

California Polytechnic State University, San Luis Obispo

Practical Podcasting:
A Technical Guide to Producing Studio-Quality Podcasts

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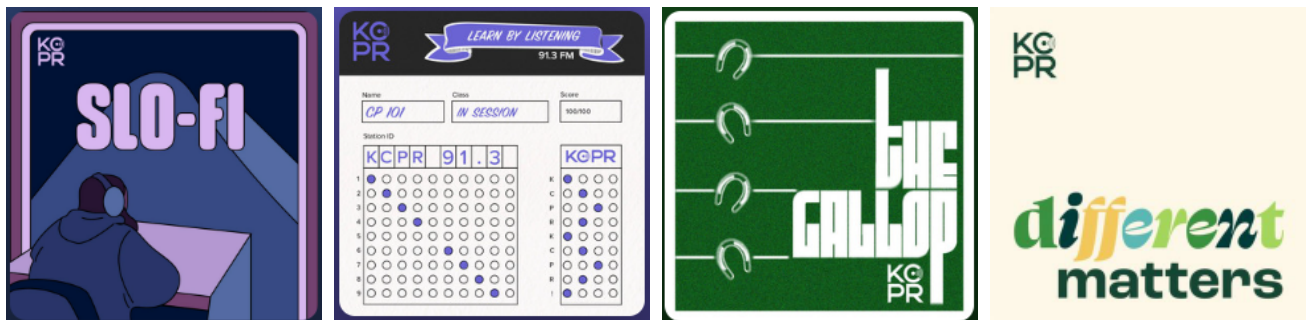
LAES 462: Capstone Senior Seminar in Liberal Arts and Engineering Studies

Dr. Michael Haungs and Dr. David Gillette

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1. Introduction

Podcasting exists at the intersection of the technical aspects of audio engineering and disciplines such as journalism and story-telling. Podcasts at KCPR, the student radio station, cover a wide range of topics including the soundscape of the DIY music scene in San Luis Obispo (SLO) on *SLO-Fi*, the intricacies of navigating SLO on *Cal Poly 101*, the best of Cal Poly Athletics on *The Gallop*, and the voices of underrepresented populations on campus on *Different Matters*.



Figs. 1-4: From left to right, the cover art for each of the podcasts produced by KCPR.

SLO-Fi, CP 101, The Gallop, and Different Matters

KCPR utilizes podcasts to entertain and inform its audience of the various experiences possible as a Cal Poly student. As a student-run entity, KCPR depends on the student body for volunteers to produce and host podcasts for the station. Incoming podcast producers may come from various audio production backgrounds ranging from beginner to experienced. Despite this, there is no formal training for these incoming students. *Practical Podcasting* endeavors to provide a basic background into the more technical aspects of podcasting by teaching users fundamental techniques and

processes for recording, mixing, mastering, and production. In comparison to existing resources for these audio disciplines, *Practical Podcasting* consolidates information often found scattered across different sources into one document that will level the playing field, such that all podcast producers have an understanding of the fundamentals of these audio disciplines. With this knowledge, it is the hope that the podcasts produced by KCPR will be able to compete with professional podcasts in terms of audio quality.

2. Product

Practical Podcasting is a technical guide about the best practices for recording, mixing, and mastering studio-quality audio for podcast producers at KCPR. As such, the guide mentions specific hardware and software that is used by the radio station and the students who work there. Despite the creation of the guide for this specific audience, much of the information contained within is general and can be adapted to more general audio production applications like music or film. The guide is intended to be used in tandem with an Adobe Audition template to help streamline the episode creation process by providing a linear sequence to proceed through recording, mixing, and mastering. In addition, *Practical Podcasting* strives to be accessible to users of different operating systems by providing different processes to follow for Mac and Windows.

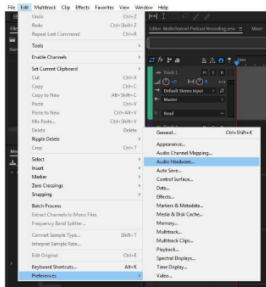
The guide begins with a brief forward intended to give the reader some background into why *Practical Podcasting* was created, the topics covered within, and recommended third-party software to streamline the episode creation process. Next in the guide, are some crucial steps about preparing your laptop to record, which have been split into two sections: one for Windows users and one for Mac users. These sections include pictures that detail specific menu paths and window navigation to aid the user in ensuring proper settings and connection to the recording interface.

Preparing to Record

Before you record, there are a few things you should do to set up your laptop for a successful recording session. This section will vary depending on your operating system. The RODECaster is most compatible with recording into Adobe Audition, so that is what this guide will cover.

Windows

1. Download the latest ASIO4ALL driver from <https://asio4all.org/about/download-asio4all/>
2. Download the "Podcast Interview Template" from the KCPR Podcast OneDrive and save it to the following location.
 - a. Documents > Adobe > Audition > 22.0 > Session Templates.
3. Open Audition and go to the following.
 - a. Edit > Preferences > Audio Hardware.



Recording

Getting a good recording is the most important step to achieving a studio-quality sound. With good recordings, you will have to do minimal audio restoration which will minimize your time spent editing.

Setting up Mics

1. Plug XLR cables into the mic and the RODECaster. The male end of the XLR goes into the interface and the female end goes into the mic.
 - a. The RODECaster is the primary interface used by the KCPR podcast team due to its four inputs, more than any of the studios at the station.
2. My personal preference is to number the mics from left to right and plug them into the corresponding channel on the interface.
3. Proximity effect is a phenomenon in recording that has to do with how far away the microphone is from a source. Proximity effect exaggerates the lower portion of the frequency spectrum captured by the microphone. The closer to a source, the more this effect is exaggerated which can create a fuller sound. The further away a mic is from a source, the audio will sound more hollow and more room characteristics will be captured.
 - a. To make the best use of the proximity effect, have all folks be about a fist's distance away from their mic.

Fig. 5-6: Screenshot of the referenced sections, preparing to record and recording.

Once the user's chosen device is properly set up, *Practical Podcasting* continues on to the first major section: recording. In this section, it is emphasized that the greatest contributor to studio-quality sound is a good recording. The guide continues through the recording process touching on topics such as mic setup, the proximity

effect, setting microphone levels, recording into a digital audio workstation (DAW), recording a back-up, and finishes with some advice from previous podcast producers that may be useful to readers.

The largest portion of the guide is concerned with mixing which, in turn, corresponds with the most time consuming part of the episode creation process. The mixing section covers the definition of mixing, what constitutes a good mix, audio restoration, signal processing effects, and volume control. Among these, important tools like equalization (EQ), compression, reverb, and panning are discussed along with their function within the mix.

Mixing

Probably the most time-consuming portion of the episode. This is the meat of what you will be doing. Mixing is the process of blending tracks in a way such that the best of each track comes together into the master mix. I am using mixing in a broad sense to include everything from exporting files from the RODECaster microSD, to audio restoration, and using effects. Mixing is subjective and is ultimately up to the ear of the engineer. There are a lot of different ways to achieve a good mix. The best advice I can give for achieving a good mix is to listen to a lot of podcasts. Find things you like that you want to try to emulate and things you don't like that you want to try to avoid. This is known as finding reference tracks in the broader world of audio engineering. Some personal favorites of mine, if you have no clue where to start, are *Renegades: Born in the USA* and *Sound Barrier* which are both accessible on Spotify. This section is about using your judgment to modify audio to what you think sounds good. Don't worry if that sounds like a lot of pressure, you have a team working with you and giving you feedback!

Mastering

Mastering is the glue that will hold everything together. A good master will elevate the quality of the mix and prepare it for distribution. This portion, while still subjective, I would argue is much less subjective with mixing. There are a few concrete goals you want to achieve with a master.

1. If you missed it at the end of the mixing section, the first step to a good master is to TAKE A BREAK! Give your ears time to rest and recoup.
2. Make a new session and import your reference audio tracks along with your mix.
3. Solo your mix and take a good analytical listen for mistakes, things you don't like, or anything else you want to change.
4. Use a mastering compressor, like the one in Izotope's Ozone 9 Elements, to lightly compress the cut. You're aiming for 1-2 dB of gain reduction.
5. EQ the cut to match the tone qualities of your reference tracks.
6. Use a limiter to increase the loudness of your mix. You want 2-4 dB of gain reduction at the loudest points.
7. Use a meter to determine the loudness of the mix. Make sure it is an appropriate loudness and dynamic range. A unit called a loudness unit full scale (LUFS) is the standard method of determining this. Aim for -14 LUFS.
8. Export your final, mastered cut! Once it's approved you're done!

Figs. 7-8: Screenshots of the mixing and mastering sections.

Finally, the guide covers mastering. Mastering is the final step of the episode production process and acts as the glue that holds the episode together. *Practical Podcasting* includes a definition of mastering and some tips for creating a good master.

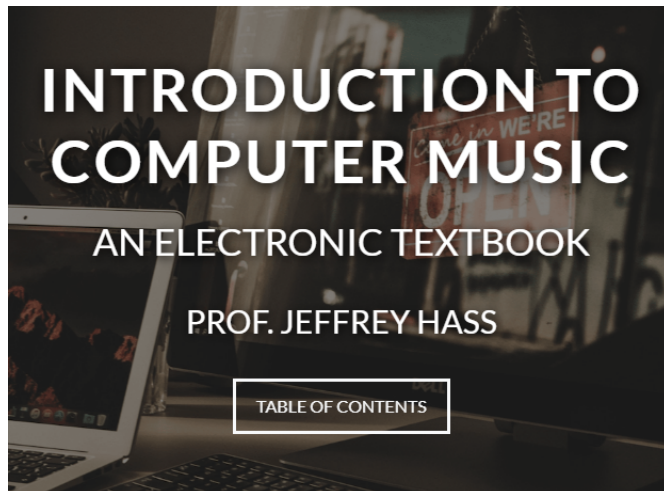
The guide is organized in such a way that it follows the natural process for episode creation. This helps with the readability of the guide, as the reader will not have to jump between sections to find the information they may need. The information is instead readily available at each stage of the episode creation process.

3. Background

Practical Podcasting was assembled based off of the author's experiences editing ten podcast episodes over the course of the 2022-2023 school year. One such episode "Honeyboys", the pilot episode for *SLO-Fi*, was nominated for Best Podcast at the Intercollegiate Broadcasting System Awards 2023. As the pilot, the quality was not the best, but was still recognized nationally. The quality has improved with each episode, culminating with "Noise Ordinances in San Luis Obispo, with Repeater", as the author developed best practices and processes in the Cal Poly way: Learn by Doing.

In addition to this experiential based learning, much of the technical information was synthesized from resources provided in the sound design sequence of classes at the university. One of these was *Introduction to Computer Music* by Jeffrey Hass. This textbook was the required textbook for MU 311 - Sound Design: Technologies. The textbook was an effective addition to augment students' learning of the course objectives: developing an understanding of acoustics, psychoacoustics, and their application in music production; operation of a music studio including configuring standard studio equipment like microphones, audio interfaces, MIDI

controllers, and monitors; recording different instruments and utilizing MIDI sequences; demonstrate understanding of basic digital audio theory and history; and finally, utilizing each of the previous course objectives to prepare a music track (Kramer, *MU-311*). As it pertains to *Practical Podcasting*, information regarding proximity effect and signal processing from the textbook are included in the guide. The other of these was *Mixing Audio: Concepts, Practices, and Tools* by Roey Izhaki. This textbook was required for MU 312 - Sound Design: Recording. The course objectives for this class were as follows: design sound for multimedia, understand the basics of electricity, develop the skills of critical and analytical listening, record live audio for a variety of instruments, perform audio restoration, and mix audio (Kramer, *MU-312*). The textbook provided a more nuanced perspective of the mixing process, what defines a perfect mix, and tools such as EQ, compression, panning, and reverb. These perspectives found their way into *Practical Podcasting*.



Figs. 9-10: Covers of the two textbooks used as primary research materials.

4. Design

Much of *Practical Podcasting* was constructed based on notes taken by the author detailing his processes as he endeavored to produce the final few podcasts for the year.

These notes provided the structure for the guide.

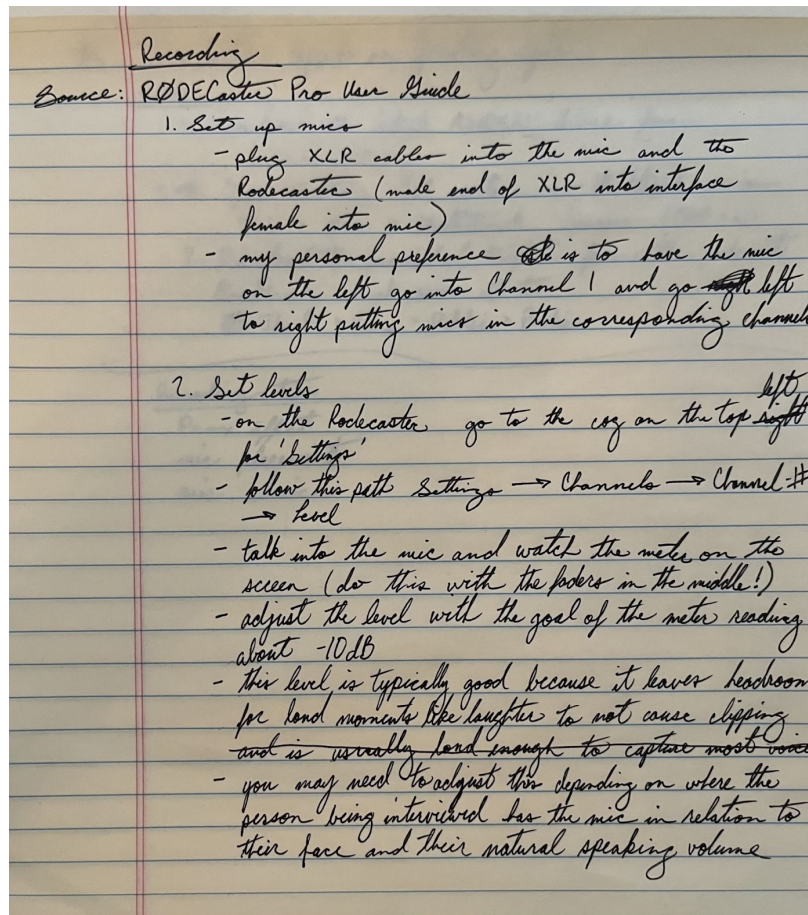


Fig. 11: Production process notes from the author.

In addition to the author's notes, conversations with and questioning the different podcast producers at the station helped to determine the content within the guide. The questions and their generalized answers were as follows:

What was their editing process? It was found that the general processes utilized by each podcast producer, were similar and in line with other podcast production guides.

What information was necessary or helpful to know at each stage in the creation of a podcast episode? These tips were included in *Practical Podcasting*, typically, as forewords or final thoughts concluding the major sections.

What were some audio concepts that could be helpful to utilize at different points in the production process? Topics such as proximity effect, microphone placement, panning, and reverb were added to *Practical Podcasting* before the final draft.

The questions were asked as part of a continuous process of collaboration and brainstorming.

One of the author's concerns for the project regarded its scope. In the initial ideation stage, the author considered making a comprehensive guide about how to make a podcast, from deciding the content of the podcast, to the audio editing and distribution of episodes. When taking notes during the production of the last podcast episodes, the author quickly realized that limiting the scope to just audio engineering

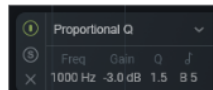
processes with an audience of future KCPR students was not only better for the project, but necessary to keep the guide from ballooning in size.

Like many guides, *Practical Podcasting* includes color pictures to help illustrate steps in the production process that may be difficult or confusing to explain with text alone. These pictures are screenshots of what the user following the guide should be seeing on their screen, accompanied by the specific step in text that they reference. Early drafts of the guide omitted these, and often garnered feedback that the guide was hard to follow or understand. The pictures were able to mitigate this confusion and make the guide easier to follow and understand.

1. Put a high-pass filter at about 150-250 Hz to help mitigate plosives.



2. Use a 3 dB cut at around 1000 Hz to help reduce the nasally sounds in a voice.



3. Use a 3 dB cut around 5000-7000 Hz to help reduce sibilance.

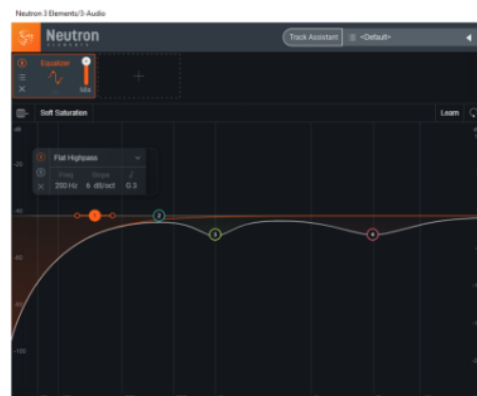
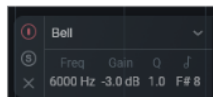
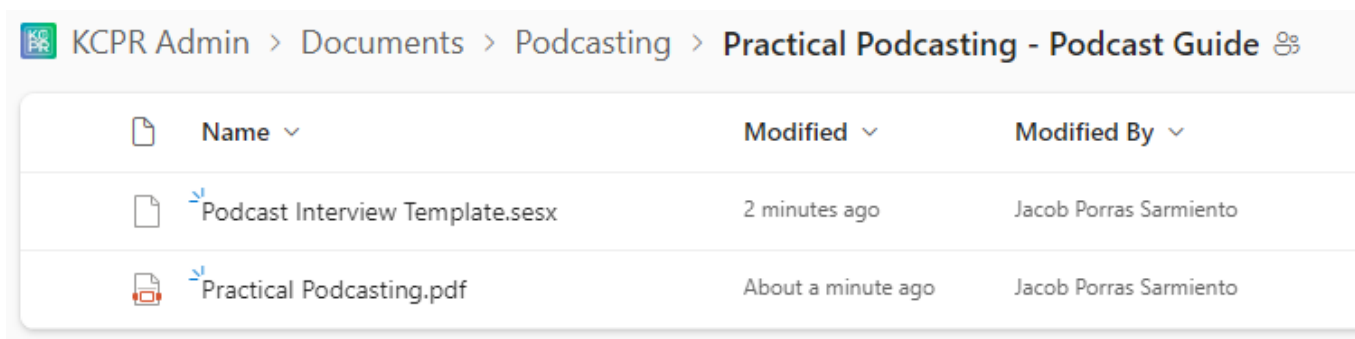


Fig. 12: An example of pictures used to help illustrate the use of EQ.

The author chose to use a very conversational, narrative tone with *Practical Podcasting*. As all students are volunteers, ultimately, users are working at KCPR for fun. Despite this atmosphere, the station is also used by many students as a resume-builder for those that want to pursue careers in radio, audio, or journalism. The tone of *Practical Podcasting* seeks to emulate the culture at KCPR, while providing information that would allow them to learn the skills necessary to pursue careers in audio.

5. Implementation

Practical Podcasting will live, in perpetuity, in the KCPR Podcasting OneDrive. This location was chosen for its accessibility with the target audience, KCPR podcast producers and others within the station with an interest in audio production. It will be available for the next generation of podcast producers at the station to use as soon as they join and are granted access to the OneDrive.



Name	Modified	Modified By
Podcast Interview Template.sesx	2 minutes ago	Jacob Porras Sarmiento
Practical Podcasting.pdf	About a minute ago	Jacob Porras Sarmiento

Fig. 13: The file path for the location of *Practical Podcasting* within the KCPR OneDrive.

One of the podcast producers that contributed to the user testing of *Practical Podcasting* was hired by the station as the podcast team manager for the 2023-2024

school year. They appreciated the new resource for the team and will recommend it to incoming hires at KCPR.

6. Analysis and Verification

The primary method for analysis and verification was expert testing. The experts who gave feedback on *Practical Podcasting* were Patti Piburn and Dr. Laura Kramer. Professor Piburn is a faculty member of the Journalism Department at Cal Poly and is the faculty advisor for KCPR. With experience as a journalist since 1995, and as an educator since 2006, Professor Piburn acted as the product owner role in an Agile project management method of development. Professor Piburn gave approval on the final draft saying, “WOW! This is great”. Dr. Kramer was the sound technologies professor at Cal Poly until September 2022 when she took a position at Pennsylvania State University. In addition to teaching, Dr. Kramer has an extensive resume as a performer and composer with credits going back over a decade. When asked for feedback on the final draft, she said, “What a great idea and resource. This looks fantastic”.



Patti Piburn
To: Jacob Porras Sarmiento



Laura Kramer <laura.m.kramer@gmail.com>
To: Jacob Porras Sarmiento

Hi Jacob,

WOW! This is great.

What a great idea and resource. This looks fantastic

Figs. 14-15: Feedback from Professor Piburn and Dr. Kramer.

In addition to expert testing, the guide was informally tested by podcasting producers and peers at KCPR as part of an ongoing series of brainstorming sessions and discussions. These test groups were asked if the structure of *Practical Podcasting* aligned with the production processes they followed, if there was any content that was useful for specific sections in the guide, and if there was any content missing from the guide that would be helpful to cover. Following these informal discussions, their feedback was incorporated into revised drafts. A prime example of this feedback concerned the addition of pictures to the guide, “I think pictures help a lot for [demonstrating] where to find the buttons ... if this is new-user friendly but it’s so organized!!” This piece of feedback prompted the addition of pictures to help demonstrate where to find settings, how to navigate menus, and what plug-in settings can look like. In addition to these specific questions podcasting producers and peers were asked for general comments and feedback. One said of the final draft, “It looks amazing! You should be so proud!”

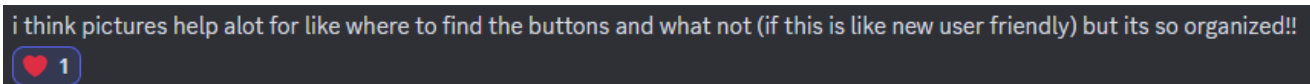


Fig. 16: User feedback.

With positive feedback from subject matter experts and peers alike, *Practical Podcasting* succeeds in its goal to be a resource for incoming podcast producers of varying skill levels.

7. Interdisciplinary Connections

Podcasting is inherently an interdisciplinary art form that takes technical elements from the field of audio engineering and production and integrates them with story-telling and journalism. The interdisciplinary nature of podcasting allows it to act as a bridge to connect a variety of different audiences through common interests or experiences. *Practical Podcasting* at its heart, strengthens this bridge by developing standard practices for episode production that, in turn, improve the overall quality and consistency of episodes. This quality and consistency may allow for better audience retention and a broader fan base for podcasts produced with the guide in mind. With stronger connections, listeners are enabled to grow and better themselves through exposure to new thoughts, ideas, and experiences.

In addition to the inherent interdisciplinary aspects of podcasting itself, audio engineering is an interdisciplinary field as well. Audio engineering integrates the fundamental elements of music, acoustics, and psychoacoustics with electrical engineering topics including, but not limited to, the construction of filters, digital signal processing, and electronics manufacturing. One of the great surprises of the author's studies at Cal Poly was how closely topics like digital signal processing were intertwined with music. For example, in the sound technologies sequence one of the first things taught was about sampling theory which covered the Nyquist Theorem, aliasing, and even covered Digital-to-Analog Converters (DACs). All of these topics

were also covered in the first few weeks of the digital signal processing class. While not necessary in the course of becoming a professional audio engineer, an understanding of the theory that goes into signal processing, that an electrical engineering background provides, is a definite complement to traditional audio technology curriculum from a pure music program.

8. Related Work

One of the references used in the creation of *Practical Podcasting* was *The Ultimate Podcast Production Guide* made by iZotope, a well-regarded company in the audio engineering industry, responsible for creating some of the most widely-used plug-ins to streamline the production process. One of the largest differences between iZotope's guide and *Practical Podcasting* was the emphasis the iZotope guide placed on the planning stage of podcast creation. The first section of the iZotope guide focuses on determining subject matter, target audience, format, name, monetization, length, schedule, and script planning.

How to Plan a Podcast

1. [Define what your podcast is about](#)
2. [Choose your target audience](#)
3. [Select your podcast format](#)
4. [Name your podcast show](#)
5. [Podcast monetization](#)
6. [Ideal podcast length and release schedule](#)
7. [Test your format with an informal dry run](#)
8. [Outline and plan your script](#)

How to Record a Podcast

- [Set up your room for success](#)
- [Select microphones and pop filters](#)
- [Choose an audio interface](#)
- [What to record your podcast on](#)
- [Select a DAW](#)
- [Choose the right podcast accessories](#)
- [Podcast recording techniques](#)

How to Edit Podcast Audio

1. [Edit your podcast content](#)
2. [Clean your podcast audio](#)
3. [Podcast sound design](#)
4. [Mix and master your podcast audio](#)

Learn more about podcast production and audio cleanup

- [Learn from iZotope RX tutorials](#)
- [Learn from professional audio engineers](#)

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Figs. 17-18: Side-by-side comparison of the structures of the iZotope guide (on the left) and *Practical Podcasting* (on the right).

The audience for the iZotope guide is also different from the audience for *Practical Podcasting*. The iZotope guide assumes an audience that is at a complete novice level with audio production and no pre-established audio hardware or software. This differs from the *Practical Podcasting* audience in a few ways. While *Practical Podcasting* has a novice user in mind as well, KCPR has access to both audio hardware in

the form of microphones and a high-quality interface, audio software in the form of a discount for Adobe Audition, a well-respected digital audio workstation (DAW), and is working on a company subscription to Descript, an extremely helpful transcription software. *Practical Podcasting* also goes into a much greater depth for each of the major sections of recording, mixing, and mastering. In addition, all the information for each of these is contained within *Practical Podcasting* while the iZotope guide provides hyperlinks for deeper exploration of topics and techniques. The structure of both guides is very similar, likely for a similar reason: both follow the natural episode production process of recording, mixing, and finally, mastering. Overall, both ultimately accomplish the similar goal of providing the user with best practices for podcast episode creation that will increase the quality of the user's work.

9. Future Work

One of the things that the author would definitely do, with more time to commit to the project, would be to create a printed version of *Practical Podcasting* beyond simply printing out the pdf. An analog version of the guide could possibly increase connection between the guide and the user and allow them to have more ownership in their own episode production process by writing notes in the margins.

While *Practical Podcasting* succeeds in the development of technical skills pertaining to the audio editing portion of episode creation, the guide could go further as a complete guide to podcast content creation. Additions to the guide could include

how to plan and write a script, creating show notes, promotion and marketing, developing audience engagement, distribution, and monetization. The guide could also include the importance of collaboration, networking, and forming relationships in creative industries such as audio.

Finally, it might be helpful to go much more in-depth with the topics discussed within the guide. *Practical Podcasting* only scratches the surfaces of the disciplines of recording, mixing, and mastering in an effort to quickly provide the knowledge absolutely necessary to develop content for KCPR.

More testing would have to be done to determine if *Practical Podcasting* would still accomplish what it sets out to do with the addition of more journalistic and marketing topics, more in-depth discussions of the audio engineering techniques used in episode creation, and a printed version.

10. Conclusion

Podcasting is an interdisciplinary field that can be used to connect people over shared interests and experiences. Podcasts utilize story-telling and journalistic elements in tandem with sound design techniques to share their information and entertain their audiences. *Practical Podcasting* successfully fills the need at KCPR for a more in-depth introduction to podcast production and can serve as a tool that the station can use until the information becomes obsolete. It can also serve as a foundation upon which future podcast producers can build on and expand as better

practices are found. Subject matter experts and peers alike believe that the guide is a strong, valuable resource for its target audience. With the techniques contained within the guide, up-and-coming producers will be able to enhance their skills with audio engineering in the Cal Poly way of Learn by Doing to build their resumes and develop portfolios in preparation to enter the audio industry. In addition, many of the topics and techniques within the guide can be utilized for sound design applications other than podcasts. Improved consistency and sound quality for KCPR podcasts may allow for better audience retention and a wider fan base with whom to share information and entertain, while generating more traffic for the station as a whole. As a result, KCPR continues to remain relevant to audiences, building community and maintaining its reputation as a fixture in the culture of the Central Coast.

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