was recorded over Zoom with a simultaneous local recording of the host using a handheld audio recorder.

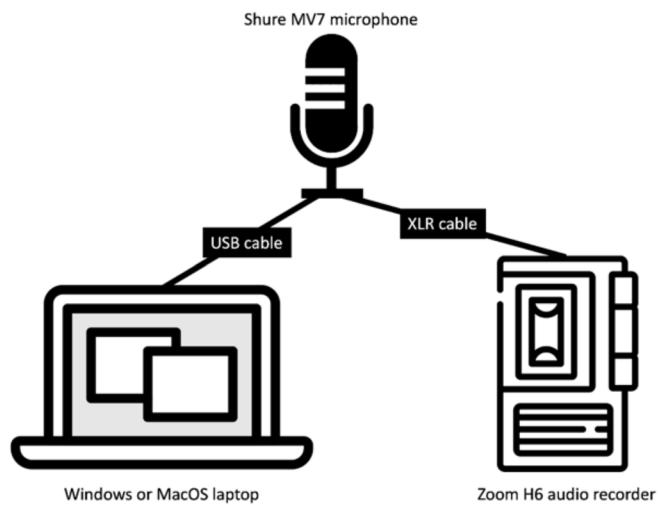


Fig. 1. Audio Signal Chain

The audio signal chain starts with a Shure MV7 USB/XLR dynamic microphone. The microphone was connected to a Windows or MacOS laptop over USB (USB micro-B to USB-C cable). The microphone was simultaneously connected to a Zoom H6 audio recorder using an XLR cable. The Shure MV7 microphone can output a signal over USB and XLR simultaneously. The audio setup produces a clean recording by the host in the Zoom H6 audio recorder and produces a backup recording of the host using Zoom. The guest's audio was recorded using Zoom only. The MV7 USB microphone was selected as the audio input by the host in the Zoom application. A pair of earbuds connected to the computer's audio jack was used as the host's Zoom audio output. This audio setup allows the host to talk with the guest over Zoom. Figure 1 above details the audio signal chain.

Zoom recording settings used when the podcast episodes were recorded shown in Figure 2. A key option to enable when recording podcasts over Zoom is to “Record a separate audio file of each participant.”

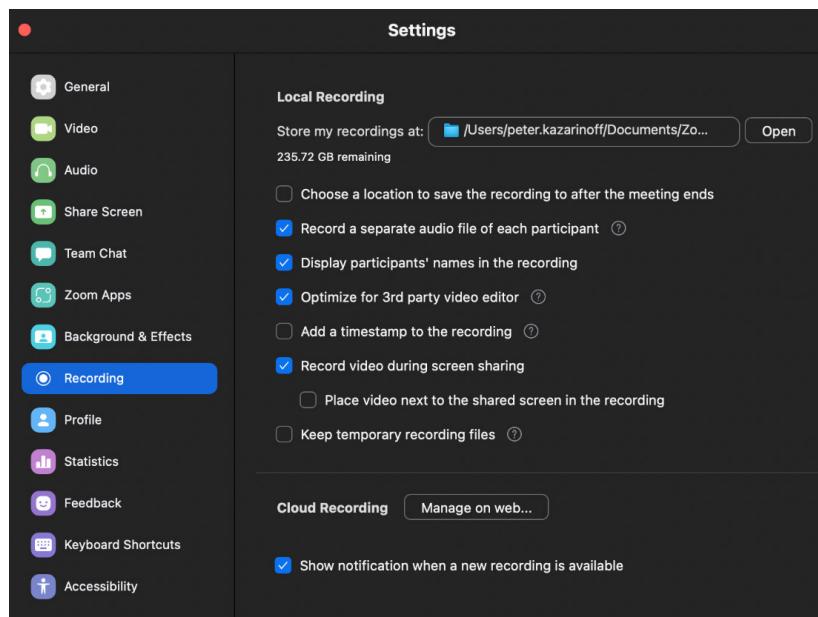


Fig. 2. Zoom Recording Preferences



Zoom audio settings included enabling “Original sound for musicians” and “High-fidelity music mode”. Zoom audio preferences used for podcast recordings are shown in Figure 3.

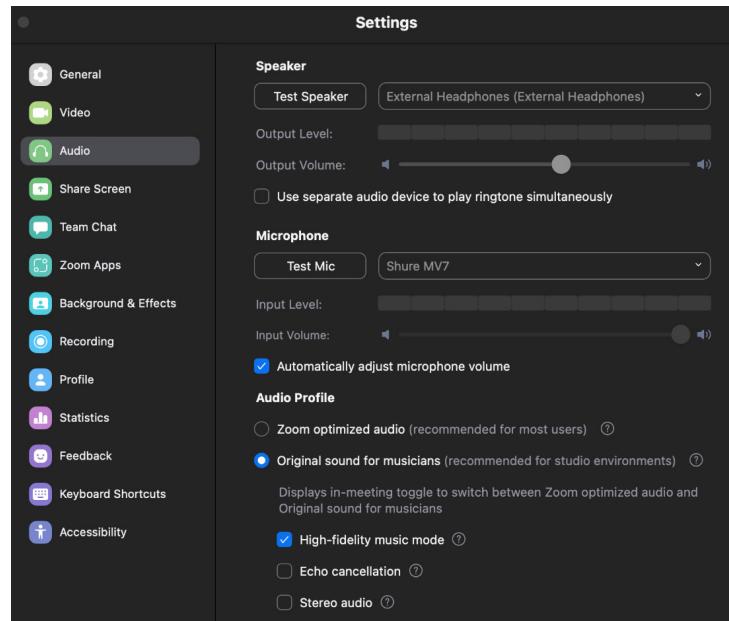


Fig. 3. Zoom Audio Preferences

Each podcast recording took around 20 to 30 minutes, depending on the episode. After recording, the episodes were edited.

Editing

Podcast episodes were edited to clean up the audio and make them easy to listen to and understand on various devices (phone speakers, earbuds, car speakers, etc.). Episodes were not edited for content unless a guest requested to re-do an answer or leave out a portion of the interview. Breaths, coughs, long pauses, “um’s” and “ah’s” were edited out when necessary to increase intelligibility. Podcast episodes were edited with Adobe Audition version 2022 on a MacOS or Windows Laptop. An example Adobe Audition Project is shown in Figure 4. The podcast episodes were edited in multi-track mode at a 44100 Hz sample rate and a 32-bit depth.

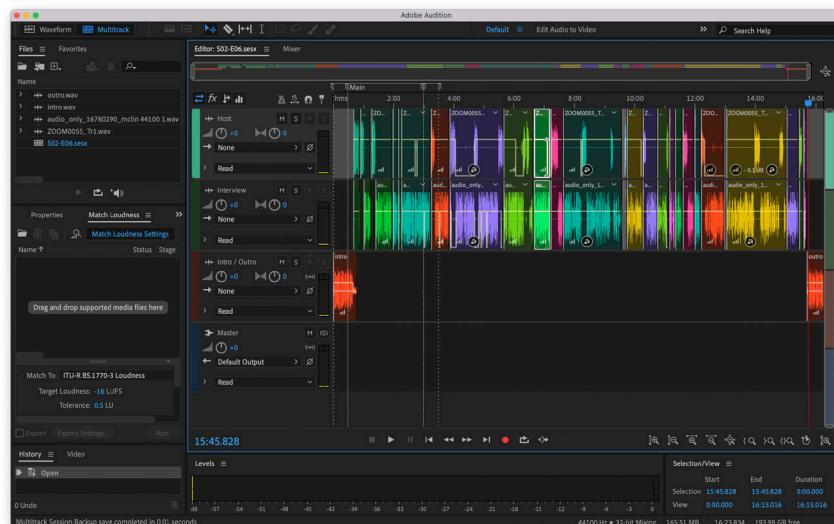


Fig. 4. Adobe Audition Audio Editing Software



The podcast intro and outro were added to the beginning and end of each episode. The intro music is from Stream Beats [17], and the song is called Ambient Gold. The outro message was based on the outro message of the Future of Work podcast [18]. Each podcast audio recording differs slightly based on ambient noise, recording environment, and other variables. A general set of audio effects were applied to increase intelligibility, remove harshness, and ensure the podcast episodes were easy to listen to on a variety of devices.

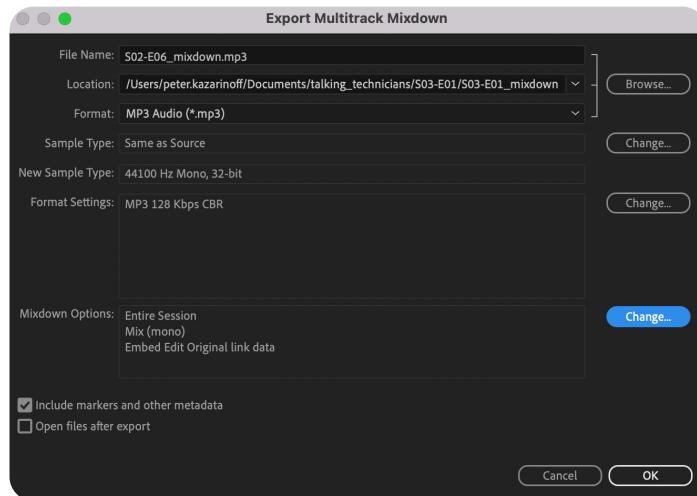


Fig. 5. Adobe Audition Export Settings

Audio Editing Effects Order:

- Noise Gate: -40db Threshold
- Parametric EQ: Adobe Audition 2022 Vocal Enhancement Preset
- De-esser: Frequency 9.2k, Threshold -40db
- Compressor: Threshold -16db, Ratio 3:1, Attack 10ms, Release 100ms, Makeup gain 8db
- Limiter: -1 db

After audio effects were applied, podcast episodes were normalized to a target loudness of -16 LUFS. After editing, each podcast episode was exported from Adobe Audition as a mono .mp3 file. The Adobe Audition export settings are shown in Figure 5.

Publishing

Otter.ai [19] was used to construct text transcripts of each episode. After transcription, manual checking and editing were completed to ensure accurate transcripts of each episode. Finally, transcripts were exported from Otter.ai as .txt files.

Podcast episodes were uploaded and hosted on buzzsprout.com [7]. Buzzsprout's Magic Mastering service [20] was applied to each episode. A description was added to each episode that included links related to the episode.

Video versions of the podcast episodes were converted from .mp3 audio files and a single .png image using a custom Python script [21] and ffmpeg [22]. The single .png image used to create .mp4 videos was 1920 x 1080 pixels. The custom .png image for YouTube export is shown in Figure 6.



Fig. 6. Single .png image used to produce .mp4 video files from podcast .mp3 audio files.

The basic ffmpeg terminal command used to convert .mp3 audio files into .mp4 video files is below:

```
ffmpeg -loop 1 -i image.png -i audio.mp3 -c:a copy -c:v libx264 -shortest video.mp4
```

Ffmpeg, a command line tool, used to modify and convert video files, was installed using the conda package manager [23] into a custom conda virtual environment. Conda is a virtual environment creation and management tool used in the Python and Data Science ecosystem. A virtual environment is a stand-alone isolated collection of software separate from a computers system tools. See the audio-to-video git repository for more information [24].

Results and Discussion

Publishing Platforms

Buzzsprout has distribution agreements with almost every major podcast platform, such as Apple Podcasts, Spotify, Google Podcasts, Stitcher, iHeartRadio, TuneIn, Alexa, Overcast, PocketCasts, Castro, Castbox, and Podchaser. This is an excellent way for us to increase the visibility of our podcast.

The podcast was also published to the Micro Nano Technology Education Center (MNT-EC) YouTube Channel [25] and shared on the MNT-EC website [1].

Website Analytics

As of January 2023, there are 3.02 million podcasts produced with 150 million episodes, with an average of 50 episodes per podcast. We use these data points to help us estimate what constitutes success and, frankly, survival rates for podcasts [26].

Education podcasts are the second most popular genre, with approximately 450,000 unique podcasts (not episodes) in existence. Although we were not able to segment down into the STEM niche and find specific data for comparison, we know that overall podcasting is growing in popularity, with 82 million people reporting they listen to or are aware of podcasting. We aim to continue growing our download count and track how many people listen to our episodes. We are also interested in where listeners are enjoying the Talking Technicians podcast in the US or globally. For example, we know international students return to their native countries but continue to have ties to the US in various ways. Some of those listeners may also be US citizens now residing abroad and working for a multinational corporation [26].

Since launching the Talking Technicians Podcast on December 31, 2020, the podcast has had 626 “views” from 415 unique visitors on the MNT-EC Website [27]. Google Analytics reports clicks on various parts of the site as “views” and not listens as most podcast platforms. The overall listening time for podcast episodes via the website is only 30 seconds, but between views and listen time, the podcast is at number nine of the most visited pages on



the site. It also is helpful to the overall mission of the site and delivers other engagements, and has driven over 2,100 “events” or actions/clicks to other areas of the site, again part of why it is consistently in the top ten list of valuable pages for the site.

Traffic (User) data on the MNT-EC website begins December 2020; however, MNT-EC started publishing static videos with audio only to YouTube.com. Therefore, Seasons One and Two of YouTube Data are reflected from May 2021 to July 2022.

YouTube Analytics

Overall, we have 24 episodes uploaded to YouTube as audio-only files with a total of 549 views. The view count data point, however, does not tell the whole story as they resulted in almost 27 hours of total listening time impact. Of those hours, the average listen time per episode is only two minutes (with a range of listens from just under one minute to over 7 minutes average per episode) [25]. But, again, this does not provide a complete picture as those 24 episodes received nearly 12,000 impressions on the YouTube platform (for people who searched for us or found us in suggested video lists) and contributed 60 clicks through to the MNT-EC Website from May 2021 to July 2022.

Podcast Analytics

As mentioned above, the Talking Technicians podcast was made available on the listening platform, BuzzSprout, starting in December 2020. In addition, BuzzSprout also cross-lists the podcast on several other listening platforms, including Apple Podcasts, Spotify, iHeartRadio, etc. [28]. In the first two seasons, the podcast was downloaded over 1,160 times across various platforms. The graph below shows the top five listening platforms plus an accumulation of all other platforms available to BuzzSprout.

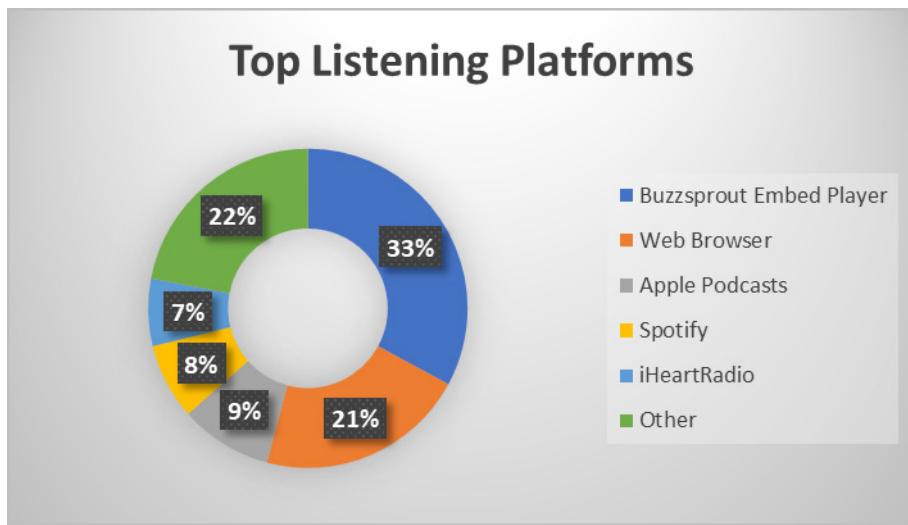


Fig. 7. Top Podcast Listening Platforms

The web browser data could be accounted for by the fact that the podcast is listened to through the MNT-EC website embedded player and in other countries outside the United States. MNT-EC has the BuzzSprout player embedded into its website, where people can listen to the podcast. The top five Talking Technicians episodes on BuzzSprout provide us with early data for later comparison and evaluation when we connect with other STEM Podcast producers. The top five episodes downloaded are shown in Table 2 on the following page.



Table 2. Most Popular Podcast Episodes by Number of Downloads

Episode Number	Episode Title	Number of Downloads
S01-E01	Laser Technicians at Lawrence Livermore National Lab	114
S02-E02	Antonio is a technician at Lawrence Livermore National Lab	85
S02-E03	Cristian is an electron microscopist	81
S02-E06	Linzee is a technician at Intel	67
S01-E12	Welcome back Geovana, Amalia, and Danil!	66

The total number of downloads for each episode is shown in Figure 8 below. Most of the downloads for each episode happen within the first seven days of publication. After the first week, download activity for each episode decreases. This decreasing trend is something that appears to happen naturally with other podcasts and online media like YouTube videos (Looking at Nano-Link YouTube [29] and MNT-EC YouTube pages [30]).

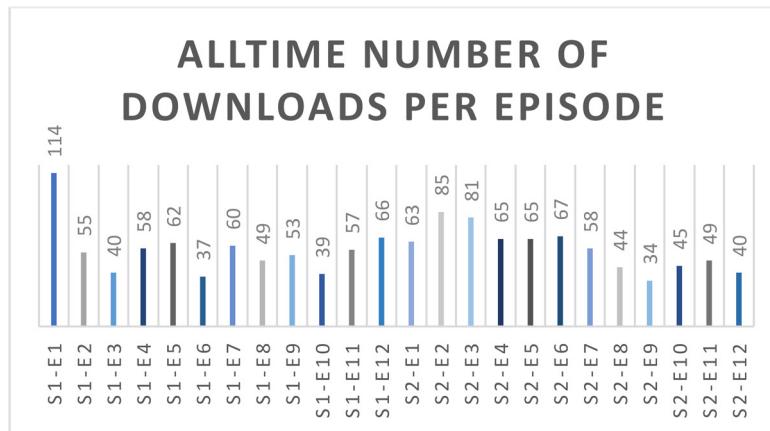


Fig. 8. Podcast Downloads Per Episode

Guest Demographics

A core value of the Talking Technicians Podcast is sharing voices from diverse working technicians. Table 3 below shows the identities of the podcast guests during the first two seasons.

Table 3. Podcast Guest Gender Identity

	Number of Guests
Male	17
Female	11
Non-Binary	0



In season one, we interviewed five technicians who were immigrants. Listening to their stories of what they had to go through to become technicians was of interest to the authors. One story stands out, a woman from Brazil came to the United States with her husband. They came because he had gotten a job with a US-based company. In her home country, she was a pharmacist. When she came here, she had to start all over with her schooling. However, she loved being a pharmacist back home and was doing HIV research. She didn't speak much English, so she went to school to learn and also took some other classes so she could apply for pharmacy school. She gave up on pharmacy school, and she chose to pursue an AAS degree in Bioscience Technology. She then got a job at Intel and now loves her job. She explains in the episode how nervous she was and how she wasn't sure if she could do it. Sometimes we forget just how different things are for other people and listening to that episode can put things into perspective for us.

Technician Responsibility Trends

By reviewing the text transcripts of the 24 podcast episodes, themes, trends, and contrasts emerge. For example, some technicians were recent graduates, and only a few were in the workforce for 30 years or more. When the podcast guests were asked what kinds of things they did at their jobs, there were quite a few recurring topics with some key differences between large companies, those with 1000+ employees, and small companies, those with less than 100 employees. Small company technicians did everything the large company technicians did, plus other responsibilities as outlined in Figure 9. Some top items that emerged were preventative maintenance, communication, and teamwork.

We don't have the data to compare wages, but we do know that those working for a company in a higher cost-of-living area tended to start with higher wages than those who lived in a lower cost-of-living location. Benefits were another thing that kept coming up for the technicians at the larger companies. Again – we don't have the data to compare wages or benefits between the two groups; however, the technicians that did tell us about benefits said they were a huge plus for them and their families if they had one.

Nonetheless, all the technicians we interviewed talked about continuous learning opportunities and supportive environments at work.

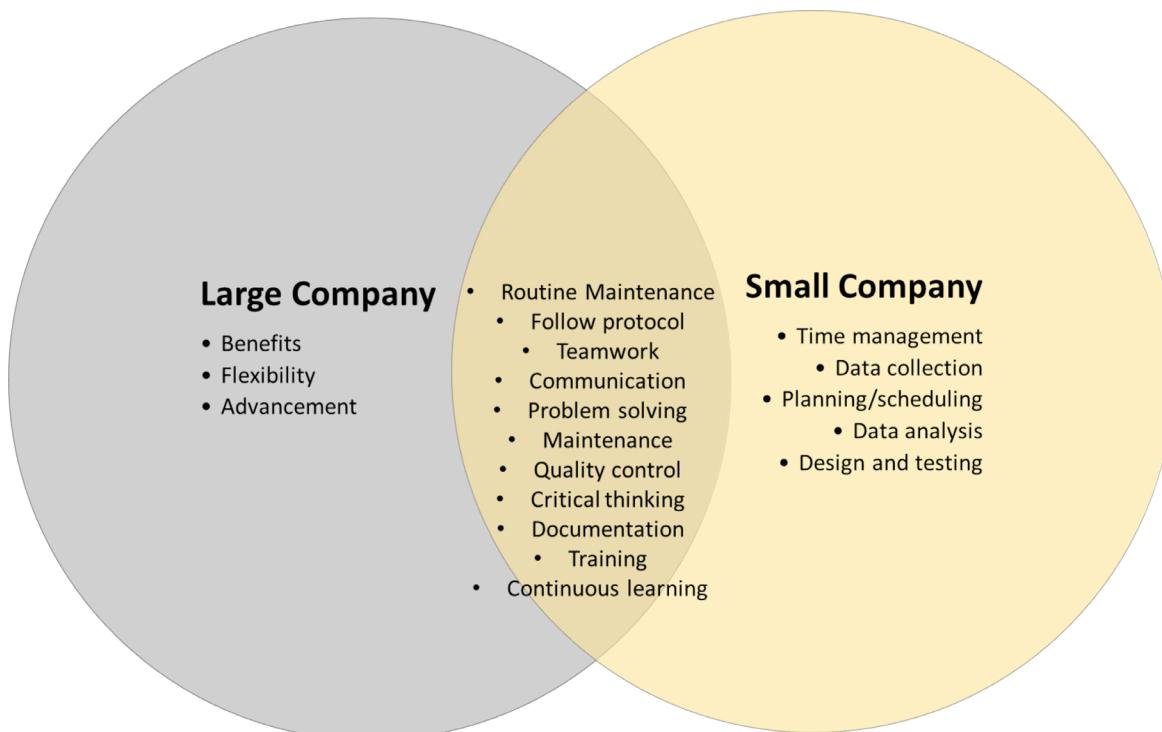


Fig. 9. Venn diagram showing the responsibilities that technicians at a small company have compared to technicians at a large company.



Takeaways for Community College Students and Faculty

Over the course of two seasons and 24 episodes of the Talking Technicians Podcast, we find five takeaways for community college faculty and students:

- Working as a technician is a rewarding career that can help people in direct and indirect ways
- Technician jobs are living wage jobs. Most jobs included benefits such as health insurance and retirement.
- Working as a technician can be a life-long career or the start of a career that can lead to more advanced roles.
- Becoming a technician can be a transformational experience. It allowed some guests to buy a house, send their kids to better schools, go on vacation, or not have to worry about how to pay the next bill.
- All technicians noted that future students or career changers should consider starting a community college program and encouraged others to just dive in and get started.

Conclusion

The Talking Technicians podcast is driving awareness of technician education and technician careers. The podcast has seen growth for MNT-EC's dissemination in audio and video compared to plain text on a webpage. Podcasts are more compelling as an audio stream. Generally, it is a great format that drives how you can share information and the people you can reach. This work shows people listen to podcasts on YouTube as well as podcast players on mobile devices. The Talking Technicians podcast goes where people are: listening to audio or watching/listening video. Podcasts allow us to hear and feel the emotion of the presenter and the guest. We can focus on the words better and are not distracted by looks, body movement, or the environment around the individual or group. As a result, we are more in tune with what is being said and more likely to be fully engaged with the person speaking.

Further study could include if and how partners have integrated the podcast in the classroom, either in their lesson plans or by teaching students to make their own podcast. In addition, it would be interesting to survey the MNT-EC partners to see who is using podcasts; and to record more demographic data from each podcast interviewee.

Acknowledgements. This work was funded by the National Science Foundation under DUE ATE #2000281. The Talking Technicians Podcast would not be possible without the hard work, dedication, and support of Janet Pinhorn, Program Manager for the podcast. Reaching out to guests, scheduling tech checks and recording times, following up with guests, and answering email questions were all part of Janet's essential work. The Talking Technicians Podcast would not be possible without Janet.

Disclosures. The authors declare no conflicts of interest.

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