

# *You're An Instrument!:* Creating active music-making experiences through worldbuilding and storytelling

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Figure 1: Two scientists causing trouble.

## Abstract

This paper outlines the development and use of NIME supporting active audience participation within *You're an Instrument!*, an immersive childrens' theatre show that turns a planted audience member into a musical instrument. We outline the use of wireless gestural instruments in the show, exploring their novel use as hidden props and theatrical devices that help invite audience members into a fictional world. Through the creation of this fictional world, we illustrate how Digital Musical Instruments can be employed to build a narrative that may help to actively involve

audience members. This paper is a call for instrument designers to consider using worldbuilding and storytelling techniques to more actively engage audience members in discovering the workings of new instruments.

## Keywords

worldbuilding, instrument design, accessibility

## 1 Introduction

This paper outlines the use of a wireless gestural instrument, the AirSticks, in a novel theatre production involving musical interaction. We explore their novel use as hidden props and theatrical devices and as a tool to invite audience members into a fictional world where they participate in active music-making through storytelling. We discuss the development and key discoveries relating to this active audience participation in an immersive



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childrens' theatre show we created that revolves around a planted audience member being turned into a musical instrument.

Building on immersive theatre disciplines, we make the following proposal in the field of instrument design: worldbuilding and storytelling that involves the audience can provide a scaffolding that promotes more active audience participation and a new relationship with Digital Musical Instruments (DMIs).

## 2 Background

We first look to the discipline of 'immersive theatre,' as it is often called, to investigate how other practitioners go about defining and working with worldbuilding and storytelling that involves the audience participation, and to explore crossovers in musical disciplines.

The genre of immersive theatre has experienced a huge spike of popularity in the past decade, with the advent of a wide variety of theatre shows that espouse an intimate, choose-your-own adventure experience of theatrical spectacle. This popularity is in part due to Punchdrunk Theatre – a British theatre company known for pioneering the immersive style of performance where audiences interact with actors and explore elaborate set designs in non-traditional spaces. In 2011, Punchdrunk premiered *Sleep No More* [17], adapting Shakespeare's *Macbeth* as a film noir experience, allowing audiences to freely explore a multi-story set, discovering scenes and characters in a nonlinear fashion. In reality, this genre is a loosely defined and significantly broader concept beyond what many refer to as 'immersive theatre' or 'experience design.' As Burickson [5], the author of 'Experience Design: A Participatory Manifesto' puts it:

...the term experience design has been finding its way into the conversations of designers and artists and makers in an unexpected array of disciplines. It's not always clear what people mean when they use the term, but it's often met with an ah ha! look in their listeners. This is what I've been trying to do, they seem to be thinking [5].

The field of human-computer interaction (HCI) has also reflected on this concept through what is known as a diegetic interface, an interface that is integrated into the narrative or environment of a virtual space, allowing the participant's interactions to occur within the context of the story itself [14].

Specific to these kinds of works is the notion of 'immersion' in artistic experiences. We investigate below why techniques such as worldbuilding and storytelling that involves the audience are employed in art forms like theatre where active audience participation is used. Specifically, we will focus on three types of immersion Burickson [5] proposes.

### 2.1 Types of immersion

**2.1.1 Psychological immersion.** In a participatory experience, the narrative provides the clues or direction as to why an audience member might participate or take a particular action.

Despite these being fictional scenarios, the storytelling contributes to a shared knowledge within the experience that guides the audience to participate in concrete ways. Reason and Heinemeyer [20] call this kind of technique 'storyknowing,' and they have shown that storytelling workshops in diverse art forms have encouraged participants to develop storyknowing and intrinsic value through the process of inhabiting a story [20]. Of course,

literary fiction also serves to foster empathy and a kind of experiential knowledge, enhancing people's capacity to navigate complex emotional landscapes [10].

Burickson [5] would call this type of immersion 'psychological immersion' – being engaged in a personal manner as the experience develops. This in turn allows for a richer experience, as the audience personally relate to events that are occurring in the experience.

**2.1.2 Physical immersion.** 'Mise-en-scène' is a term used in cinema to describe all the worldbuilding elements found within the frame of a shot. It literally means "placing on stage," down to the smaller more subtle elements on a set like the colour of the walls or the paraphernalia on a bookshelf.

In a traditional theatre show or concert, the mise-en-scène could be said to be all the objects, props and theatrecraft that makes up the world that the actors or performers inhabit. This is often referred to as 'environmental storytelling' or 'spatial dramaturgy,' and is what Burickson [5] would call 'physical immersion.' In the case of music, the beer glasses on the stage beside jazz musicians and the low lighting could be considered to be the mise-en-scène of a gig, physically setting the scene and marking what kind of performance is about to happen.

**2.1.3 Ontological immersion.** Where worldbuilding really thrives, though, is in interactive, participatory theatre. In an immersive environment where the audience is placed within the bounds of the work not as passive bystanders but as active participants, mise-en-scène plays a different, more important role. The design of space and setting in immersive theatre goes beyond mere background, actively inviting the audience to explore and interact, thus contributing to the narrative and emotional depth of the experience.

Worldbuilding elements are crucial in immersive environments because they provide the sensory and narrative depth and detail that encourages audience participation [15, 19].

Machon [15] notes that worldbuilding improves 'sense-making,' or the way we understand the scenario of an interactive experience. Burickson [5] would call this type of immersion 'ontological immersion,' as we construct a personal understanding or narrative coherence of what we are experiencing. This in turn allows for a more rich experience, as the audience relates to things that are occurring in the experience.

For instance, in Punchdrunk's interactive VR work *Believe Your Eyes* (2017), the actor that appears in the VR experience subsequently appears in real life once the audience member has left the venue, breaking down the notion of the static VR work as a means of growing the audience's interaction with the work beyond the initial world they experienced. This multi-sensory engagement is central to immersive experiences, as highlighted in works by companies like Punchdrunk [15].

Here, the life of the work extends beyond the written dialogue or blocking, because the theatremakers have engaged in worldbuilding around the traditional frame of a theatre show. Retail services and customer-facing settings have already noticed this, demonstrating that storytelling and theatrical elements can significantly enhance engagement and creativity in service provision [12].

So far we have explored three types of immersion Burickson [5] puts forward – physical, psychological and ontological immersion. These techniques are closely related to broader techniques of narrative and worldbuilding. But what of these types of immersion have been explored in music composition and DMIs?

## 2.2 Related work

So far we have discussed the immersive techniques that centre around storytelling and worldbuilding in the context of theatre. To be clear, worldbuilding occurs already in music – when we attend a live concert, as Small [21] points out, even concert halls “...are highly specialized buildings, designed down to the last detail to house not just musical performances but performances of a very specific kind” [21]. That is, when we attend an orchestra concert, the narrative is that of attending with a group of like-minded people who are there to share in the consumption of a skilled performance, and the *mise-en-scène* is everything from the usher’s uniform to the plushness of the seats. In a sense, this is like ‘immersive theatre’ in that it has a very clear style and involves the audience in a very particular way. That being said, the fact that diverse performances take place in the same venue despite its consistent design, suggests that this aspect is not typically a concern for musicians or performers, and likely not for audiences either.

There are also comparisons to be made with immersive music projects in the digital space that use different forms of mixed and virtual realities, such as Laurie Anderson’s *Puppet Motel* [1] (an interactive CD-ROM), Pauline Oliveros’ *Rotating Brains / Beating Heart* [2] (a mixed reality performance) and Juan Carlos Vasquez’s *Ecstasy / Light / Inertia* [23] (an interactive gamified musical experience).

However, what we are interested in is how these immersive techniques apply to a more active audience experience in the context of a live performance and DMIs. That is, how can these techniques be used when audiences are active participants in the music?

Noting the spike in popularity of this genre in theatre, it is interesting to observe that the realm of participatory music hasn’t seen the use of these techniques as widely. That is, works such as Ferrari’s *SOCIÉTÉ 1* [11], Cardew’s *Scratch Orchestra* [6] and Louis Andriessen’s *Volkswed* [3] which involve audience participation, occur in the ‘world’ and narrative of a traditional concert hall or venue. They are immersive in the sense that some performers might surround the audience or break the fourth wall, but they are not immersive in that they usually share the same background context – the ‘world’ of functional musical performance.

It is worth noting that participatory music performances have of course been presented at NIME in the past, such as Carsen’s *Mesh Garden* [7], and DMIs have been utilised in several participatory music performances such as Machover’s *Brain Opera* [16]. But in many participatory music works we have attended, the lack of an explicit narrative around participation means that the reason or story behind why an audience member is contributing is because that is how the artwork functions. In immersive theatre, that is not the case due to the narrative drive and worldbuilding that occurs around the works – participation in this genre is not just because “that’s how it works,” but because the audience’s ontological, physical and psychological reality becomes that of the work.

Thus, we posit that music and DMIs stand to benefit from research that has already been conducted in immersive theatre disciplines. These techniques have been shown to be an effective means of increasing interest and engagement amongst audiences across a broad spectrum of artforms [15]. Worldbuilding and storytelling that involves the audience has been shown in above sections to increase active participation, and we extrapolate on this idea below using our own work as an example.



Figure 2: A trailer of *You're an Instrument!* DOI: 10.26180/25807339

## 2.3 Project Background

The AirSticks is a small wireless device, that can be worn or put into objects, which converts movement into sound. Utilising an IMU, data is transmitted via Bluetooth to a computer running our own custom software we call *AirWare*. The data from *AirWare* is then interpreted and sent via MIDI or OSC to music making software such as *Ableton Live*, *Max/MSP* or *Supercollider*. For a detailed technical overview see [22].

The instrument has been developed at Monash University’s SensiLab and used in hundreds of performances since 2013. The overall focus of the AirSticks project is to bring accessible music making experiences to the broader community. A detailed technical review of the AirSticks is beyond the scope of this paper. For more on the AirSticks as an Accessible Digital Musical Instrument (ADMI) see [13].

## 3 The show

In late 2022, the three authors were approached to present a kids’ workshop at Casula Powerhouse in Sydney, Australia as part of the Way Out West (‘WoW’) Festival for children and families. The workshop would involve the AirSticks as a means of helping children create music in a safe and enjoyable school holiday setting.

However, the recruitment of the second author (E) - a professional actor - and the development time we had available to us, meant the workshop slowly transitioned away from a workshop into a theatre show. The key foundation we wanted to achieve in the show was an interactive adventure that culminated in the children playfully making music together with DMIs. We ideally wanted to establish a rich and satisfying context for kids to play music, as opposed to some technology workshops we had witnessed previously which typically involved a hands-off, ‘play this’ approach. As development progressed, it became clear that the best way to achieve this would be through a show, not a workshop – thus *You're An Instrument!* was born.

The show has since been performed 59 times to 4,300 students, with a large focus on getting the show in front of children with Disability in regional areas. The show continues to be toured, including a season at the Edinburgh Fringe Festival 2025.

A trailer of the show can be viewed in Figure 2.

### 3.1 Plot

The show begins with a seemingly boring and conventional workshop on various music technologies, led by the first and third authors (C and A), who introduce themselves as researchers, wearing lab coats and using technical language. In the workshop, which spans the history of instrument technology both analogue and digital, the C accidentally reveals a twist: the existence of





**Figure 3: A showreel for *You're an Instrument!* DOI: 10.26180/25807336**

an experimental pill capable of turning humans into musical instruments.

C immediately attempts to hide this reveal on account of it being a dangerous experiment, but A, intrigued by the prospect of a human trial, advocates for an immediate experiment on an audience member. Following an ethical discussion and an agreement that the experiment could never be tried on someone under eighteen, consent is given by E, an audience member (and plant). E signs a waiver and takes the pill, but the experiment goes immediately wrong as he generates violent sounds and threatens destruction, against the researchers' wishes.

Chaos ensues, but E is calmed by the children's suggestions of gentle thoughts, realising that he can think of any sound and play it by moving his body. Buoyed by his newfound powers, he takes the audience on a wild musical adventure, generating novel sounds and visiting strange places through a virtuosic performance.

After the performance, though, he feels hollow – all E wanted to do was make music with other people. That wish suddenly manifests as it's discovered that he can in fact transform any ordinary object into a musical instrument simply by touching it. The culmination of the show features an impromptu ensemble performance with E and the children forming a band, as the children shake, dance and move instruments and AirSticks to create music together.

A showreel of *You're an Instrument!* can be viewed in Figure 3.

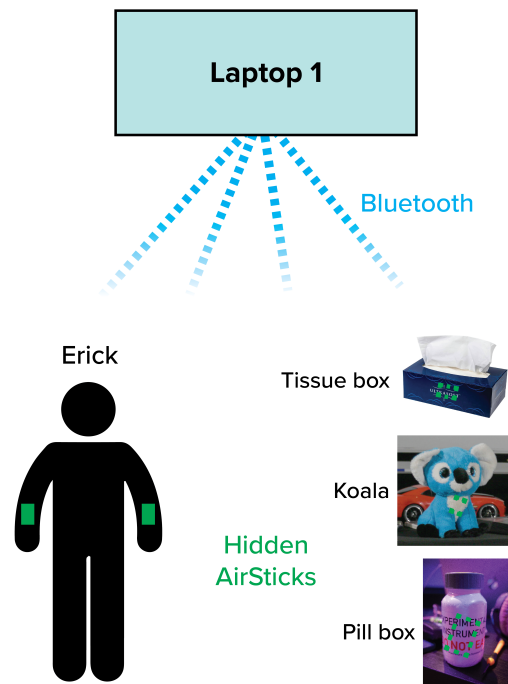
### 3.2 Technical and musical elements

The technical setup for *You're an Instrument!* allows for a seamless presentation of the above narrative. All AirSticks remain hidden throughout the show (until the Q+A at the end), creating the effect that E and the objects are creating sound through the pill technology.

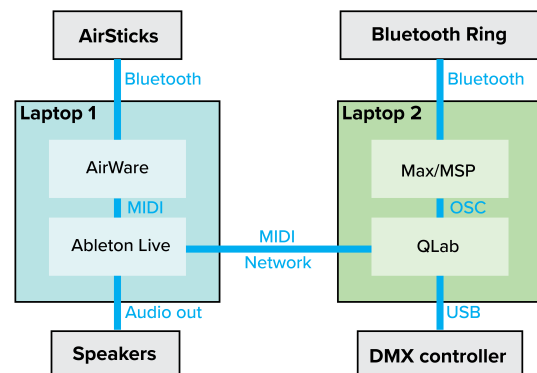
We use five AirSticks in total, utilising a combination of instrument mappings and cues to create the illusion that objects are turning into instruments (see Figure 4).

For instance, when E touches the tissue box (transferring his powers into the object), instead of moving the location of the AirStick, we simply fade out the AirStick mapping on E's right arm and fade in the AirStick instrument mapping from the tissue box.

In order to facilitate these cues, I trigger each change using a wearable Bluetooth scrolling ring<sup>1</sup> that advances through cues on a *QLab*<sup>2</sup> session on Laptop 2. The five AirSticks are all mapped to a single *Ableton Live* session on Laptop 1 through *AirWare*. The



**Figure 4: Hidden AirSticks in the show.**



**Figure 5: The technical layout of *You're an Instrument!*.**

*QLab* session sends MIDI triggers to Ableton over the network MIDI protocol. This *QLab* session also controls the changes for lighting states (using a DMX controller and 7 wireless LED tube lights) and the pocket smoke machine (using an RF transmitter) as shown in Figure 5.

## 4 Discussion

This discussion unpacks how narrative elements and worldbuilding contributed to a participatory musical environment that encouraged children to actively participate and play music in the show. In order to demonstrate this, we highlight four key moments in the show alongside research discussed in Section 2.1, that build towards the centrepiece of the show – the children in the audience making music.

<sup>1</sup>A reprogrammed TikTok Fingertip Page Turner, <https://www.amazon.com.au/Fingertip-Bluetooth-Control-Shutter-Scrolling/dp/B0B8SRCNKJ?th=1>

<sup>2</sup><https://qlab.app>





Figure 6: E loses control.

#### 4.1 The reveal

“Three, two, one... you’re an instrument!”

Up until this countdown in the show, the logical reality of the audience has operated in the same world they have in any other musical workshop. That is, the music-making technology used up to this point is known to all children, whether it be a snare drum, or a drum pad in *GarageBand*. The context or narrative of the show is one they are familiar with, having most likely taken part in educational workshops previously.

After the countdown, however, we enter a new reality where the experimental pill really has managed to turn a person into an instrument. E loses control – every time he moves, an enormous crunching occurs, as we map the smallest of E’s gestures to loud noises (see image in Figure 6). We also hear E’s thoughts, descending into him screaming “I could destroy this whole room!”

The impact of this moment was carefully designed to have the greatest amount contrast to the previous ten minutes of the workshop. The *mise-en-scène* changes immediately. The lights, which have been on a house white setting, suddenly cut off as if malfunctioning, and are replaced by a dramatic red wash. Lights on stage begin to flicker, smoke begins to rise from the scientists’ laptops, and a crunching sound rips through the speakers which have previously been unused in the show. This dramatic change signals that we have crossed the threshold into a reality very different from the traditional workshop moments ago.

The sound mapping itself uses an extremely sensitive movement threshold. Any accelerometer value changes over time, even an arm movement of a few millimeters, causes the triggering of multiple modelled, distorted synthesiser notes that create the effect of a malfunctioning experiment. We use two physical modeling synthesisers layered on top of a white noise generator, emulating a string instrument that is akin to the sound of scraping fingers on a blackboard. In fact, the reveal has had so much impact in the past that it has caused children to run out of the theatre or classroom, only to join back in moments later when the energy calms.

This reveal plays an important part in the show, because it immediately places the children in an alien environment, where seemingly impossible ideas are possible. By using a combination of lighting, special effects and a distorted AirStick mapping, we are intimating that this silly experiment of turning bodily movements into sound is real (the irony of this is that E is wearing technology that actually achieves this, a nice allusion towards the Clarke [8] observation that “any sufficiently advanced technology is indistinguishable from magic” [8]).

In this moment, we open the children up to the possibility of a new musical reality. Through the storytelling and scene-setting



Figure 7: C and A handling E to improve his ‘piano technique’.

of this dramatic moment, we emphasise the fact that movement really can be converted into sound without musical experience. Even early on in the show, we scaffold the idea that it is possible to simply move in whatever way one might desire, however silly it might look, and create music and sound. Our hope is that the children empathise with E throughout this process, whether or not they can play an instrument, because E has clearly stated he “isn’t a musician” and “can’t play an instrument.”

This is the first of four moments that contribute to an environment that encourages musical participation.

#### 4.2 Power and control

“This is not what I want to play!”

In the early stages of his discovery that he is playing different instruments with his mind and body, E decides to “think of a harp” in order to play it – an instrument he “...always wanted to play.” The scientists immediately shut him down, asking him instead to “think of a piano,” a more traditional instrument in their minds. Against his wishes, E’s movements then map to a piano. The sound mapping on the AirSticks creates the effect of playing an invisible piano – as E raises his hands and moves them out in front of him, piano notes are triggered that are quantised in both rhythm (a steady quaver pulse) and pitch (C major pentatonic scale).

The scientists use this opportunity to correct his technique, noting that if he wants to become a ‘real’ musician, he will have to use proper technique, such as curving his fingers and keeping his back straight. The scientists physically manipulate E like a puppet, disempowering him and correcting his movements by physically handling him in front of the audience, as seen in Figure 7.

The moment reaches a peak when E pushes away the scientists in frustration, lamenting the fact that he has so many other musical ideas he wants to explore besides the piano.

We chose to labour on this moment in the show because we are hoping the children will draw comparisons with their own experiences of learning music at school or outside the classroom. As someone who has taught and been taught instrumental music in schools, I am acutely aware of the anxiety and reluctance many students can feel during music lessons and performances, and this has been well-documented in the literature [4].



**Figure 8: E playing ‘farts’ to everyone’s amusement.**

Students often have an instrument picked for them, like I did when I was in primary school, being made to play the flute because the saxophone I chose was too heavy. Students are also put through sometimes uncomfortable and, to the student, seemingly meaningless exercises like scales or tone and fingering exercises that they may not feel contributes to their overall musical experience. Setting aside the possible impacts or benefits on their future musical endeavours, what I’m particularly interested in here is how music students are made to perceive music production, and what potential creative outlets this might preclude.

Of course, mastery of an instrument is a very different process and motivation to using the mappings and AirSticks in the show, which display characteristics of a classic DMI with a very low entry point, and a low ceiling [9] – they cannot be mastered like a typical acoustic instrument, and they can be immediately played.

But if they have the means to get music lessons (which many do not), students learning instruments usually have to prescribe to the traditional models of learning, which strive for perfection in the delivery of a very specific set of criteria that accompany the Western canon of musical works. Likewise, E is being forced to play an instrument that he doesn’t want to play, in a manner he doesn’t want to play it. We raise this narrative point to create empathy between E and the children in the audience as a means of exploring the possibility of musical alternatives they will see opened later in the show.

This is a political statement: we are explicitly shutting down E’s seemingly unlimited musical power, controlled through his mind, by limiting him to a rudimentary piano lesson. The futility of the scientists’ control thus serves to build a world with these power structures in mind, illustrating how the traditional model of music-making in schools (lessons and performance), may not always be the only choice. By telling a story and creating a fictional reality that reflects their own, we are establishing a value system and means of interpreting their current environment like Reason and Heinemeyer [20] propose – one that they might be more likely to actively participate in.

### 4.3 The fart

“Did you just think of farts?”

Every good kids show has a fart joke in it. *You’re an Instrument!* has many fart jokes, and we’d like to explain why.

The first moment of farts comes about as E, upon attempting to think of another instrument, suddenly plays the sound of farts every time he moves (seen in Figure 8).

C and A quiz E on why he would think of farts when his thoughts are influencing the sounds he plays, but E denies having thought of them entirely. It is thus concluded that the audience’s thoughts must be influencing the sounds E makes, much like how

the audience calmed him down with ‘calm thoughts’ earlier in the show.

E: I swear I didn’t think of farts!

A: Well it has to be someone! [to C] Did you think of farts?

C: I didn’t! I think they [gesturing to children] must have thought of farts!

In the fart moment, the AirStick instrument is mapped in an almost identical manner to the piano sound above, but the sample is replaced by random chopped up sections of a fart sample sourced from a sound library instead. This produces exactly the effect it sounds like it does – when E moves, it sounds like he’s farting in quantised time.

Much like in Section 4.2, here we are emphasising a conceptual point. By demonstrating two ideas through the narrative of the show, we hope to influence music creation later.

The first idea we raise through this moment is that we are in an environment where everyone’s thoughts might be influencing the musical and sonic result. By setting up the idea that someone in the audience might be changing E’s ‘body-instrument’ with their own thoughts, we are opening up the possibility of making them feel like an active contributor to the show as it unfolds.

The second idea that the fart sounds raise is an expansion of what music and sound might look like. By creating an absurd mapping that transforms body movements into fart sounds, we are illustrating that this environment is open to any sound and mapping that one can think of.

We are operating in a shared musical environment, where all our thoughts and actions influence each other, and we can make any sound we might desire – all it takes is to think about it and move. This is the narrative of the show, but it is also the musical reality that DMI practitioners and composers like ourselves operate in – we have the ability to map nearly any movement to a limitless amount of sounds, it takes only the thought process and reasoning to achieve it.

### 4.4 Joining the band

“Let me have a try!”

After E’s virtuosic solo, showing the audience the limits of his musical ability and everything he’d like to do with his newfound abilities, he becomes so overwhelmed with emotion that he sheds a tear, wiping it away with a tissue. Shortly after this, he suddenly loses his musical abilities, unable to play anything. After a brief back and forth with the audience’s help, it is discovered that E has transferred his powers into an inanimate object – the tissue box.

The scientists, the original sceptics of E’s powers, are overjoyed, and celebrate by passing the tissue box between them, playing the instrument themselves. E intervenes by requesting that the children should not only play it, but add to the sounds. The tissue box is passed around, gaining all sorts of silly sounds (including fart noises) as each child contributes a ‘thought’ to the box.

This moment culminates in E activating the ‘musical powers’ of two more objects (a koala bear and the pill box) that each form parts of a band, with E asking children to “think of a bass guitar!” and “think of a melody!” to complete the trio of instruments.

The mapping uses previously composed MIDI fragments being revealed in a way that means the instruments are all quantised and using the same scale mode as each other, creating the feeling of musical cohesion.



Figure 9: Everyone participating in ‘the band’ at the end of *You’re an Instrument!*.

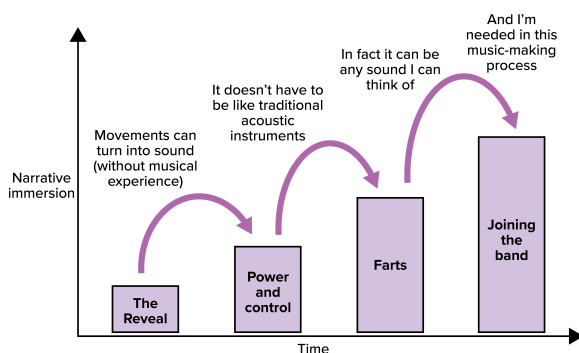


Figure 10: Increasing steps of narrative immersion in *You’re an Instrument!*.

Each AirStick ‘instrument’ is passed around in addition to acoustic auxiliary percussion instruments, and children are encouraged to move and vocalise other silly sounds that they might like to hear in the band.

This active audience participation is not an appended moment at the end of the show, it is the peak of the narrative structure that not only asks but encourages the children to make music. The audience has become a necessary part of the band, and the narrative and worldbuilding of the show has culminated in the participatory moment, as seen in Figure 9.

## 5 Conclusion

The common thread in all of these moments in *You’re an Instrument!* is that we have used narrative techniques and worldbuilding to create an environment within the kids show that we believe is more conducive to active participation at the big moment in the show – when the music-making is done by the audience. By using cleverly placed narrative moments across the show, and building a new reality with the help of worldbuilding elements, the music composition in the show is enhanced through the new context that encourages audience participation, as seen in Figure 10.

We state this to contribute not to a dramatic framework, but directly to the composition and DMI position we are putting forward – narrative and worldbuilding are in fact compositional tools that help provide examples and reasons why an audience

member might interact with and create music with DMIs. Active musical participation is not just something that happens in *You’re an Instrument!*, it is an inevitable and encouraged result of a logical series of (albeit fictional) narrative moments that place the audience in a more active, comfortable and safe environment where they can play music. This is different to a music workshop, where the inevitable result of playing is achieved by asking someone to play or try an instrument. Here, we are applying both the *mise-en-scène* and narrative techniques discussed earlier as a means of scaffolding active audience engagement, using fictional scenarios based in truth to enhance empathy and understanding (much like Reason and Heinemeyer [20] propose) that may allow for active audience engagement. In *You’re An Instrument!*, the narrative and worldbuilding allowed students to feel comfortable exploring silly sounds, and moving to play new sounds amongst strangers. We have observed this technique working well with adults as well, perhaps not in the manner of suspended belief, but at the very least in the manner of scaffolding a structure that provides reasons around participation. Thus, building on immersive theatre disciplines, we propose that worldbuilding and storytelling that involves the audience provides a scaffolding that promotes more active audience participation and a new relationship with DMIs.

## 6 Ethical Standards

This project was conducted with the necessary ethical consent and permissions through Monash University.

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