

# RESOURCES FOR AT-HOME PERFORMANCE AND PEDAGOGY

## Home sound setups don't have to be scary!

The aim of this document is to introduce equipment and software that can be used for at-home performance, pedagogy, collaboration, and creation.

Please note that the University of Virginia has no affiliation with any of these companies or websites. These are recommendations only, and not requirements for your teaching.

We have visited each recommended website and had no issues but cannot warrant the safety of the websites or freedom from malware.

This list is provided in June 2020 as an aid during the unprecedented time of COVID-19 lockdowns, social distancing and virtual learning.

This information has been compiled from many sources including the websites of Sweetwater, B&H, Neumann and AudioTechnica.

Please feel free to share with students, colleagues, etc.

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## BASIC LINGO

**Volume** = decibel output

**Gain** = Gain refers to the level of something at the *input* stage, before it's been processed. A microphone preamp's gain turns up the *input* signal of the microphone to a recordable level. While gain does increase volume, it's a fundamentally different concept.

**Preamp** = The word preamp can mean two things: a) the preamplifier circuit within any device, or b) a dedicated external device containing such a circuit. The purpose of a preamp is to amplify low level signals to line level, i.e. the "standard" operating level of your recording gear. Microphone signals are usually way below the nominal operating level, so a lot of gain is required, usually around 30-60 dB, sometimes even more. So you need a preamp for just about any sound source. But this doesn't have to be an external device. Most audio interfaces already come with built-in preamps. And usually, they're good enough to get you started. It's worth noting, however, that somewhat more expensive audio interfaces come with much better preamps than entry level audio interfaces.

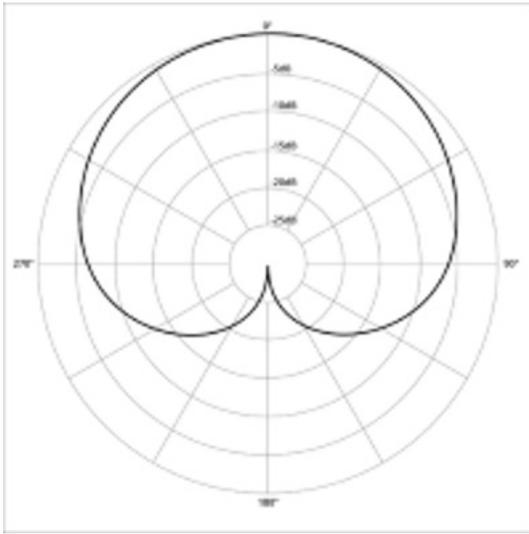
**Audio interface** = An audio interface is a piece of hardware that expands and improves the sonic capabilities of a computer. Some audio interfaces give you the ability to connect professional microphones, instruments and other kinds of signals to a computer, and output a variety of signals as well. In addition to expanding your inputs and outputs, audio interfaces can also greatly improve the sound quality of your computer. Every time you record new audio or listen through speakers and headphones, the audio interface will reproduce a more accurate representation of the sounds. They're an absolutely essential component in computer-based audio production. They're used for recording music and podcasts, and in video post-production for recording voice-overs and sound design.

# MICROPHONE LINGO

- 1) Polar pattern
- 2) Diaphragm
- 3) Dynamic / Condenser / Ribbon

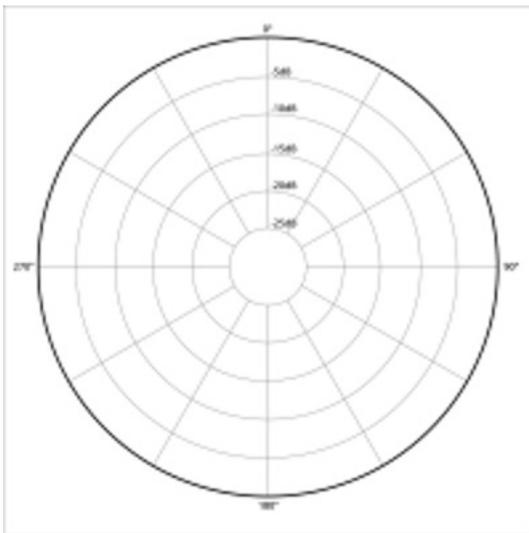
**Polar Patterns** describe how microphones pick up sound, where they 'listen' and which positions are blocked. The patterns are labeled cardioid, omni, figure-8, and shotgun.

## Cardioid



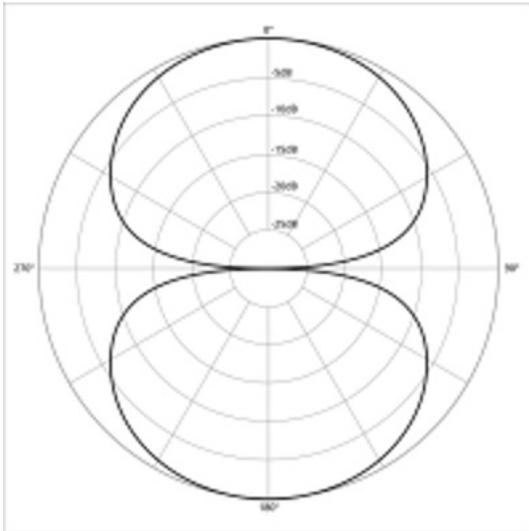
- Cardioids capture sound in front, which allows an isolated sound source regardless of ambient sound.
- These are ideal for live performance.
- Commonly used to mic loud instruments.
- Mic position when speaking and singing into cardioids is very important.

## Omnidirectional



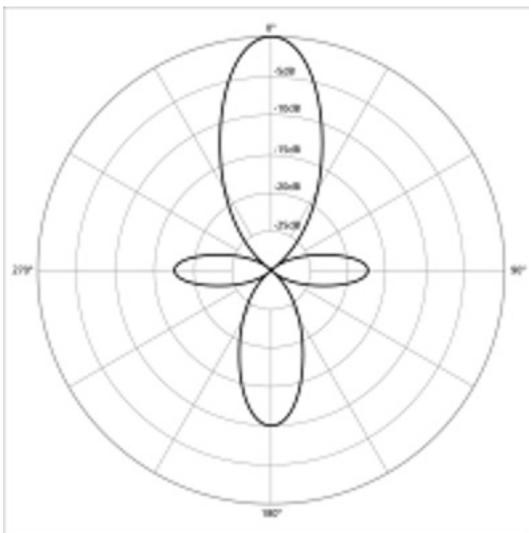
- Omnis capture sound from all angles.
- Since they are non-directional, omnis give a more natural sound.
- Used in large spaces with great acoustics, and for live recording of multiple instruments.
- Unsuitable for loud and noisy spaces.

Figure-8



- Figure-8s capture the sound of both the front and back.
- Ideal for stereo recording and for capturing two or more instruments.
- Similar to omnis but with sound rejection on sides.
- Commonly used on ribbon mics and on some large diaphragm condenser microphones.

Shotgun (also called Line and Gradient)



- More directional than cardioids.
- Used for theatre, and as overhead mics for choirs and drum set.

A **Diaphragm** is a thin membrane inside a microphone that vibrates when it comes into contact with sound. The diaphragm converts acoustic soundwaves into electrical energy.

The size of the diaphragm affects how the microphone handles pressure, which translates to sensitivity, dynamics, and internal noise levels.

*(The distinction in diaphragm size is common only to condenser microphones, according to Neumann.)*

## Large Diaphragm



- They are extremely common on modern USB mics.
- Very versatile.
- Excellent for vocals and spoken word.
- Often used for solo instruments.

Larger diaphragms are capable of sensing more vibrations. The more vibrations that are captured will result in a more accurate representation of the original sound.

Large diaphragm membranes move easily, which allows them to react to differences in pressure and results in a “natural” sound.

## Medium Diaphragm, also called hybrid



- These are non-essential for a home studio or small venue.
- They are touted to sound similar to large diaphragms while retaining some of the high frequency content that small diaphragms could.

## Small Diaphragm, also called pencil mics



- Typically used for piano, acoustic guitar, stringed instruments, drum kit, percussion, when live.
- Used for almost anything when recording.
- Provides very detailed sound.
- Excellent for use in pairs if you want stereo.

Small diaphragms tend to be stiffer and can handle higher pressure. They can handle a wide dynamic range without distortion.

The three most commonly found types of microphones for music are:

**Dynamic Moving Coil**

**Dynamic Ribbon**

**Condenser**

You can find all three kinds of mics with XLR or USB connectivity. USB powered versions don't require phantom power, which a lot of people like.

### **Dynamic**

These mics have a moving coil magnetic diaphragm and work very well for loud sounds without worrying about distortion. They aren't only for loud settings, they just excel in them.

### **Condenser**

Condenser mics have a thin diaphragm that sits close to a metal plate. They require phantom (external) power, either through batteries, a mixer or an external power box.

### **Ribbon**

The light metal ribbon takes the place of a diaphragm. It is very sensitive and gives a dark, "natural" sound. They work very well for higher frequencies. They often need a mic activator like a Cloud Lifter (\$149) to boost the gain and cannot be used with phantom power. They are fragile, require careful care, and generally not recommended for beginning recording enthusiasts.

# **EQUIPMENT RECOMMENDATIONS**

## **Audio Interface**

\$500–\$1,000

UAD Apollo Twin USB (\$899) — similarly great preamps and fidelity plus added bonus of the amazing UAD plugins.

Apogee Duet USB interface (\$649) — much better preamps and overall fidelity

Under \$500

Focusrite Scarlett 1818 3<sup>rd</sup> gen (\$399)

Around \$100

Focusrite Scarlett audio interface 2i2 3<sup>rd</sup> gen. (\$109)

## **Microphones**

NB. Many personal recording devices, like Zoom's H-series, are able to be used as an external mic in addition to personal recording devices.

Buying used microphones is tricky and not usually recommended unless you know you're getting it from a reliable source who will disclose any damage or drops that the mic has sustained.

Used mics from Sweetwater:

[https://www.sweetwater.com/used/categories/microphones-wireless/condenser-microphones?query=&page=1&sort=price\\_asc](https://www.sweetwater.com/used/categories/microphones-wireless/condenser-microphones?query=&page=1&sort=price_asc)

Used mics from Musicians Friend:

<https://www.musiciansfriend.com/microphones/open-box#narrowSideBar>

## **Dynamic mics**

Under \$400:

Sennheiser MD421

Around \$100:

Shure SM57

Under \$50:

Shure PGA48

## **Condenser mics**

More than \$500:

Warm Audio's Neumann clones – WA87 (\$599) and WA47 (\$899) are excellent at a fraction of the cost of new Neumanns (U87 \$3600) (U47 \$4,000)

DPA microphones are really incredible, particularly for live use. These are tiny condensers that can be mounted on instruments at the bridge or bell, etc. The DPA 4099 core (\$619) can be purchased with different mounts for different instruments and are very detailed.

Around \$500

Avantone CV-12 (\$499)

Warm Audio WA14 (\$499) is a fantastic mic, clone of the AKG c414 (\$1074) which is industry standard and extremely versatile.

Around \$100ish

Audio Technica AT2020

Around \$50

Blue Snowball Ice (about \$50, USB out so should be plug and play for most)

Under \$50

Shure SM48LC

## **Ribbon Mics**

Around \$1,000

Royer R-121 (\$1165)

Under \$300

Avantone CR14

Under \$200

Cascade Fat Head

Under \$100

MXL R144

## SETUP RECOMMENDATIONS

### **ACOUSTIC GUITAR**

Acoustic guitars when not amplified have a softer sound with immersive nuances. These types of instruments require the fidelity and quality of large diaphragm condenser mics. You can also go for a well-placed Cardioid condenser mic or Figure-8 pattern ribbons depending on the situation and noise level. Finally, setting up an extra small diaphragm mic will work wonders in capturing the higher frequencies that sometimes get lost when acoustics are plugged in or mic'd directly up front. A recommended setup for acoustic guitar is something like a Neumann km84 pointed at the 12<sup>th</sup> fret and large diaphragm pointed towards the sound hole.

### **BRASS**

Brass instruments should be mic'd from several feet away from the bell; if you mic too closely, you will lose the character of the horn. The wavelengths do not stop at the end of the bell, but actually up to 14 inches beyond the bell. Close-mic'ing only works if you want isolated sounds, or if you manipulate in post-production. An advantage of this setup is that it avoids room interference.

Brass instruments respond best with large diaphragm condenser or ribbon mics.

Record in a medium or large room if you are able.

Set up your mic in front of you, not behind.

*Additional thoughts for horn players:*

In a natural setting, you don't hear the horn's direct sound, you hear the sound reflected off surfaces behind the player. Depending on what kind of a recording you are making, you may need to think about this.

Start with the mic about six feet in front and five feet off the ground, aimed generally in the player's direction. Move further for more room sound, or closer for a brighter and more intimate tone.

Mic placement tips for brass from Audio Technica:

<https://blog.audio-technica.com/basic-recording-techniques-tips-recording-brass-instruments/>

### **CHAMBER**

Varies based on the ensemble.

String Quartet:

<https://blog.audio-technica.com/basic-recording-techniques-small-ensemble/>

Brass Quintet:

<https://www.gearslutz.com/board/remote-possibilities-in-location-recording-amp-production/93051-recording-brass-quintet.html>

Wind Quintet:

<https://www.gearslutz.com/board/all-things-technical/437467-woodwind-quintet-recording.html>

## **ELECTRIC GUITAR**

Close mic'd guitar amplifiers are as loud, sometimes louder than drums, and require mics that can handle high SPL (sound pressure level). Your best bet is a cardioid or hyper cardioid dynamic mic positioned in front of the amp speaker. A second condenser mic can be used if you want a warmer sound or to capture some of the room.

## **HARP**

<https://www.dpamicrophones.com/mic-university/how-to-mic-a-harp#:~:text=A%20common%20placement%20is%20to,bass%20or%20the%20low%20mids.>

## **PERCUSSION**

Dynamic cardioid mics for the snare, bass and toms

Small diaphragm microphones can then be used to capture the nuances of the hi-hat, ride and cymbals.

<https://www.soundonsound.com/techniques/session-notes-recording-percussion>

## **PIANO**

<https://blog.audio-technica.com/basic-recording-techniques-piano-sound/#:~:text=Position%20two%20AT4051b%20small%20cardioid,on%20the%20mics%20as%20well.>

## **STRINGS**

Place the mic one to three feet away from the instrument.

Position it out and up from the instrument.

Point it toward the f hole.

Large diaphragm condenser microphones (in a cardioid pattern) work well.

This covers all strings.

<https://blog.audio-technica.com/basic-recording-techniques-strings/>

Bass specific:

<https://www.sweetwater.com/insync/choosing-the-best-mic-for-upright-bass-with-sound-samples/>

Violin specific:

<https://consordini.com/violin-recording/>

## **VOICE**

For live vocal performances where stage volume can get loud and feedback suppression is important, the best choice is to use cardioid microphones.

Recording vocals on the other hand, large diaphragm condensers work best.

If you are going for a more vintage sounding vocal recording, use ribbon mics (if you can commit to their care) or dynamic mics.

Small diaphragm omnidirectional mics and shotgun mics can be used for capturing choirs and singing groups.

## **WOODWINDS**

Shure 57 and 58 microphones are very reliable options. The Shure beta series is even better and in a live ensemble situation the 57 is recommended over the 58 because of the tighter pickup pattern and less interference.

Flute

Aim the mic at the embouchure hole. Raise the microphone up too high, then angle it down—this makes sure you're not blowing into the mic itself.

Oboe, Clarinet, Soprano Saxophone

Aim at approximately your left hand or a little below. This works pretty well for bass clarinet, too.

Alto, Tenor, and Baritone Saxophones

Aim the microphone down into the bell, or just a little higher. DPA clip-ons work great in this setting.

Bassoon

Aim the mic to the center of the instrument.

## MISCELLANEOUS

### **TREATMENT OF YOUR SPACE**

You could have \$5K of gear but a room with hard, bare walls will still sound horrible. Expensive soundproofing foam isn't necessarily needed but something as simple as hanging blankets or having some material to absorb bass frequencies in room corners, using a rug, etc. can make a world of difference.

DIY sound absorbing panels can be very worth it: <https://acousticsfreq.com/how-to-build-your-own-acoustic-panels/>

### **EXTERNAL SPEAKERS**

<https://www.cmuse.org/best-speakers-for-classical-music/>

Some tips from Crutchfield:

<https://www.crutchfield.com/S-0II7WT2W8NT/learn/homeaudio/computer-music.html>

### **HEADPHONES/MONITORS**

<https://soundgearlab.com/roundup/best-headphones-for-classical-music/>

<https://headphonesaddict.com/best-cheap-headphones/>

## SOFTWARE RECOMMENDATIONS

In the following pages we outline some of the more useful and accessible software tools for various performing needs: audio editing, video editing, streaming, video conferencing, and (a)synchronous performance tools, as well as more specific needs like virtual accompaniment and notation software. If we have a specific recommendation for a need, it will be listed in bold.

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## **DAWs (DIGITAL AUDIO WORKSTATIONS)**

A DAW is either an electronic device or software, which is used for recording, editing and producing audio files. DAWs come in a wide variety of configurations from a single software program on a laptop, to an integrated stand-alone unit, all the way to a highly complex configuration of numerous components controlled by a central computer. Regardless of configuration, modern DAWs have a central interface that allows the user to alter and mix multiple recordings and tracks into a final produced piece.

DAWs are used for the production and recording of music, songs, speech, radio, television, soundtracks, podcasts, sound effects and nearly any other situation where complex recorded audio is needed.

**Reaper (\$60; free temporary license) – PC, Mac, Linux**

<https://www.reaper.fm/>

Logic Pro X (\$199) - Mac only

<https://www.apple.com/logic-pro/>

Soundtrap (\$8-14/month) - online cross-platform; useful for making beats, podcasts

<https://www.soundtrap.com/>

Other paid options - Ableton, Pro Tools, Audition, etc. (costs often significant; platforms vary)

Audacity (free) – Windows, Mac

<https://www.audacityteam.org/>

GarageBand (free) - Mac only; limited-feature version of Logic <https://www.apple.com/mac/garageband/>

Bandlab (free) - online cross-platform; collaborative emphasis; functions similar to GarageBand

<https://www.bandlab.com/>

Another great resource is Audiomovers, which can help you with collaborative editing projects (for instance, if you and your students are all collaborating on an editing project and you need to share audio back and forth, though it also does other things). (\$9.99/month or \$99.99/year) - DAW plugin - Windows, Mac, and beyond! <https://audiomovers.com/>

## **VIDEO EDITING**

It's very difficult to find an easy-to-use video editor. Most of the recommendations we received were for Adobe Premiere or for Final Cut, but both are expensive. We've also listed four free options that have full functionality but a steeper learning curve.

The final listing in this section, Handbrake, is an online video format converter, which may prove useful if your students send you videos in different formats which you need to combine into one file.

**Adobe Premiere (\$19.99/mo Creative Cloud educational plan) - Windows and Mac**

<https://www.adobe.com/products/premiere.html>

**Final Cut Pro X (\$299) - Mac only**

<https://www.apple.com/final-cut-pro/>

iMovie (free) - Mac and iOS only; limited-feature version of Final Cut

<https://www.apple.com/imovie/>

Lightworks (free; also exists in paid Pro version) - Windows, Mac, Linux

<https://www.lwks.com/>

OpenShot (free) - Windows, Mac, Linux

<https://www.openshot.org/>

Shotcut (free) - Windows, Mac, Linux

<https://shotcut.org/>

KDENLIVE (free) - Windows, Mac, Linux

<https://kdenlive.org/en/>

Handbrake (free online video format conversion tool)

<https://handbrake.fr/>

# **STREAMING PLATFORMS & TOOLS**

## **PLATFORMS**

If you want to stream a live performance, you'll need to select a platform on which to stream it. Facebook Live and YouTube Live are both extremely popular. You may want to use OBS when setting up your stream - you'll find it under Streaming Tools, below - or just work directly with the platform. Though it's most famous for gaming streams, Twitch has a live music streaming service as well, which may be useful if you're looking to reach the Twitch audience.

This is not an exhaustive list of streaming platforms, but it does represent three of the easiest options to use.

Facebook Live

<https://www.facebook.com/facebookmedia/solutions/facebook-live>

YouTube Live:

<https://preview.tinyurl.com/yazdrnbr>

Twitch:

<https://www.twitch.tv/p/en/stream/>

## **TOOLS**

OBS (free) - Windows, Mac, Linux; a tool to aid in live streaming - captures audio/video and integrates with many popular streaming services.

<https://obsproject.com/>

## **VIDEOCONFERENCING**

By now we're all far too familiar with Zoom, but there are a number of other popular and useful platforms available to you which are worth investigating if Zoom isn't getting the job done. Not listed because it's already ready to go on Apple products is FaceTime.

Microsoft Teams has a number of workflow tools available and also features tight integration with Office, which may prove useful if you're already an Office user.

### **Zoom:**

<https://zoom.us/>

### Skype:

<https://www.skype.com/en/>

### Facebook Rooms:

<https://www.messenger.com/rooms>

### Google Hangouts:

<https://hangouts.google.com/>

### Microsoft Teams:

<https://www.microsoft.com/en-us/microsoft-365/microsoft-teams/group-chat-software>

## **ENSEMBLE PERFORMANCE**

### **ASYNCHRONOUS PERFORMANCES**

Virtual Choir is a full-service option where the final video is professionally assembled from the materials you submit. It carries a correspondingly high price. The most popular production app is Acapella, which does streamline the process, but it has serious limitations on video length and isn't useful for large ensembles. The final, most difficult option, is to use a video editor to create your video performance. If you plan to use a video editor and don't already have advanced skills, start learning now!

**Virtual Choir** (\$20 per performer per piece, one-time \$500 institutional fee)

<https://www.virtualchoir.net/>

**Acapella** (free basic version; \$9.99 per month or \$47.99 per year) - iOS; more limited in application than Virtual Choir - 10 minutes max length; 9 max performer frames

<https://www.mixcord.co/pages/acapella>

### **SYNCHRONOUS, DISTRIBUTED GROUP PERFORMANCE**

The advice we've received on live collaborative performance at a distance is that the technical demands, especially on the internet connection, are large and unforgiving, and it is impossible to remove the effects of latency, making synchronous distributed performance most effective in musical styles that can absorb that latency effectively. Our recommendation is that we don't try it under these circumstances, but if you want to explore, your search can start and end with JackTrip (though we list two other options as well for completeness).

**JackTrip (free)** - Windows, Mac, Linux; extremely difficult to implement, but the best game in town if you want to try synchronous distributed performance. Start your exploratory journey with the following three links.

<https://ccrma.stanford.edu/software/jacktrip/>

<https://jackaudio.org/>

[https://docs.google.com/document/d/1YLX8NatB\\_Ktdr24LyVg7h\\_P3zwG1lh1D0A0e733mCYo/edit?usp=sharing](https://docs.google.com/document/d/1YLX8NatB_Ktdr24LyVg7h_P3zwG1lh1D0A0e733mCYo/edit?usp=sharing)

**JamKazam (free)** - online, cross-platform; reviews state this doesn't work well, and is virtually unusable with more than two musicians

<https://www.jamkazam.com/>

**Soundjack (free)** - Windows, Linux; much like JackTrip, with all the same problems

<https://www.soundjack.eu/>

## VIRTUAL ACCOMPANIMENT

The virtual accompaniment landscape is still developing. The resource you choose will largely depend on your repertoire needs. Vocalists will almost certainly select one of the voice-specific products. Wind and brass instruments may have most luck with Smart Music. String players may look to one of the per-track websites. Music Minus One is an old standby and most useful for extremely popular works. Many instruments have readily available, but non-customizable, accompaniments on YouTube.

Smart Music (\$80/year for teacher; \$40/year per student) - largely instrumental/band focus  
<https://www.smartmusic.com/>

Music Minus One (\$20-25 per volume or work) - largely instrumental  
<https://www.halleonard.com/search/search.action?seriesfeature=MMONE&dt=item#products>

Appcompanionist (\$10-15/month, depending on libraries selected) - voice only  
<https://www.appcompanionist.com/>

Virtually Vocal (\$15/month for teacher; \$10/month for student) - voice only  
<https://www.virtuallyvocal.com/>

Piano-Accompaniments.com (about \$10 per work) - live piano sound; wide library of instrumental works  
<https://www.piano-accompaniments.com/>

Piano Accompaniments Tracks.com (about \$3-5 per movement) - live piano, various tempi available; voice and instruments  
<https://pianoaccompanimentstracks.com/>

FindBach 4D piano accompaniments – live piano, the uses a pedal or space bar to vary the tempo of the accompaniment (\$19.99/year)  
<https://www.findbach.com/>

## NOTATION

For people who don't already have a preferred notation program and who have only temporary needs, MuseScore is free, used by many, and has decent functionality. You may also consider flat.io or Noteflight if their added tools (mostly with a strong pedagogical/collaborative emphasis) happen to meet your needs.

**MuseScore (free) - Windows, Mac, Linux, Chrome; fairly full-featured notation software**

<https://musescore.org/en>

Finale (\$350 for profs, \$99 for students) - Windows, Mac

<https://www.finalemusic.com/>

Sibelius (\$9.99 per month or \$149 perpetual license) - Windows, Mac

<https://www.avid.com/sibelius>

flat.io (free basic version or \$6.99 per month) - online cross-platform; interesting pedagogical tools

<https://flat.io/>

Noteflight (free basic version or \$7.95 per month) - online cross-platform; also interesting pedagogical tools

<https://www.noteflight.com/>